

Internet exchanges as organisers in the interconnection market

Uta Meier-Hahn, meier-hahn@hiig.de
Alexander von Humboldt Institute for Internet and Society

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Abstract: Today's internet is made up of more than 48 000 networks, mostly operated by private actors. Together, they produce connectivity – a resource they all depend upon when doing business. In order to establish connectivity these competitors need to cooperate. Internet exchanges offer technical facilities for networks to “meet” and exchange traffic. It is argued that internet exchanges have a specific disposition to act as organisers that facilitate the cooperation. This disposition and their organisational practices are analysed through the lens of concepts that are rooted in the economics of convention.

Keywords: organising; connectivity; internet exchanges; interconnection markets; economics of convention

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1. Introduction

Since the commercialisation of the internet in the early 1990s, a networked market has evolved at the internet's core. Connectivity is the good that all network actors depend on – from access network operators, to carriers, to content delivery networks and they can only produce this good together. The very nature of connectivity requires network actors to cooperate while at the same time often being competitors for the same group of customers. I address the question of how network actors deal with this dilemma with help of internet exchanges, also referred to as internet exchange points (IXPs).

While numerous studies emphasise internet exchanges as key elements in the internet infrastructure¹, their role as market organisers has not been reflected upon explicitly. This lack of attention comes as a surprise since we are far from having answered the question of “how large-scale distributed systems in the global economy can be governed in the absence of formalized international regimes” (Van Eeten & Mueller 2012). With regard to this uncertainty, any organisational form that manages to align diverse private market actors behind a common purpose (establishing connectivity) or values, seems well worth examining.

The paper is structured as follows: First, a theoretical understanding of organising as a process and the role of organisers in markets is provided. Then the topic of internet interconnection is introduced with a historical backdrop and an excursion towards the interconnection “ecosystem”. This is necessary to understand how network actors until today behave in awareness of interdependency while being competitors. In the last part, the theoretical suggestions are mapped to internet exchanges and their activities. Specifically, the example of peering fora illustrates what organising can look like in a networked market that is strongly mitigated by technology.

Throughout the text, citations from an ongoing study are included for illustrational use. They stem from semi-structured interviews and informal discussions with European and North American internet interconnection experts such as peering coordinators from internet service providers, internet exchange operators and industry observers.

1. Cf. Brodtkin 2013; Chatzis, Smaragdakis, Feldmann, & Willinger, 2013; Clark, Faratin, Bauer, & Lehr, 2008; Clark, Lehr, & Bauer, 2011; DeNardis 2012; Norton 2012; van Eeten & Mueller, 2012

2. Organisers in markets

Before discussing how internet exchanges can be regarded as organisers in the market for connectivity, it is necessary to clarify how the term “organiser” will be used in this paper.

Organisation theory distinguishes between the static characteristics of organisation, referring to an order or structure that has been produced, and the dynamic aspect of organising, understood as a process and practice. What most definitions of the practice of organising agree on is that it should be understood as an intentional, systematic action that is motivated by a goal. Scholars disagree whether this goal precedes the action or whether the goal is established through reflexive sensemaking (Weick, Sutcliffe, & Obstfeld, 2005) in the course of action. Drawing on Spann (1925), Pfadenhauer highlights one feature of organisational situations. This feature is that the goal cannot be accomplished directly. So organising is defined as “action that effectuates action”. It does so by building a framework that supports the desired action to take place (Pfadenhauer 2008, p. 203). Organisers in this sense are intermediaries who facilitate the coupling of otherwise independent actions.

In the research school economics of convention (EC) this conception of organisers and organising is rephrased. In contrast to Pfadenhauer’s model – and more broadly: to new institutionalisms in general (cf. Scott 2008, pp. 55-56) – the focus is not put on actors and their enacting of roles. Thus, the unit of analysis are not roles but situations (Boltanski & Thévenot, 2007, p. 181; Knoll 2013, p. 40). Actors do not adhere to roles, because norms and values are not regarded as being attached to actors. Instead, actors have a critical capacity to evaluate every situation anew (Boltanski & Thévenot, 1999). They can decide which frame of reference and mode of evaluation they find legitimate to apply and, thus, mobilise different values and other resources, depending on the situation. Such interpretive frames can be described as conventions (Diaz-Bone & Thévenot, 2010, p. 5). Accordingly, to the knowledge of the author, the role of organisers has not been deliberated about by EC scholars. There is no such figure as an organiser in the EC.

