Internet... the final frontier: an ethnographic account ; exploring the cultural space of the net from the inside

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Internet… The Final Frontier: An Ethnographic Account

Exploring the cultural space of the Net from the inside

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Abstract

The research project "The Internet as a space for interaction", which completed its mission in Autumn 1998, studied the constitutive features of network culture and network organisation. Special emphasis was given to the dynamic interplay of technical and social conventions regarding both the Net's organisation as well as its change. The ethnographic perspective chosen studied the Internet from the inside. Research concentrated upon three fields of study: the hegemonial operating technology of net nodes (UNIX) the network's basic transmission technology (the Internet Protocol IP) and a popular communication service (Usenet).

The project's final report includes the results of the three branches explored. Drawing upon the development in the three fields it is shown that changes that come about on the Net are neither anarchic nor arbitrary. Instead, the decentrally organised Internet is based upon technically and organisationally distributed forms of coordination within which individual preferences collectively attain the power of developing into definitive standards.

Captain's Log

III Hello Usenet - Goodbye?
Agency and Ordering in Electronic Communication

200 hello, you can post

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1.1 The computer as a "new" medium
1.2 Communication on and about Usenet

2 "Imminent Death of the Net Predicted!" – Periods of medial (dis)order
2.1 "Hello Usenet" – The founding years
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"Last Chance for Common Sense":
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Patterns of transformation

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References

Captain's Log

It's 1999, and the Internet is stretching out before us – into infinity. You are reading the final report of the research project entitled "The Internet as a space of interaction. Net culture and network organisation in open data networks". This text is accompanied by a CD-ROM containing our collected works about the Net, also to be found on our Internet web server at http:/duplox.wz-berlin.

This joint project, involving the WZB and the Technical University of Berlin, was sponsored from 1996 to 1998 by the Volkswagen Foundation as part of the priority programme on "New information and communication technologies in the economy, media and society: interplay and future prospects". It was carried out by the project group "The Cultural Space of the Internet", which was founded in early 1994 in the WZB department of "Organisation and Genesis of Technologies".[1]

Welcome to the Net

The 1990s was the decade of the Information Society in Germany, as it was in other countries. The construction and expansion of information infrastructures became part of the political agenda; "multimedia" was voted word of the year in 1995; and the Bundestag set up a commission of inquiry on "The Future of the Media in the Economy and in Society: Germany's Pathway into the Information Society".[2] Connection to the Internet on a global scale and ever speedier communication are trends that involve a huge part of the contemporary world. The Internet has transformed itself from a research network into a universal medium at a speed which has surprised many. A presence on the Net seems to have become an indispensable part of public life.

If we subdivide processes of technical development (as an ideal type) into the three phases of emergence, stabilisation and establishment (Dierkes 1997; Weyer et al. 1997), we would probably now situate the Internet in the "established" phase. The number of computers connected to the Net across the world has increased more than ten times in the last four years: the Internet Domain Survey counted over 3 million Internet hosts in July 1994, compared to over 36 million in the summer of 1998.[3] The number of countries with international Internet connections grew from around 70 to over 170 over the same period (to July 1997).

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[1] Apart from the "standing members" (Sabine Helmers, Ute Hoffmann, Jeanette Hofmann, Lutz Marz, Claudia Nentwich, Jillian-Beth Stamos-Kaschke und Kai Seidler), the following people also contributed to the work of the group: Tilman Baumgärtel, Meinolf Dierkes, Valentina Djordjevic, Volker Grassmuck, Madeleine Kolodzi, Johannes Brijnesh Jain, Thei van Laanen, Jörg Müller, Martin Recke, Barbara Schlüter, Evelyn Teusch und Eef Vermeij.

[2] The commission concluded its work in the summer of 1998 (see the reports under http://www.bundestag.de/gremien/14344xhtm).

[3] http://www.nw.com/zone/WWW/report.html

Although the Internet has undoubtedly become established, it is now less than ever a "finished" technology. Today's Internet is no longer what it was only a few years ago. New services such as the WWW have changed its appearance fundamentally, its functions have been expanded by innovations such as Internet telephony and push channels, and growing commercial use has increased the security and reliability requirements of e-commerce and legal business. In short, the establishment phase has brought the Internet far-reaching and radical change.

Project outline

In the *Net Culture and Network Organisation* project we wanted to know what essentially holds the distributed "net of nets" together. The central thesis behind our research was that the open, unbounded network has a kind of implicit design plan. This implicit design has left its mark on the Internet in the course of its use, during which Net users have effectively constructed the system. In addition to this thesis, we also started out with certain fundamental assumptions regarding the Internet as a cultural and sociological object of investigation. These assumptions are packaged together in the concept of "cultural space".

- We looked at the Net as a new kind of *space of interaction*, distancing ourselves from the metaphor of the Information Highway which became popular in 1993/94 and portrayed computer networks merely as arteries that transport information (see Canzler, Helmers & Hoffmann 1997 on the information highway metaphor). In the global information space, saturated with technical media, the exchange of information and its regulation are subject to different conditions than those applying in the traditional (mass) media or in the geographical space of distinct nation states.

- For us the culture of the Internet represented a "complex whole" in the ethnological sense, which both includes and pervades knowledge and usage, and institutions and artefacts (see Helmers, Hoffmann & Hofmann 1996). The material, immaterial, technical and social elements of the network do not evolve in isolation, rather constitute a cultural *web of meaning*, which growth and transformation now threaten to tear apart.

- The description of cultures is traditionally carried out using ethnographical methods. Ethnography means going to the scene of the action, observing people in their activities, possibly becoming personally involved and recording what occurs. The world of the Internet can also be an object of ethnography and be described "*from within*" (see Helmers 1994).

- The technical basis of computer networks does not, in principle, prevent the researcher from becoming personally involved in the object under observation. Both access (literally and in the sense of understanding) to the field and investigation of the field do, however, entail particular prerequisites; on the other hand, the Net also permits hitherto unfamiliar forms of observation (cf. Hofmann 1998b). Field research on the

Internet thus requires the researcher to be *equipped with the relevant technology and practical experience* to a degree which is otherwise uncommon in cultural and sociological projects.

To summarise these four aspects: our approach involved a spatial model of communication, an ethnological concept of culture, a commitment to a perspective of the Internet from within and a determined immersion in technology. On this basis we chose three arenas for an empirical investigation: the technology of Internet nodes; the basic Internet transmission protocol; and a popular communication service. The three parts of this report each take us to one of these three areas of investigation.

The central concern of the first part is the Unix culture – dominant for so long among Internet hosts – and its reincorporation into the technical and social norms of data traffic. The second part is concerned with the political aspects of the Net, as exemplified by the reform of the Internet Protocol (IP). We show how the reigning architecture of the Net and the "techniques of government" in Internet governance are bound together. Using the example of Usenet, the third part tunes into the noise of a medium in use. Here we illuminate communicative action on Usenet which is concerned with the medium of communication itself.