However, EC scholars have theorised about organisations. They have suggested thinking of organisations as arrangements of conventions, as compromises (Boltanski & Thévenot, 2007, p. 36; Diaz-Bone 2009, p. 236). Following both the situational focus and the idea of organisations as compromises, organisers can be seen as entities that influence specific processes of ordering in a way that actors find legitimate in that specific situation. Organisers facilitate compromises, they foster conventional arrangements.

As Diaz-Bone and Thévenot (2010) point out, at the centre of the EC is a set of interrelated concepts. Some of these concepts are presented in a check-

list form here in order to apply them to internet exchanges later. Because by drawing upon these concepts an analysis of organising can be performed. It allows to identify organisers as entities that engage in such activities.

- *Discourse*: Organisers facilitate the exchange of opinions, they promote a discourse by arranging or supporting situations of intersubjectivity.
- *Devices* (Boltanski & Thevenot, 1999, pp. 366-373; Thevenot 2001, pp. 410-411): Organisers identify devices that can bridge different conventions.
- *Form investments* (Thevenot 1984, 2002, p. 9): Organisers contribute to shaping formats of information and promote them.
- *Quality conventions* (Díaz Bone 2008; Favereau, Biencourt, & Eymard-Duvernay, 2002): Organisers communicate quality conventions by which goods and services are evaluated on a market.

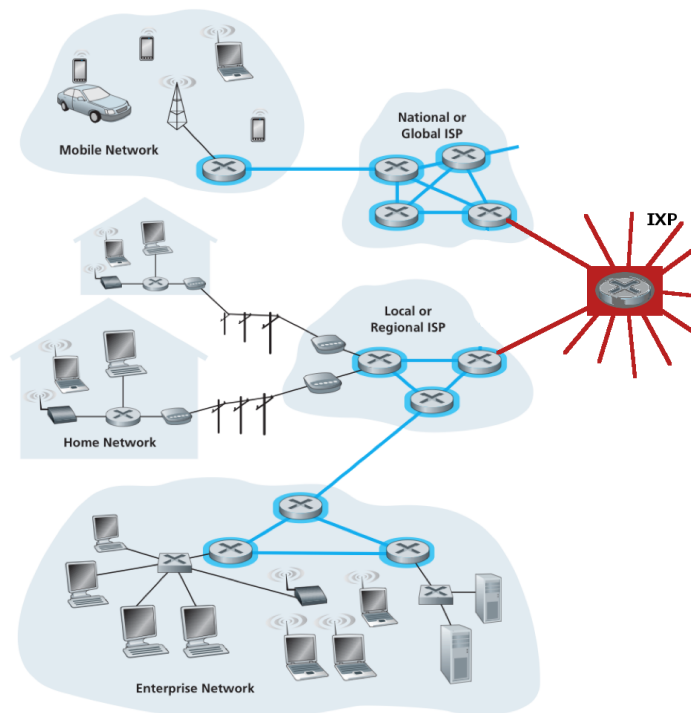
Organisers do not exclusively pursue these activities. Any market actor can engage in the same way. However, not every actor is equally accepted and trusted by other market actors. In order to “effectuate action”, in order to be heard and in order to facilitate compromises, organisers need legitimacy themselves.

Organisational theory blossomed due to its applicability to economic entities such as firms. In this context, it is usually assumed that the organiser’s activity is backed up by a direct mandate. In a market environment however, entities interact with each other in the absence of a formal governance structure. Organising markets seems to be a contradiction. If there is nobody to designate roles or responsibilities, what are the sources of legitimacy which organisers in markets can draw upon to be accepted as such? And how great is the integrational force of this legitimacy?

3. The making of connectivity: history and basics

3.1 The internet as a network of networks

The internet is a network of networks. More than 48 000 networks made up the internet in September 2014 (Bates, Smith, & Huston, 2014). Technically, these networks are called autonomous systems (AS). Organisations that operate an autonomous system are referred to as network actors in this article. Network actors may include carriers, internet service providers, access providers, content delivery networks or organisations with a mixed portfolio. They all have to connect their network(s) to other networks in order to establish connectivity. Connectivity on the internet refers to the situation in which data packets from one end of the network can be routed to any other point of the internet, usually by making hops through a number of in-between networks. Connectivity is the central idea of the internet. The internet relies upon successful interconnection arrangements between network actors at the core of the network. Internet interconnection is not limited to internet exchanges, but large amounts of internet traffic pass through them. The rest passes through direct so-called cross-connects or private network interconnects.