All three strands of the investigation are equally concerned with questions of "being" and "becoming". In the conclusion we highlight those aspects of the interaction space of the Internet which, in our opinion, continue to exert an influence on the constantly expanding Net even as it changes. Both efforts to reform "from within" and attempts to regulate "from without" have to work on the basis of these concurring patterns of organisation. Our study thus ultimately illustrates the continuities *accompanying* the transformations – in other words, how persistently the culture of the Internet asserts itself even in the phase of radical change.

Exploring the new territory

The Internet has gained in terms of visibility and – at least in the industrialised countries – in terms of social and economic relevance. There has also been a growth of cultural and sociological research about the Net. A rough survey of the more recent literature in English reveals three main areas of interest. Works on virtual communities that have grown up around the services of the Internet are most common: social relationships and the formation of identity in the information space have been the main objects of investigation here, while some researchers have also treated the internal organisation of Net services (see, e.g., Jones 1995 and 1998; Kollock & Smith 1998; Porter 1997; Shields 1996; Sudweeks, McLaughlin & Rafaeli 1998; Turkle 1996). The second area of interest, which has received much less attention, is the reappraisal and documentation of the history of the Internet (see, e.g., Hafner & Lyon 1996; Hauben & Hauben 1997; Salus 1995). The third research area is concerned with political and legal questions of Internet governance (see the following volumes of essays for an overview: Kahin & Keller 1997; Kahin & Nesson 1997; Loader 1997).

An enormous quantity of books about the Net has also appeared in Germany over the past few years.[4] The majority of these are instructions for construction and use, course books and dictionaries, but there is also an increasing number of social science titles.[5] The only recently discovered "terra incognita of Computer networks" (Wetzstein & Dahm 1996, p. 37) has become a favourite destination for business trips.

In sociological research the new reality of the world of the Net is being given a superstructure of old/new objects of knowledge. Objects of knowledge are not found; they are made. The Net as a cultural space, the focus of our project, is *one* such object of knowledge constituted by the anthropology of technology. To this corresponds a form of representation which reflects the images recurring in the field under investigation. (We are confident that the readers of this report will not be entirely unfamiliar with the voyages of the Starship Enterprise: *space ... the final frontier* …)

The external perspective of regulation and control offers another type of approach. This, for example, is the approach of the project being carried out at the Max Planck Institute for the Study of Societies in Cologne: "The Internet and the development of research computer networks. An international comparison from a governance perspective".[6] While this project focuses on the genesis of the technical infrastructure of the Internet, the Telecommunications Research Group at the University of Bremen is investigating which public instruments can be used to foster the institutionalisation of the new technologies of communication at the applications end. Their project is entitled "Pathways into the Information Society. Comparing German, EU and U.S. 'Multimedia' Initiatives and their Institutional Embedding"[7].

The Internet as a "life world" represents a third approach. The question here is how the new forms of computer-based communication affect identities, relationships and communities (see Döring 1998 on the present state of research). Thus, the "Virtual Communities: The Social World of the Internet" project under the social science priority programme "Switzerland: Towards the Future" is concerned with the question of whether virtual communities possess a function of social integration and what power they have to bond people together.[8] The project group "Transit Culture" at the RWTH in Aachen is examining the role of global networking in the transformation of the space-time framework.[9]

Finally, the Net is becoming interesting as a place of commercial innovation, as an "electronic marketplace". In this context a technology assessment project is being carried out at the Karlsruhe Research Centre on "Internet Payment Systems for Digital Products

[4] While in the autumn of 1995 the "Internet Literature List" counted around fifty publications in German, three years later, in autumn 1998, there were over a thousand (http://medweb.uni-muenster.de/zbm/liti.html).
[5] A selection of titles in German: Becker and Paetau 1997, Bühl 1997, Brill and deVries 1998a, Gräf & Krajewski 1997, Hinner 1996, Münker & and Roesler 1997, Rost 1996, Stegbauer 1996, Werle & Lang 1997.
[6] http://www.mpi-fg-koeln.mpg.de/~kv/paper.htm and Leib & Werle 1998.
[7] http://infosoc.informatik.uni-bremen.de/internet/widi/start.html
[8] http://sozweber.unibe.ch/ii/virt_d.html
[9] http://www.rwth-aachen.de/ifs/Ww/transit.html

and Services".[10] Digital money is also a focus of the project "The Internet as a Global Store of Knowledge" at the Humboldt University in Berlin, which comes under the inter-regional DFG Research Cooperative "Media – Theory – History".[11]

Inevitably connected with electronic commercial dealings are new requirements for legal relations on the open Internet with its lack of state borders. In this area – as in others – the Net is becoming not only an object of research and regulation but also a resource for these; see, e.g., the "German Cyberlaw Project" and the "Cyberlaw Encyclopaedia".[12]

A further line of investigation concerns online research tools. The working group "Online Research" set up at the Centre for Surveys, Methods and Analyses in Mannheim (ZUMA) in May 1998 is dealing with fundamental scientific questions in the area of Internet-based procedures of data collection.[13]

The examples mentioned are an indication of the increasingly diverse links between the Internet and economics, politics, science and the world we live in. There is no shortage of prognoses that the Net will change our lives, but assessments of the actual extent of social change that it will bring vary widely. While some see it as merely a transitory home for more or less fleeting computer-mediated social worlds (Rammert 1999), others discern the evolution of a "qualitatively new kind of society" (Bühl 1997).

While our "insider" perspective allows us to make certain well-founded conjectures about the persistence of traditional forms of order within the Net, we cannot make far-reaching statements about the sociological significance of open data networks. But we can at least point out that the correlation between growth in size, centralisation and the development of hierarchies observed in traditional "large technological infrastructure systems" (Mayntz 1993, p. 105) is not yet apparent on the Internet – quite the contrary. Trends towards increasing heterogeneity and decentralisation in Net architecture and in applications are becoming apparent. But then the Net is not a normal information infrastructure, rather it is possibly "the best and most original American contribution to the world since jazz. Like really, really good jazz, the Internet is individualistic, inventive, thoughtful, rebellious, stunning, and even humorous. Like jazz, it appeals to the anarchist in us all …" (Edward J. Valauskas, cited in Rilling 1998).

Now that we have completed our work, the project group "The Cultural Space of the Internet" bids you farewell. We would like to thank all those who have supported us by providing information, effort, advice, criticism and, last but not least, financial contributions.

"Energy!"

[10] http://www.itas.fzk.de/deu/projekt/pez.htm
[11] http://waste.informatik.hu-berlin.de/I+G/Listen/Forschung.html
[12] http://www.Mathematik.Uni-Marburg.de/~cyberlaw/; http://gahtan.com/techlaw/home.htm
[13] http://www.or.zuma-mannheim.de/. Also see the "Newsletter" on Internet surveys and Web experiments edited by ZUMA OnlineResearch and Bernad Batinic.