(Internet interconnection takes place at the core of the internet (blue). Internet exchanges (IXPs) allow network actors to connect (red). Adapted from Kurose & Ross, 2003/2013, p. 23)

3.2 Cooperation and competition: peering and transit

Technologically, an important milestone in the development of internet interconnection occurred in 1986. It was during this year that standards were introduced and adopted for the interconnection of networks which used the internet protocol (IP)²³. By 1990 IP had spread as the main protocol for wide area network interconnection internationally (Leiner et al., 1999). This technically allowed for the interoperability that was necessary to get IP-based interconnection facilities going anywhere in the world.

From the regulatory side, a significant step was taken in 1992 with the commercialisation of the internet's backbone, i.e. the principle, long-distance data routes which connect the core routers of the internet. The US National Science Foundation determined that the previously government-funded core of the internet should be operated by the private sector.

With commercialisation, however, also came a change of attitude towards internet interconnection. The internet had been started in academic institutions and research centres. Building connectivity was seen as proof of the concept and a necessarily collaborative effort to make the internet work. Now the backbone of the internet transitioned into the economic realm (1999). Commodification of infrastructure provision took up. Regional network service providers could get connectivity from several backbone operators in a competitive process (Norton 2012, pp. 102-103).

These specific policy decisions about the operation of the internet were in line with the liberalisation of the telecommunications sector in general. In the USA, Europe and many more places around the world, deregulation started between the mid 1980s and the 1990s (Lazer & Mayer-Schonberger, 2001). Where monopolistic telecommunication structures were transformed towards more open, regulated forms of competition, new backbone and access networks could emerge. A growing number of network actors needed to establish connectivity. This gave way to the evolution of what is sometimes referred to as the interconnection "ecosystem" (Norton 2012, pp. 99-149).⁴

2. The standards were introduced in the RFC 985 "Requirements for Internet Gateways -- Draft" (Landweber, Lauck, Mills, & Perry, 1986). RFCs are the documents in which new standards for internet technology are being proposed to members of the Internet Engineering Task Force (IETF). The IETF is an open organisation with the aim of improving the internet by producing technical documents to be used by network engineers around the world.

3. Early precursors of internet exchange points were called Internet Gateways, followed by Network Access Points (NAPs) (Leiner et al., 1999).

4. Differences in national regulatory frameworks have and continue to shape interconnection practices around the world. Regulatory intervention may happen e.g. in

Similar to other networked markets like the markets for air transportation or telephone connectivity, there is also a tension between cooperation and competition in the market for internet interconnection. All network actors depend on connectivity as the resource or basis of their business. They can only produce this together. At the same time there is competition when network actors negotiate supply and demand in interconnection agreements (Zarnekow, Wulf, & von Bornstaedt, 2013, p. 60).

There are two kinds of economic relationships in internet interconnection which mirror awareness of this concurrence of cooperation and competition: peering and transit. Both indicate distinct conventions.

Peering denotes cooperation. It typically describes a settlement-free interconnection relationship.⁵ Two parties agree to directly exchange traffic between their networks and deliver this traffic along the routes of their networks free-of-charge. Both parties benefit from this cooperation because by exchanging traffic directly, they both avoid sending it over third party networks for which they would have to pay. Peering became a paradigm for small and medium-sized networks because it allows them to bypass the pay-to-use connectivity offered by transit providers. Peering relationships are settled in a highly informal way: According to an OECD survey, in 2011, out of all peering agreements in the internet an estimated 99.51% were based on handshake agreements only (Weller & Woodcock, 2012). There are no contracts and no guarantees. Since internet exchanges are the places where numerous networks can meet and exchange traffic directly in this mutually beneficial way of peering, they have become associated with or founded in the spirit of cooperation. By cooperating at internet exchanges, network actors bundle forces against incumbent telecoms.

Transit on the other hand, implies a vendor-customer relationship. It involves charges, typically per amount of traffic and it is a slightly different service. Transit is the termination of traffic at *any endpoint* of the global internet, not just the delivery to the endpoints that the partnering network has at

form of limiting access to the market, by binding internet interconnection to transparency rules (France) or by making certain interconnections mandatory within a jurisdiction (China). Detailing this would be beyond the scope of this article. However, it is important to keep in mind, that even though the internet is global in scope, and even though standards for interconnection have been adopted all over the world, there are regional differences in the regulatory frameworks that apply to and influence internet interconnection.

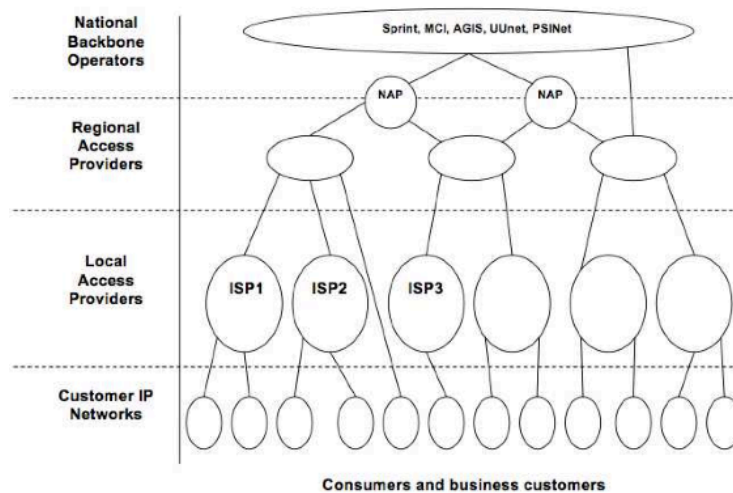
(In awareness of regional differences in interconnection practices – most prominently between the United States of America and Europe – this article will focus on the internet interconnection landscape in Europe.

5. Paid peering also exists, but rather as exception of the rule.

hand directly. So peering only refers to the exchange of data packets between two networks and does not necessarily involve the termination of packets at *any* endpoint of the network, but transit does.

3.3 How the internet interconnection “ecosystem” has changed and the role of exchanges

During the initial phase of the commercial internet, the topology of the network resembled a hierarchy. Payments for the transmission of traffic generally would go from bottom to top in this hierarchy.



(“Traditional Internet logical topology“. Source: Labovitz, Iekel-Johnson, McPherson, Oberheide, & Jahanian, 2010, p. 4)

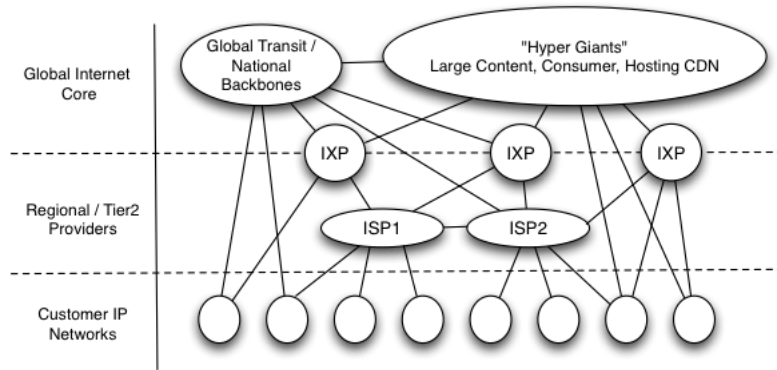
Tier1: At the top of this hierarchy were backbone operators, often referred to as Tier1 internet service providers. Tier1s typically stemmed from ex-monopolist telecommunications providers. They maintained long-haul connections and, by definition, have access to the routes to any endpoint of the internet in that region – just through settlement-free peering relationships (Norton 2012, p. 111). Tier1s by definition, do not pay for transit. (2012, p. 114)

Tier2: On the next lower level were so-called Tier2s. These regional internet service providers operate networks only in a limited area. In order to reach another region, they had to buy transit from the Tier1 backbone operators who would then route the Tier2’s traffic to other regions.

Access networks: At the bottom of the hierarchy were local internet access networks, Tier3s. The customers of access networks are individual or organisational end-users who pay for access to the global internet. Access networks were in a customer relationship with Tier2 providers from whom they bought

transit. Access networks typically were not connected to internet exchange points.