I The Internet as a Cultural Space

1 From academic temple to mass media

When examining network culture "from the inside out", the main interest was not the Internet's influence upon its social surroundings, but the network's special, dynamically changing interplay made up of technological and social conventions. Following on from a general explorative ethnographic observation of the network's structures, developmental dynamics and cultural idiosyncrasies (cf. Helmers 1994), we chose two areas for an in-depth analysis of recurring cultural patterns of meaning in the "cultural space of the Internet": the Unix operating system and netiquette rules of correct behaviour. Choosing netiquette as a field of research might seem more reasonable than a somewhat esoteric operating system. Under the premise that an Internet culture transcending the boundaries of singular phenomena has developed, it should be possible, however, to find their characteristics in all areas of the cultural space – including the network nodes' operating technology.

The most elementary feature of network culture is the priority of a flow of data which is as optimal and unhindered as possible. Not only is this an archetypical functional aim of networking, it is an imperative factor which is a leitmotif running through the development of network technology at both host and client level as well as the social forms of interaction. Depending upon the referential area, the free flow of data is manifested both verbally as the "Blue Ribbon Campaign for Free Speech Online", as "Fight Spam", as "Free Software", as the castigation of "lurkers", as "Information wants to be free" and as the endeavour for as much connectivity as possible, the boundaries of network technology permitting, realised in the guise of "open architecture networking" (cf. Leiner et. al 1998).

When speaking of idiosyncrasies of network culture, the important matter is a portrayal of culture as a result described in the present tense, as is customary in the field of ethnography. At the time when the project was being developed in 1994/5, the chosen areas Unix and netiquette were important mainstays for the deduction of cultural patterns within the Internet using ethnographic methods[14]. In the course of its development, starting out as an "academic curiosity" (Tanenbaum 1997, 13) the Internet has changed into an exclusive research network and recently, into a ubiquitous network that has become part of everyday life for many people (cf. for example Leiner et. al 1998; Helmers & Hofmann 1996; Finne, Grassmuck & Helmers 1996; Rilling 1996; Lovink & Schultz 1997; Krempl 1997). The World Wide Web system, whose interface now includes other Internet services (Email, FTP, News) and is the typical gateway to the network world, is not only dominant nowadays as far as its appearance is concerned, but in 1994 it was very new and not significant enough from a network cultural point of view for it to merit any attention as a starting or focal point for research on Internet culture. Even today, with widely developed WWW systems, this field is still largely neglected in favour of more comprehensible social

[14] For more information on the ethnographic framework and its implementation in the project cf. Helmers, Hoffmann & Hofmann 1996, 19 ff. and 26 ff.

spaces such as IRC or MUDs which are studied more closely and in more detail (cf. Turkle 1996; Reid 1991 and 1994; Müller 1996; Seidler 1994).

The Internet's cultural foundations, which were laid during the days of the research network, are – seen from an archaeological point of view – an old cultural layer, but by no means buried and cut off from what is going on today. Not only is this cultural layer as alive in personam and involved in the goings-on of important "coordinating points" of network development where old flags are kept flying, for example IETF or Internet Society committees, news administration or at the local sysadmin level, as it ever was. Rather, this old class is very much alive and continues to be influential upon development beyond a personal level, as will be outlined below. On the other hand, the cultural foundation, made up of the free flow of data and the best connectivity possible, is such a resistant basis due to its open form that it will be depicted in everything erected on this historic foundations. This is basically nothing but the old kung fu trick of victory through flexibility.

2 Unix - Live Free or Die

The development of Internet "nodes", i.e. the computers connected to the network, occurred at the same time as the development of data transmission. Unix machines played a prominent role in these nodal points. At around the same time – the late Sixties and early Seventies – American universities, research institutes and firms begin work on the initial development of data transmission techniques for the ARPANET as part of research programmes instantiated by the Department of Defense (DoD) and – without the DoD's help or participation – the Unix operating system is conceived in the Bell Labs (cf. Leiner et al. 1998, Cerf, no year given). During the following period, Unix, which already included the idea of networking as an essential feature, was developed further in such a way that it became a kind of "ideal" host system for the Internet. Unix was not only a system for using the network, but thanks to the fact that it was used as a developer's tool, it was also an important system for developing networks. In 1994, Unix celebrated its silver anniversary.

The following text deals with the importance of Unix for network culture and Unix user groups, i.e. with cultural parallels between Unix as the operating system layer and the Internet as the networking layer. Speaking at the operating system level: Unix is a combination of programmes based on a necessary smallest common denominator.

> "It has been said that UNIX is not an operating system as much as it is a way of thinking. In *The UNIX Programming Environment*, Kernighan and Pike write that the heart of the UNIX philosophy 'is the idea that the power of a system comes more from the relationship among programs than from the programs themselves.' ...Almost all of the utility programs that run under UNIX share the same user interface - a minimal interface to be sure - but one that allows them to be strung together in pipelines to do jobs that no single program could do alone." Tim O'Reilly (Peek et al. 1997, 8; cf. Hauben & Hauben 1977, 133ff.)

This network computer view of things is phrased as a model in Internet RFC 1, "Host Software", written in 1969: "The simplest connection we can imagine is when the local HOST acts as if it is a TTY and has dialed up the remote HOST" (RFC 1). In the Eighties, a Unix firm came up with an advertising slogan seen from the network level's perspective: "The Network is the Computer".

2.1 Space Travel

Just as legend has it that the first Internet RFC was written in a bathroom at night (Hafner & Lyon 1996, 144), there is also a charming legend on the origin of Unix. The genesis stories all correspond to a certain pattern: Something great begins very humbly, with unsuitable means, not as a result of order, diligence and doing things by the book, but rather nonchalantly and playfully, and is connected to certain people whose names belong to these yarns. The heroes whose names are passed on are revered programming artists (cf. "Who's Who" in Libes & Ressler 1989, 29 ff.; Molzberger 1990). When combining this pattern with the expression "hack"[15], it becomes apparent as to exactly why this type of stories are repeated, whereas stories that do not concur with hacking are either modified to fit the pattern or not passed on altogether.

One day, in the summer of 1969, Ken Thompson was playing Space Travel and got stuck between Mars and an asteroid belt. The inadequacy of computer systems at the time annoyed him.[16] "The machine wasn't up to it. The software wasn't up to it. And he was going to solve the problem." (Salus 1994a, 5) Ken Thompson worked at Bell Telephone Laboratories as part of a group of computer developers, among them Dennis Ritchie and Rudd Canaday. A PDP-7 which has since gone down in history was standing unused in another working group's rooms. With this PDP-7, the developmental process began on what would later become Unix, "just for fun", according to Dennis Ritchie (Salus 1994a, 7). As AT & T saw no business possibilities for Unix, the system's source code was given to anyone interested in it under the condition that there would be "no bug fixes, no support". AT & T's attitude is described as part of Unix history: "Oh, just something we happen to do for our own internal use. You can have a copy if you want to, but if you got problems, don't bother us." (Henry Spencer, in Hauben & Hauben 1997, 140). "BTL didn't really have a distribution policy in the early days, you got a disk with a note: *Here's your rk05, Love, Dennis*. If UNIX crapped on your rk05, you'd write to Dennis for another." (Andrew Tanenbaum in Libes & Ressler 1989, 13). Nevertheless, UNIX soon became a registered trademark of AT & T, the manual pages were protected by copyright, the "unauthorized use or distribution of the code, methods and concepts contained in or derived from the UNIX product" illegal. (Libes & Ressler 1989, 20, 22-23)

[A Space-Travel Orbit, photo from the PDP-7 (Ken Thompson)]

[15] The compendium "On-line hacker Jargon File", http://www.ccil.org/jargon, has been a reliable source for ultimate definitions of hackerdom and everything connected to it since 1975. For more on the tradition of hackers and hacking, cf. Turkle 1984; Sterling 1992; Eckert et al. 1991

[16] The fact that he was playing a space game gives the story a special touch. For more on the importance of SciFi in the computer and networking world, cf. Turkle 1984, 246, 273-275; Barth & vom Lehn 1996; the compendium "MONDO 2000. A User's Guide to the New Edge, edited by Rudi Rucker, R.U. Sirius & Queen Mu, especially on Cyberpunk Science Fiction.

Tim O'Reilly and Jerry Peek in the introduction to their 1073-page standard work UNIX Power Tools (Peek et al. 1997, 1):

> "UNIX is unique in that it wasn't designed as a commercial operating system meant to run application programs, but as a hacker's toolset, by and for programmers. (...) When Ken Thompson and Dennis Ritchie first wrote UNIX at AT&T Bell Labs, it was for their own use, and for their friends and co-workers. Utility Programs were added by various people as they had problems to solve. Because Bell Labs wasn't in the computer business, source code was given out to universities for a nominal fee. Brilliant researchers wrote their own software and added it to UNIX in a spree of creative anarchy that hasn't been equaled since, except perhaps in the introduction of the X window System."[17]

Many people contributed to the further development of Unix. After it first started out "as a kind of after-hours project" (Titz 1996, 202), there were soon first started out "as a kind of after-hours project" (Titz 1996, 202), there were soon many universities and firms that worked with and developed Unix. One of the most important academic centres of development was Berkeley, where BSD Berkeley Unix originated in the late Seventies (cf. Libes & Ressler 1989, 16ff.; Salus 1994a, 137 ff., 153 ff.). A free system with published source code is not a "static operating system that limits users, but rather invites them to come up with individual solutions to their own requirements." (Roland Dyroff in Holz, Schmitt & Tikkart 1998, 13). The numerous software developments that were very often put at the user's disposal free software in addition to the operating system itself, confirm the impact of the invitational impulse. The meeting of Unix and the Internet, which complement each other as parts of a whole, was extremely fruitful for their respective development. In summary, it can be said that "some of the Unix operating system's greater strengths, however, stem not from its simplicity, but from the truly collaborative nature of its development and evolution." (Salus 1994b)

This collaborative development could not be foreseen at the beginning, but due to the special nature of the development environment, it was discernible as a vague possibility on the horizon.

> "UNIX is essentially a two-man operation at present. Anyone who contemplates a UNIX installation should have available some fairly sophisticated programming talent if any modifications planned, as they almost certainly will be. The amount of time that we can spend working on behalf of, or even advising, new UNIX users is limited. Documentation exists, but never seems to be complete. There have been rumblings from certain departments about taking over the maintenance of UNIX for the public (i.e., other Labs users) but I cannot promise anything." (Dennis Ritchie, 1972)[18]

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[17] Originally an MIT project, later X Consortium, now Open Group; http://www.camb.opengroup.org/tech/desktop/Press_Releases/xccloses.htm.

[18] From Notes 2, a magnet tape marked "DMR", dated 15/3/1972, http://cm.bell-labs.com/cm/cs/who/dmr/notes.html. "I have no memory of why I wrote them, but they look very much like something to have in front of me for a talk somewhere, because of the references to slides. From the wording at the end ("the public, i.e. other Labs users"), I gather that it intended to be internal to Bell Labs."

2.2 The network world in miniature and networking with others

Unix boxes, in contrast to the PCs and Macs popular today which have been conceived with standalone and single-user use in mind, are geared towards multi-tasking and multi-user use. Unix has registered users, ken and dmr for example. Using Unix, the CPU processes tasks "simultaneously" using timesharing, instead of using the batch mode customary at that time to process them in succession. Unix system users have a home directory whose environment they can create according to their own personal preferences. The Unix permission system sets the file access permissions read, write execute for users, group and world and is one of the possibilities for collaborative work inherent to the system's design. Mail communication[19] between system users was already in existence in the earliest versions of Unix (cf. Salus 1994a, 105).

> "Bob started saying: 'Look, my problem is how I get a computer that's on a satellite net and a computer on a radio net and a computer on the SRPANET to communicate uniformly with each other without realizing what's going on in between?'" (Vinton Cerf about fellow TCP/IP developer Robert Kahn in Hafner & Lyon 1996, 223).

What appears as a platform-independent endeavour as a cultural characteristic of the Internet seen from the data transmission level; correspondingly, on the operating system level, portability is one of Unix's strong points that is mentioned over and over again.

The endogamous networking technique, as it were, used in the world of Unix was UUCP; Unix-to-Unix-CoPy, developed at Bell Labs in 1976, and still used by some Unix users. UUCP provided a technological method for the Unix Users Network developed in 1979 – Usenet. The early transatlantic diffusion routes for Usenet's idea and software were simple: "Usenet in Europe (...) was born from a tape I took with me from San Francisco USENIX conference (...) back to Amsterdam" (Usenet pioneer Teus Hagen at the Mathematisch Centrum Amsterdam, cit. in Hauben & Hauben 1997, 182; for more on the importance of interpersonal networks, cf. Schenk, Dahm & Sonje 1997).

The Internet data transmission protocols TCP/IP were implemented in the widespread Berkeley Unix 4.2 BSD in 1983 with financial aid provided by the American Department of Defense (for more on the role of TCP/IP in 4.2 BSD Berkeley Unix, cf. Santifaller 1995, 31f.).