Internet exchanges or internet exchange points (IXPs): Internet exchanges or network access points (their predecessors) were locations where Tier2s and Tier1s could meet to interconnect for transit if they did not want to invest in private interconnections. However, the exchanges did not only provide the infrastructure to enable transit relationships. They also enabled those Tier2 networks to interconnect with each other directly. Peering since has come to be regarded as economically advantageous for networks which knew that they had similar traffic flows between each other. By exchanging this traffic directly at the IXP, the Tier2s cut out the Tier1 from the equation. Both Tier2s saved the money they otherwise would have had to pay for transit to reach the other Tier2. Direct peering relationships had another advantage: the Tier2s would reduce the number networks that their traffic would have to pass through. So peering at that time was not only cheaper than buying transit but it also reduced the latency. Direct peering enhanced the quality of experience for the end users.



(“Emerging new Internet logical topology“. Source: Labovitz et al., 2010, p. 4)

Roughly within the last ten years, actors and traffic flows on the internet have gradually changed in a way towards more direct interconnection relationships as can be seen in the graphic above. The number of peering relationships *across* different stages of this hierarchy increased, but there were also infrastructure innovations such as content delivery networks (CDN) that undermined the hierarchical structure. The internet’s topology has started to change “from hierarchy to mesh” (2010).

By facilitating cooperation among network actors, internet exchanges played a vital role in contesting this hierarchy.

3.4 Commercial vs. not-for-profit internet exchanges

In September 2014, a total of 460 internet exchanges were known to exist. These exchanges are distributed as follows: 193 in the regions of Europe, Central Asia and the Middle East, 97 in North America, 89 in the Asia Pacific region, 51 in South America and the Caribbean and 30 in Africa. 103 countries have at least one internet exchange⁶ ("List of Known IXPs Around the Globe," n.d.).

Interconnection facilities come in various shapes and sizes. They differ by foundational context, ownership, business model, governance model, the services they offer, underlying local regulations, and joining requirements for members. So there is both room and need for a comprehensive analysis of internet exchanges around the world in order to make broader assessments.⁷

In order to indicate the spectrum, two distinct types of internet exchanges shall be delineated: commercial and not-for-profit exchanges. Both of these types are common, yet they differ with regard to their disposition to act as organisers in the market. In a well-known industry handbook, the not-for-profit characteristics have been coined the "European model" whereas the commercial characteristics are referred to as the "US model" (Norton 2012, pp. 240-250). Since there are several counterexamples this attribution should only be taken for tentative orientation.

Not-for-profit exchanges: In Europe, the majority of all internet exchanges are of a non-commercial nature, even though commercial exchanges have been founded within the last few years. The first European internet exchanges emerged out of academic institutions and were later transformed into associations with boards and members who have voting power. Examples include two of the largest exchanges, the Amsterdam Internet Exchange (AMSIX) and the London Internet Exchange (LINX), both established in 1994. The members pay fees which are calculated towards covering the costs for the professional operation and development of the exchange. Not-for-profit exchanges are accountable to their members. Their orientation towards catering for the interests of their communities is deeply enshrined in their organisational structure. In this, they differ profoundly from commercially driven exchange points.

Commercial exchanges: Commercial internet exchanges are often operated by data centre companies which also offer other services such as co-location

6. The regions refer to the administrative regions in which the internet has been divided, starting in 1990. In each of these regions a Regional Internet Registry (RIR) manages the internet address space in a self-regulatory fashion.

7. For a tentative overview see Silvius (2011).

and rackspace. Sometimes, they do not even call themselves internet exchanges. For such companies, internet interconnection is one out of several sources of revenue. Due to their commercial setup, these facilities have one freedom that not-for-profit exchanges lack: They can attract specific customers by applying differentiated pricing strategies, such as offering discounts to important customers. They do not need to treat all members equally. Since the economic value of an internet exchange point also derives from both the number and the kinds of networks that are available for peering, this freedom gives commercial exchanges a strategic advantage over not-for-profit exchanges. However, for the customers, a commercial setup also implies that they have no say in the management and future operations of this exchange. It is the owner who manages the exchange and decisions are inevitably skewed towards generating a profit. This puts the customer network actors in a dependent position.

3.5 Neutrality as a measure for acceptance

“An IXP is not a player in this market. [...] The actors are the ISPs. The actors are the ones who make their choices.” (Senior interconnection expert)

Internet exchanges are positioned as intermediaries between network actors.⁸ Network actors have to be able to trust the internet exchange in numerous ways, e.g. with regard to security. That is why neutrality is an important concept for internet exchanges, even though it may be interpreted differently. Neutrality can be evaluated in different dimensions which show that not-for-profit exchanges have a strong advantage in being perceived as neutral because of their self-regulatory governance model.