> "The incorporation of TCP/IP into the Unix BSD system releases proved to be a critical element in dispersion of the protocols in the research community. Much of the CS research community began to use Unix BSD for their day-to-day computing environment. Looking back, the strategy of incorporating Internet protocols into a

[19] On Internet mail as a hack: "Between 1972 and the early 1980s, e-mail, or network mail as it was referred to, was discovered by thousands of early users. (...) As cultural artifact, electronic mail belongs in a category somewhere between found art and lucky accidents. The ARPANET's creators didn't have a grand vision for the invention of an earth-circling message-handling system. But once the first couple of dozen nodes were installed, early users turned the system of linked computers into a personal as well as a professional communications tool. Using the ARPANET as a sophisticated mail system was simply a good hack." (Hafner & Lyon 1996, 189)

supported operating system for the research community was one of the key elements in the successful widespread adaption of the Internet." (Leiner et al. 1998)

Bill Joy, who worked on the TCP/IP implementation project, got together with Stanford graduates to set up the firm Stanford University Network Microsystems – Sun Microsystems, one of the most important Unix businesses[20]. "The first SUN machines were shipped with the Berkeley version of UNIX, complete with TCP/IP. When Sun included network software as part of every machine it sold and didn't charge separately for it, networking exploded." (Hafner & Lyon 1996, 250)

2.3 Family trees

The Unix family's genealogy is divided into different systems with subvariants thereof. Their relation to one another is unsystematic, which purists view as unsightly. "The different versions of the UN*X brand operating system are numbered in a logical sequence: 5, 6, 7, 2, 2.9, 3, 4.0, III, 4.1, V.2 and 4.3." (Filipski 1986) More important than technical family ties and groups, however, is the fact that commercial and free Unices are worlds apart. Free Unices are the planned children of the Unix community. In the beginning, there was the Berkeley Software Distribution BSD. Offspring have names such as "FreeBSD" or "OpenBSD" or "Minix". Or Linux – originally "just a hackers' delight (Bentson 1994), "a small exercise to probe the potential of the i386 processor." (Torvalds 1995, 90)

> "In the summer of 1991, the Finnish computer science student Linus Benedict Torvalds had no idea what a success story he was paving the way for. He only had a computer which he didn't really know what to do with, a bit too much time on his hands, freshly-gleaned knowledge on the construction of operating systems and a lot of energy. And he had the possibility of publishing the results of his work all around the world – via the Internet. So it came about that in November 1991, the following news could be found in newsgroups on operating systems under the subject *Linux Information Sheet*: "There is a new *Unix* clone for 368-PCs. There's not much there yet, but enough to play around with. It can be found on the University of Helsinki's *FTP server*." (Titz 1996, 201)

In contrast to the early days of Unix, Internet networking was already fully developed during the beginning of the Linux project, in which developers from all around the world participated. The method of development used for Linux, with thousands of part-time developers and parallellised debugging, spread across the globe and only connected via the Internet, is similar to a great big chattering bazaar with different days and approaches, actually works, and is even faster than the conventional cathedral method, in which a group of enlightened artists builds stone upon stone and never allows a beta release out before the time is not finally right (Raymond 1997). GNU project components[21], the X Window

[20] Sun is generally seen as an example for successful, innovative technology development. One of the success factors: "According to Howard Lee, director of engineering, there were 'very few UNIX hackers in the universe' and Sun had a large number of them. These 'experts' were able to advise the hardware engineers on how to design a better machine by taking advantage of the UNIX operating system's capabilities." (Clark & Weelwright 1993, 190)

[21] The fact that Linux contains GNU software is often mentioned by people working on the GNU project: "Variants of the GNU system, using Linux as the kernel, are now widely used; though often called 'Linux', they are more accurately called GNU/Linux systems." (http://www.gnu.ai.mit.edu)

System and NetBSD were available via the Internet from the beginning and completed the Linux kernel, which was based upon Andrew Tanenbaum's free Minix system (Bentson 1994). Linux and the Internet are indivisibly connected twins. (Titz 1996, 207; cf. Torvalds 1995; Been 1995; Helmers & Seidler 1995). When asked about his motivation for continuing the Linux project, Linus Torvalds answered as follows:

> "It's a very interesting project, and I get to sit there like a spider in its web, looking at the poor new users struggling with it. Mwbhahahhaaahaaa. No, seriously, what kept me going initially after I had 'completed' my first test-versions of Linux back in '91 was the enthusiasm of people, and knowing people find my work interesting and fun, and that there are people out there depending on me. That's still true today. And it really is technically interesting too-still, after these five years. New challenges, new things people need or find interesting. But the community is really what keeps me going." (Hughes & Shurtleff 1996)

2.4 Free software development

The development of free software with published sources is traditional in the Unix field[22]. The field of free software, significant in network culture, extends Unix terrain in the narrow sense. The Internet's data transfer technology is also freely available. As closely the development of Internet culture is connected to Unix, it is also closely connected to the related areas of free software and the hacker tradition.

> "'Free software' is a matter of liberty, not price. To understand the concept, you should think of 'free speech', not 'free beer'. 'Free software' refers to the users' freedom to run, copy, distribute, study, change and improve the software. More precisely, it refers to three levels of freedom: The freedom to study how the program works and adapt it to your needs. The freedom to redistribute copies so you can share with your neighbor. The freedom to improve the program, and release your improvement to the public, so that the whole community benefits."
> (What is Free Software, http://www.gnu.ai.mit.edu/philosophy/free-sw.html)

Free software comes with rules. The areas of development of free software are in accordance with certain patterns, as it is always about connectivity to existing projects, respecting other's territory and staking out one's own territory not too close to and not too far away from others (Raymond 1998). The basic rules of free software etiquette, the GNU General Public License[23], were written by the Free Software Foundation[24]. It accompanies the GNU project, begun in 1984 (GNU stands for GNU's Not Unix), which gave birth to the popular GNU C compiler, the EMACS editor, closely linked to the classic AI language

[22] "The Berkeley copyright poses no restrictions on private or commercial use of the software and imposes only simple and uniform requirements for maintaining copyright notices in redistributed versions and crediting the originator of the material only in advertising." (http://www.openbsd.org/policy.html)

[23] General Public License, GNU Copyleft: http://www.gnu.org/copyleft/copyleft.html

[24] The socio-revolutionary opinions on the "fundamental etiquette" and "canonical definition" of free software as voiced with verve by the "flaming sword advocate" Richard Stallman, are not received equally everywhere as far as their form is concerned, but in principle (cf. e.g. Dallheimer 1998, 102, or the article "Is Stallman Stalled" in *Wired*, http://www.wired.com/wired/1.1/departments/electrosphere/stallman.html).

Lisp and the GNU Image Manipulation Program called The GIMP, similar to Photoshop. Linux as well is free software according to the GPL rules.

2.5 Celebrating the Silver Jubilee

"An operating system burdened with 25 years' worth of nifty add-on programs is bound to have an awful lot of inconsistencies and overlapping functions." (Tim O'Reilly in Peek et al, 1997, 38). The Unix field exhibits astounding cultural persistence uncommon for an operating system. Notwithstanding all creativity and innovation, a tendency towards conservatively holding on to what has been attained can be seen.

Seen from a modern security aspect, a classic Unix system seems more like an Emmenthal cheese. It was not designed with rigid security concepts in mind, although its conception does not rule them out altogether (Garfinkel & Spafford 1991)[25]. The same cannot be said of the Internet's design, where the subject of security which had hitherto more or less been neglected, became one of the potentially largest problems where access by "average users" was concerned (Tanenbaum 1997, 597). "Unfortunately, modifying UNIX to be more secure means denying some of the freedom that has made it so attractive in the past" (Libes & Ressler 1989, 301). The communicative qualities which are traditionally part of every Unix system are now up for debate in the conflict between openness versus security. Guest logins have long since been past history. Good old telnet is not bug-proof and is increasingly being replaced by the secure shell ssh. Warez pirates or pornographers who could gain access to the system are arguments for disabling anonymous FTP upload. Today, the user information services who, what and finger[26] are seen as security risks and also violate data protection concepts, which are becoming increasingly important, which is why the finger query port is closed on so many systems: "finger: connect: Connection refused".