- *Governance model:* If the decision-making processes of an exchange are based on democratic principles this is associated with neutrality. In this sense, neutrality equals self-governance and members' will. It means that the operator cannot set his own agenda for the exchange. Association-based exchanges will qualify as neutral in this sense, both commercially driven and state-regulated exchanges will not.
- *Peering policy:* A neutral exchange will strike an acceptable balance between establishing rules but not interfere with the member's businesses. What is acceptable, obviously lies in the eye of the be-

8. The strong desire to be perceived as neutral can even result in exchanges denying their intermediary role all together. A reason for this may be regulator's increasing interest in intermediary regulation and the still unfixed definitions of what constitutes an intermediary in the regulatory sense of the word.

holder. Especially the largest network actors may find a policy not acceptable if it requires all members to peer with each other. A neutral peering policy would leave the interconnection decisions to the members.

- *Fees*: If the same pricing scheme applies to all members, neutrality refers to equal treatment of members and potential members.
- *Scope of activities*: Sometimes internet exchanges engage in net politics, for instance by actively participating in internet governance fora. Neutrality in this regard denotes exchanges that refrain from voicing political opinions.

By emphasising their neutrality internet exchanges can foster their members' trust. They need this trust in order to become accepted as organisers in a global market environment that is subject to distributed and contested rule-making authorities.

"The internet relies on trust. A peering person has to trust the internet exchange will upgrade in time and not manage the traffic to their advantage but to their member's advantage. Or he has to trust that the exchange will keep people's traffic private and two peers have to trust that they'll work in good faith of each other and get rid of network abuse without degrading the quality of their competitor's internet access service." (Chief technology officer)

4. Internet exchanges as organisers and the case of peering fora

In the section "Organisers in markets" (pp. 4-5) organisers and their activities were defined by the following criteria: Organisers are motivated by a goal which cannot be accomplished directly. They act intentionally and systematically in order to effectuate action which otherwise would not take place. They do so by building a framework which supports the desired action to occur. If market actors accept this as a common frame of reference, compromises between otherwise diverging conventions become possible, even under conditions of competition. The fabric of this frame can consist of a shared discourse, devices, formats of information or quality conventions.

Internet exchanges do not per se conform with all of these criteria, but they have an ability to do so. The *goal* is to produce the internet as a network of networks and as a market place by allowing for easy interconnection. This has been the very idea behind internet exchanges, starting with commercialisation of the internet backbone. Exchanges have an inherent interest in growing their member or customer bases in order for network actors to interconnect. More members make them more attractive for future members be-

cause those will have more options for interconnection. “A successful exchange point is like a well-attended party”, notes industry expert Bill Norton (2012, p. 87). Internet exchanges’ motivation to grow may be grounded in commercial interest or, in the case of association-based exchanges, in their devotion to a member community. The latter may even have a mandate to do outreach and engage in fostering an interconnection-friendly environment.

Enhancing connectivity is a widely shared goal by many actors in the internet economy. Still, connectivity remains a network effect which *cannot be established directly* on the internet. There is neither one network actor that could enable full connectivity, nor a central authority that oversees internet interconnection. According to the open technological standards of the internet, anybody can contribute to this infrastructure. Network actors strongly interdepend on each other (Meier-Hahn 2014, pp. 13-19) while interacting on a voluntary basis. This also implies that there are limits to the organisational scope that internet exchanges can develop: They can foster interconnection between network actors, but they cannot decide about it, enforce or control it. Internet exchanges facilitate internet interconnection, but they do not directly effectuate it.

As *intermediaries*, internet exchanges can act as organisers by offering a *framework for cooperation* in a competitive market place. How do they do so? The most obvious organisational activity is that they offer a location where network actors can connect their networks by use of up-to-date technical equipment. The internet exchange facilities and their equipment are *devices* that extend the technical standards and the possible arrangements in internet interconnection into the future. Standards on the internet are important means to communicate *quality conventions*. For instance, the standards of the internet have allowed to include prioritisation requests in each and every IP packet that is sent through the internet since many years. However, as a convention, this classificatory information is not interpreted by the routers that are used at internet exchanges. So even if network actors wanted, they could not abandon net neutrality at the core of the public internet. So the configuration of the routing devices at the core of the internet actually stabilises the best-effort principle as a quality convention.⁹