Dick Haight, who wrote the Unix command "find", among other things (cit. in Hauben & Hauben 1997, 142), describes the advantages of the Golden Age of openness:

> "That, by the way, was one of the great things about UNIX in the early days: people actually shared each other's stuff. It's too bad that so many sites now have purposefully turned off the read privileges in order to keep their ideas from being stolen. Not only did we learn a lot in the old days from sharing material, but we also

[25] Elementary knowledge of Unix open doors and idiosyncrasies are part of every good introductory book on hacking and phreaking, cf. e.g. The Mentor (1998); Plowsk¥ Phreak (no year given); Sir Hackalot (1990). Garfinkel and Spafford (1991, XIX): "To many people, 'UNIX security may seem to be an oxymoron – two words that appear to contradict each other, much like the words 'jumbo shrimp' or 'Congressional action'. After all, the ease with which a UNIX guru can break into a system, seize control, and wreak havoc is legendary in the computer community (...) While UNIX was not designed with military-level security in mind, it was built to withstand external attacks and to protect users from the accidental or malicious actions of other users on the system." For people such as Simson Garfinkel and Gene Spafford, who are not only Unix experts but Usenet users as well (a classic combination), one of the ways of increasing security is communication, and hence the authors continue: "In many ways UNIX can be *more secure* than other operating systems because it is better studied: when faults in UNIX are discovered, they are widely publicized and are, therefore, quickly fixed." (Garfinkel & Spafford 1991, XIX)

[26] The "finger" command can also be used for other things than querying users. The DFN's Network Operation Center uses this for imparting up-to-date and detailed information on network problems (finger trouble@noc.dfn.de)

never had to worry about how things really worked because we always could go read the source. That's still the only thing that matters when the going gets tough."

Even if venerable old Unix still has a large following in computer freak circles, the system's foundations are still seen as out-of-date, especially the large, monolithic kernel's architecture. The ability to show graphics was added, but only poorly integrated. And, as mentioned before, it does not comply with modern security demands. But because there is no other developer's system with comparable advantages currently available, Unix is still in use. On the horizon are developments that can only be described as prototypes and as yet far from practical usability. In the field of free software, two new system developments have roused particular interest: Hurd and Plan 9.

Hurd (http://www.gnu.ai.mit.edu/software/hurd/hurd.html) is an offshoot of the MIT's GNU project and closely connected to the name Richard Stallman[27]. After waiting for idle announcements, the first test release was finally presented in 1996. Hurd's design plan is the replacement of the Unix kernel by a smaller, faster Mach kernel, achieved by connecting servers which, as a modular system, depict a more up-to-date operating system design than the old Unix architecture. GNU Mach is based on the University of Utah's Mach 4 kernel. Equally, although more extensively than Hurd, the Plan 9 system places its hopes upon distributed and networked working as an integral part of system design (http://cm,-bell-labs.com/plan9) Plan 9, "an operating system for the 21st century" (nota bene not for 1995 or 1998, such as is the case with Windows releases), comes from Bell Labs and is connected to the name Dennis Ritchie. And Ken Thompson has joined in as well[28]. The fact that renowned data artistes are giving the projects some of their aura's radiance can be seen as a certain bonus, but does not necessarily have to mean an automatic success, as the counterexample Linux has shown.

"UNIX is weak in the end-user interface area" (Severance, no year given)

"Contrary to popular belief, Unix is very user friendly It just happens to be very selective about who it's (sic) friends are." (Kyle Hearn, no year given, cit. in http://www.ctainforms.com/~cabbey/unix.html)

The interface's weakness and the low level of user-friendliness as perceived from a modern point of view was seen quite differently in the beginning. In contrast to conventional systems, Unix was seen as especially user-friendly. What later became the weakness compared with modern systems was no coincidence. Unix has remained a system designed by experts for experts, "a programmer's dream" (Garfinkel & Spafford 1991, 7).

Its power is not all that apparent in the so-called end-user field, where graphics are created, a text is written and layouted, a spreadsheet made or a game of chess played, which is why

[27] "A hacker of the old school", Hackers' Hall of Fame, http://izzy.online,discovery.com/area/technology/hackers/stallmann.html

[28] Ken Thompson and Dennis Ritchie are revered as "hackers" in the "Hackers' Hall of Fame" for their achievements as developers, together with less academic but criminal hacker legends such as the phone phreaker John Draper a.k.a Cap'n Crunch, who used an ingenious toy whistle hack which enabled long-distance calls to be made for free, or the first hacker to make the FBI's "Most Wanted" list, Kevin "condor" Mitnick. http://izzy.online,discovery.com/area/technology/hackers/ritchthomp.html

nobody outside of computer freak circles would ever think of buying a fine Sun machine which can cost as much as a mid-range car or even a house and is not able to do these menial tasks particularly well. In interviews, when Linus Torvalds stresses the fact that "Linux is meant to be fun"[29], "I only really ever played around with Linux" (Milz 1993, 129), and "We continue our work because it's fun" (Stein 1995, 144) – then each of these statements is a reference to the art of programming (Molzberger 1990; Helmers 1998). In extreme case, the pet project could be developing a system that enables computer professionals to develop supersystems (Weizenbaum 1994, 163). Efforts made by developers in the Unix sector mainly concentrate upon improving the system's quality. Perfidious "user-friendly" interfaces are developed for other people (Schmundt 1997), whereas Unix continues to communicate with its interaction partners on an adult level, to put it in the words of transactional analysis.

[Dilbert comic]

In the world of Unix, as in other cultural groups, there is large esteem for oneself, combined with disdain for others who are culturally different. The Internet's data transmission technology is a world-wide success. The Internet's favourite operating system is not. With Microsoft's increasing market leadership, the disdain for others grows steadily. "I have experienced my fair share of bugs and disasters during my prime UNIX years of 1975-1985, but none of it was as futile and frustrating as a recent attempt to change a Windows PC running Exceed to use a three-button mouse. Plug and pray and pray and play", declared Andrew Hume, USENIX president in 1996, in the organization's magazine ";login:" (Kolstad 1996). Microsoft bashing is a popular sport. Andrew Tanenbaum called MS-DOS "mushy": "Mush DOS" (Tanenbaum during the EUUG conference in Helsinki 1987, cit. in Snoopy 1995, 32). The non-public nature of its source code (as is usual for every proprietary system) aside, Windows NT is verifiably criticised for its hardware performance, which is worse than that of Unix (Holz. Schmitt & Tikkart 1998, 19). NT is "unproductive and prone to errors", an article in a VDI association magazine (Aschendorf 1998, 71).