Beyond that, there is a plethora of outreach activities which internet exchanges engage in. For instance, they generate and publish statistics, maintain

9. The best-effort principle means that the internet is set up to deliver all packets with the best of effort. But no guarantees are given with regard to loss of packets or delay.

mailing-lists for network engineers or provide interconnection trainings. In the words of the EC these are all *formats of information*.¹⁰

Most prominently though, internet exchanges organise peering fora. Peering fora are invite-only events where network engineers and peering coordinators gather.¹¹ This is a very direct way to foster a common *discourse*. Typically, the meeting place for a peering forum will have a high recreational value, and so-called “socials” with drinks and entertainment are explicitly part of the agenda. The second unique item on the agenda are time slots for pre-booked meetings: Mediated by an online booking tool, any participant can request a 30 minute one-on-one meeting with any other participant. An internet exchange operator described this as “speed dating for networks” which both highlights the informal character of these dates and emphasises their efficiency.

*“There are people who just don’t show up at these meetings. Those, I have to visit individually. **Here, it is the easiest thing.** I usually come here to **discuss capacity planning.** We talk about **which expansions we expect** [at our company, ed.]”*
(Peering coordinator at a peering forum)

Within the industry, peering fora have an ambivalent reputation: Some network actors point out how they benefit from the personal contact with other interconnection professionals. They perceive these fora as bringing about business advantages – be it in terms of new peering agreements or in less tangible terms such as personal relationships. The latter may be helpful in the future, for instance when having to troubleshoot network problems – remember: network actors interdepend on each other. Other network actors deride such meetings as “inefficient”, without having even actually participated in one. They think that the participants use the fora as an excuse to get drunk together.

*“That’s a uniquely **Euro centric view.** (...) Europe has an **extraordinary business culture** that is, to the rest of the world, **inconceivably permissive of inefficiency.**”* (Senior interconnection expert on peering fora)

From personal observation and talks, there seems to be some truth in both assessments: The participants definitely enjoy the lively atmosphere. “Beer” as of “peering” and “beer” is a buzzword many use with a wink. But all of the people I talked to at a peering forum had an explicit, work-rela-

10. It should be noted that the degree of organisational involvement differs significantly between IXPs. This article focusses on understanding their disposition and bringing to the fore the organisational mechanics and practices.

11. In Europe the 9th annual Peering Forum took place in September 2014, organised by the European Internet Exchange Association (Euro-IX).

ted agenda for the event and a tight meeting schedule. Socialising is part of this business.

Such differing assessments of peering fora seem to be contradictory. However, from an EC point of view it does not come as a surprise. The divergent views are voiced with reference to an activity that has an organisational impetus, and organising means facilitating compromises or temporarily locking arrangements of conventions.

*"The best ones [IXPs, ed.] that I've seen are the ones that **understand all parties** that are concerned in the deal. They understand what needs to be done to make the operations of the IXP **work efficiently**. And **they understand that there's other parties involved** – that there's vendors [...] that you need to have a great relationship with (...) and **they also have their own goals** to make money from your members." (High level internet exchange advisor)*

In internet interconnection, numerous conventions can be found¹²: Those who speak up for or sell transit (see p. #) follow a clear market convention in which connectivity and bandwidth are compensated with money. The idea and practice of peering (see p. #) however, already lies at an intersection of a market and a civic frame of reference: In a mutually beneficial peering relationship, both parties calculate the cost they can save by peering (market rationale). But peering can also express solidarity, cooperation and a valuation of the internet as a whole, as a collective good (civic rationale). Further, there is a domestic convention: Since interconnected network actors have to rely on each other in day to day operations, some may value trust as an important asset. This is also exemplified by the prevalence of handshake agreements. Trust is an elementary relation in the domestic realm where knowledge and experience are shared orally and by means of anecdotes. An event that emphasises socialising, strongly supports this kind of informal knowledge exchange. This is why some network actors like peering fora. Finally, even elements of a convention that centres around reputation can be found in internet interconnection. Despite the fact that many network actors sell a seemingly interchangeable product (connectivity and transport of IP-packets), they may have a certain standing – good, bad or even famous.