2.6 Fandom and Unix cult

Only those who are dedicated to the Unix cause can overcome initial difficulties and attain sufficient competence to use the system. Who then becomes a Unix fan likes talking about Unix. Dedication to Unix is apparent in the use of /dev/null as an expression for nothingness in any form or of "booting" as a synonym for waking up in the morning. A person such as this calls at least one Unix-related badge or sticker their own. Unix fans are infected with "Unirexia nervosa": "The symptoms of this disorder are the interjection of nonsense words such as grep, awk, runrun and nohup by the victim into his or her speech; the misuse of ordinary words such as cat and lint; and the avoidance of uppercase letters." (Filipski 1986)

In computer freak circles, Unix enjoys a cult status. Numerous newsgroups are devoted to the discussion and development of Unix systems and application software. Unix-related

[29] Speech held at the First Dutch International Symposium on Linux, Amsterdam, December 1994.

subjects are discussed on national and international Internet Relay Channels around the clock. Wherever computer people meet, printed T-shirts and similar devotionalia are presented, for example at IETF meetings. BSD devils and graphics with slogans such as "Powered by vi" adorn WWW homepages. Cuddly Linux penguins live in the shop window of the Berlin Internet activist organisation Individual Network e.V., in many homes, they sit on sofas and desks or accompany the Chaos Computer Club on its visit to Microsoft's stand at Cebit 98. There are numerous books, magazines, jokes, anecdotes and comics on the subject of Unix. And above all there are Unix user groups. These groups have a long tradition.

2.7 Unix User Groups

When Bruce Sterling writes in "The Hacker Crackdown" (1992, 124): "UUCP is a radically decentralized, not-for-profit network of UNIX computers. There are tens of thousands of these UNIX machines" and "UNIX became a standard for the elite hacker and phone phreak" (Sterling 1992, 115), only one of the many facets of the Unix community is mentioned. As well as cloak-and-dagger groups such as the "Legion of DOOM"[30], there is an international network of official Unix User Groups. Their meetings are informative as well as sociable and pleasant (cf. "UUG reports by Snoopy 1996). Unix User Groups depict a RL network of the Unix world. A map of the world with local user groups would more or less correspond to a map of the world with fully connected Internet areas and would, on the whole, show the general high-tech divide between wealthy and poor areas of the world as well as the boundaries of the national, social technology divide (for more on the "new wall, cf. Rötzer 1997). A mixture of expert groups and fan clubs, Unix User Groups have not only dealt with the operating system itself, but also networking aspects.[31]

Transferred to a file system structure with the root level "/world/", large files in this directory would be the US American organisation USENIX, the AUUG (Australian Unix Users' group, recently renamed to Users' Group for UNIX and Open Systems, keeping the acronym), the CUUG (Canadian Unix Users' Group) and the European Unix Group EUUG, renamed to EurOpen. EurOpen is the umbrella organisation for all nationally organised groups in Europe, the Mediterranean and Minor Asia. Representative of the aims of all the other groups, the organization's aim of the German UNIX Users' Group (http://www.guug.de), founded in 1984, is quoted here: "...to further academic research, technical development and communication of open computer systems, especially those initiated by UNIX."

Sorting files by date shows the geographic diffusion paths the Unix system took, beginning with the first USENIX meeting in 1974, later, the AUUG follow, meetings since 1975, UKUUG since 1976, NLUUG since 1987, EUUG only since 1981 etc. Sorting the

[30] Sir Hackalot of PHAZE dedicates his "UNIX: A Hacking Tutorial" to the legendary Legion of Doom, for example.

[31] Being a Unix activist and an Internet activist is often the same thing. The remailing system, for example, which enables the free anonymous exchange of Internet mail, was developed by an old EUUG activist, the Finn Johan "Julf" Helsingius (anon.penet.fi). He is of course included in the Hackers' Hall of Fame http://izzy.online.discovery.com/area/ technology/hackers/helsingius.html. For more on the multiform user group scene, cf. Libes & Ressler 1989, 124f.

/world/europen/ subdirectory alphabetically with "ls" would return the following list of names:[per 32]

```
/world/europen/
AMUUG Armenian UNIX Users' Group
       AlUUG Algerian Unix Users' Group
       UUGA UNIX User's Group Austria
       BUUG Belgium Unix Users' Group.
       BgUUG Bulgarian Unix Users' Group
       HrOpen Croatian Open Systems Users' Group
       CsUUG Czechia Unix Users' Group
       DKUUG Danish UNIX-systems User Group
       FUUG Finnish Unix Users' Group
       AFUU French Unix Users' Group
       GUUG German Unix Users' Group.
       HUUG Hungarian Unix Users' Group.
       ICEUUG Icelandic Unix Users' Group
       IUUG Irish Unix Users' Group.
       AMIX Israeli Unix Users' Group
       I2U Italian Unix Users' Group.
       LUUG Luxembourg Unix Users' Group
       NLUUG Netherlands Unix Users' Group
       NUUG Norwegian Unix Users' Group
       Pl-Open Polish Unix Users' Group
       PUUG Portuguese Unix Users' Group.
       GURU Romanian Unix Users' Group.
       SUUG Russian Unix Users' Group.
       EurOpen.SK Slovakian Unix Users' Group
       EurOpen.SE Swedish Unix Users' Group.
       /ch/open Swiss Unix Users' Group.
       TNUUG Tunisian Unix Users' Group.
       TRUUG Turkish Unix Users' Group.
       UKUUG UK Unix Users' Group.
```

The taxonomy Location-Unix(flavour)-U-G is conspicuous. Out of 29 EurOpen group names all in all, 22 are in accordance with the traditional pattern, five names are reformatory "Open-" renamings and only the Italian and Israeli[33] User Groups have non-systematic names. Other groups as well, such as BeLUG (Berlin Linux Users' Group), TLUG (Tokyo Linux Users' Group), SALUG (South Australia Unix Users' Group) SVLUG (Silicon Valley Unix Users' Group), SUG (Sun Users' Group) and STUG (Software Tools Users' Group) follow the naming pattern. In contrast to Usenet, where names play a central role (cf. Hoffmann 1997), the schematic taxonomy of Unix User Groups is as unnecessary as the traditional taxonomy of the German Research Network (according to the pattern Type-Place.de, e.g. wz-berlin, uni-hannover, rwth-aachen.de etc.). The chosen name has an informative function rather than an aesthetic one. Local newsgroups named "announce", "marketplace" or "misc" can be found globally. The list of newsgroups[34] of the Canadian CUUG (http://www.canada.mensa.org/~news/hyperactive/h_cuug.html), whose name is in accordance with the Unix group name pattern, follows this schematic convention.

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[32] Source: European (http://www.europen.org) AMUUG is however listed in the directory of Usenix Local Groups (http://www.usenix.org/membership/LUGS.html).

[33] However, the name AMIX corresponds to the name of the mother of all Usergroups, Usenix.!

[34] Whoever would have thought that Unix groups were among the oldest newsgroups to be found, such as net.jokes, fa.sf-lovers, fa.arms-d or net.math? (Cf. list of newsgroups from 1982 in Hauben & Hauben 1997, 191ff.).