"Everybody knows each other. [...] This is like a small circle of people. You will always meet again. Network engineers always meet again in life." (Network architect)

A preliminary insight, based on the first interviews is, that network engineers and peering coordinators perceive of themselves as a small, but global community of experts. In this community some persons are especially well known and credited for merits they may have earned as technicians (for in-

12. The concept of conventions and six general orders of worth has been developed by Thévenot and Boltanski in ON JUSTIFICATION (Boltanski & Thevenot, 2007).

stance by writing important standards), as charismatic figures with a vision, or as entrepreneurs.

While the plurality of conventions does not say anything about how these conventions relate, the plurality itself is notable. Peering fora are arrangements where divergent conventions live side by side.

"It is all about money." (Two peering coordinators)

In personal communication it was suggested that during these events participants with a clear interest or business policy may cross the bridge towards accepting a competing rationale. Internet exchanges actively foster this atmosphere of cooperation by offering room both for explicit business negotiations and by creating a friendly atmosphere that allows network actors to build social relationships over time. In other words: Internet exchanges can facilitate a shared discourse and establish the fora as a format of information.

*"You have to remember, that **the internet is 40.000 competitors** who are competing with each other. But **if they don't work together, then none of them have a product**. So being grown up and socialising, that doesn't have to mean sitting in a nightclub until five in the morning. It does mean: being able to **talk to each other on mutual ground, as equals**. And that means that we as competitors can work together and **deliver that one product**: (?) good quality internet. If we were trying to do this **without the beering**, without the socialising, **it would be very difficult to break down that competitive angle**." (Chief technology officer)*

By way of example it became evident how internet exchanges can act as organisers in the interconnection market. In several interviews, experts referred to two other types of events which serve the interconnection community in a similar way: network operator group meetings and meetings that are organised by the Regional Internet Registries. From a preliminary assessment, both of these bodies will likely qualify as organisers as well. They also can draw upon neutrality in order to be accepted as facilitators, and they also engage in educational programmes. However, internet exchanges are distinct from these bodies for two reasons: One is that internet exchanges actually participate in the interconnection relationship by providing the interconnection fabric – even if they take measures not to be perceived as intermediating. The second reason is that internet exchanges have an interest in pushing peering because they may have a mandate to grow and this makes their own offer more attractive.

5. Conclusion

Thinking markets together with organising as a process is an interesting approach to discover processes and practices of coordination in markets which would be invisible from a structural perspective.

Organisers have been introduced as entities that intentionally facilitate and try to influence action and thereby contribute to coordination. For or-

organisational activities in markets it is assumed that there needs to be a goal behind which the participating parties can align (while they may have other, competing goals). So organising as a process is directional, but it is not direct. It is thought of as an integrating force towards a goal in order to actually “effectuate action”. For internet exchanges, the higher goal to foster connectivity is enshrined in their technological heritage, in their mandate and for the commercial exchanges: even in their business model.

It became evident that in a market environment, an organiser needs to be granted legitimacy in order to be accepted by actors who adjust their actions voluntarily. Neutrality and a common goal are sources of legitimacy for organisers in a networked market. Both of these elements foster trust in the process. And network actors cannot but seek trust in interconnection as they interdepend on each other and the system of the internet is live.

The process of organising is aimed at facilitating compromises. This involves establishing practical commonalities such as a shared space, accepted formats of information, shared devices or quality conventions. This is not to be mixed up with mediating: organisers minimise their role as intermediaries. Internet exchanges for instance do not participate in negotiating the content of interconnection agreements between network actors. And they do not attempt to discuss which interpretational frame in internet interconnection is the right one – whether price, experience, technical expertise, future orientation or reputation is a good mode of evaluation when it comes to a business relationship between two networks. Facilitating arrangements of such conventions means that the network actors are left directly and privately in touch with each other. It creates a common ground where the actor’s different frames of reference are acknowledged and at the same time put in perspective. The relativistic atmosphere – paired with at least one common goal: to produce connectivity – is what fosters a surprisingly open atmosphere in this competitive market.

It would be interesting to learn more about how important or even necessary the practice of organising is in interconnection markets. One way to find out about this could be to analyse markets that have *not* developed well – despite good infrastructural and regulatory preconditions. This is for instance the case in the Arab region. If interconnection does not flourish there, *despite* the existence of organisers by the above mentioned criteria, this could be an indicator that either conceptually, organising needs to be adjusted culturally or that it is not so important for a market to function overall. However, if there are no organisers, this may be an indicator that networked markets rely on organisers to build the bridge between cooperation and competition.

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