"List of cuug.* newsgroups[35]
cuug.announce Canadian Unix Users Group announcements. (Moderated)
cuug.answers Canadian Unix Users Group helpful documents. (Moderated)
cuug.help Canadian Unix Users Group questions. (Moderated)
cuug.jobs Canadian Unix Users Group employment. (Moderated)
cuug.marketplace Canadian Unix Users Group forsale and wanted
(Moderated)
cuug.misc Canadian Unix Users Group general. (Moderated)
cuug.networking Canadian Unix Users Group networking. (Moderated)
cuug.sig Canadian Unix Users Group special interest groups.(Moderated)"

The order upon which the Internet, computing and programming are based forms the necessary counterpoint to hacking. Both elements, as a pair of opposites, are an integral part of Internet culture. Respecting their rules is the prerequisite for belonging. Knowing the rules is a prerequisite for wilfully breaking them, and possibly being generally respected by all for it. Ignorance of the rules can be seen as ignorance and stupidity, which is deplored. Newbies who cannot know the rules are shown them.

3 Rules and order

Netiquette describes the appropriate behaviour regarded as proper in the networking world based upon a minimal consensus as regards proper behaviour necessary for attaining as optimal a flow of data as possible when connectivity is as optimal as possible. Filtering or blocking certain content as a censorship measure disturbs the flow of data (cf. Tanenbaum 1997, 22f.; Shade 1996; Sandbothe 1996, http://www.eff.org). Disturbances in this sense are data flows that are "unnecessarily" brought about, such as massive mail spamming, crossposting in newsgroups, long idle times on IRC servers, disuse of less frequented FTP mirror sites created especially to relieve the primary site, list or news postings formatted in special system-dependent formats which are not generally readable, unnecessary questions on subjects already included in FAQ repositories or ignoring the rule that English is the language used in international network forums. The examples given refer to actions seen as disturbances. Not acting can also be regarded as a disturbance, personified by so-called lurkers[36]. They disturb the flow of data by taking data given to the network by others without giving data back themselves. As the Internet works on the basis of general reciprocity, lurkers behave dysfunctionally.

"The principal paradigm of the Net is not control but dissemination." (Interrogate the Internet 1996, 129). Social sanctioning possibilities of stopping the disruptive behaviour shown by Net users that deviate from that regarded as self-evident are few and far between: flaming, denouncement or cutting them off altogether. Some solutions are developed by guardians of the rules, for example cancelbots, which are used on Usenet for postings that are against the rules but can also be abused as a method for censoring unwanted content (for more on the cancelbot campaign against Scientology critics cf. Donnerhacke 1996). Limiting or filtering measures have little hold in a system that is designed with the free

[35] http://www.canada.mensa.org/~news/hyperactive/h_cuug.html

[36] Cf. the online discussion "Are you a *LURKER*???" held on The WELL at the Virtual Communities Conference (http://www.well.com/conf/vc/16.html) and Mandel & Van der Leun (1997, 176): "7th Commandment of Cyberspace: Thou shalt give to the Net if thou willst take from the Net".

flow of data in mind. Users can be sanctioned against by systems administrators locally, bur not network-wide. As far as Netiquette texts are concerned, the question as to the feasibility of rules formulated therein by sanctioning deviants is irrelevant. Rather, texts are based upon an integrative aim, which tries to appeal at respecting what has been created and make people see the advantages of network behaviour that is beneficial to all.

It is expected that the precious common property of the free flow of data is respected by everyone on all levels. On this basis, the most important, "most official" (Djordjevic 1998, 18) collection of Internet rules, both for developers and users alike, the "Requests for Comments" (RFC), exist, which deal with all fundamental and mostly technical matters of networking. The first RFC, titled "Host Software", was published in 1969, written by Stephen D. Crocker, who was at the time Secretary of the Network Working Group (NWG), which sent the texts by surface mail. RFCs are an invitation to collaborate, publicly addressed to everyone on the network, according to the network's cultural values of interactivity, connectivity, cooperation. RFCs are more or less "free textware". The form of the RFC systems, which still continues today, forms a network of rules such as the computer network forms the Internet with RFC conventions or data transmission procedures as a common bind holding it together. RFC states that in the RFC form, all content is possible[37]. Steve Crocker, author of this third RFC as well, comments RFC 3's message around 20 years later in 1987, as part of RFC 1000: "The basic ground rules were that anyone could say anything and that nothing was official."

3.1 Symbols of belonging

> "John Black of Oracle (VP Telecommunications) held a very good keynote address. It was about 'A Manager's View of System Administration'. At the beginning of the speech, he was wearing a suit and tie. Then he said 'OK, now you all know that I'm a manager' and quickly took his jacket and tie off .... to the audience's great amusement. Then he paid us lots of compliments: As systems administrators, we were at the forefront of technology, we had our hands on the buttons and ultimately, we controlled the future of UNIX." (Snoopy 1995, 191)[38]

The way an insider speaks and acts gives clues as to his insider status. Knowledge as to the world of networking and software, "Techspeak" and a fitting outward appearance. Although all attention, passion and exertion is directed towards the programme, a consensus has formed in the Unix world as to the appropriate look in the world of otherwise profane things. As in every cultural group, tribal colours and costumes give clues

[37] "The content of a NWG note may be any thought, suggestion, etc. related to the HOST software or other aspect of the network. Notes are encouraged to be timely rather than polished. Philosophical positions without examples or other specifics, specific suggestions or implementation techniques without introductory or background explication, and explicit questions without any attempted answers are all acceptable. The minimum length for a NWG note is one sentence." (RFC 3)

[38] LISA: Large Installations Systems Administration. There were around 1200 participants in Monterey.

as to one's cultural status. For Unix users, there is an appropriate look, e.g. as befits one's station. Neither Rolex nor tweed suit, no, in this group it is T-shirts, sandals and a beard[39].

> "It has often been said that if God had a beard, he would be a UN*X programmer." (Filipski 1986)

The style of clothing is functional, says "dress for comfort" and corresponds to what is called the "comfortable leisure style of the hippie generation" in our society. To be especially snobby is to dress in exactly the opposite manner, as is often remarked upon when speaking of the "Father of the Internet", Vinton Cerf. Regional differences from the dress code at *UUG meetings are also noted, for example the "German trend towards formalism including all external attributes (suit, tie etc.)" (Snoopy 1995, 15).

The Unix look is a universal computer look; beyond all functionality ascribed to it, it is a symbol for the programme's primate. This style, then, is seen as being "correct" at IETF meetings as well. As part of an RFC published in 1994 it was made the official dress code after an increase in tie-wearers at IETF meetings (cf. Hofmann 1998). "The Tao of IETF. A Guide for New Attendees of the Internet Engineering Task Force" has the following to say about the dress code:

> "Seriously though, many newcomers are often embarrassed when they show up Monday morning in suits, to discover that everybody else is wearing t-shirts, jeans (shorts, if weather permits) and sandals. There are those in the IETF who refuse to wear anything other than suits. Fortunately, they are well known (for other reasons) so they are forgiven this particular idiosyncrasy." (RFC 1718)

3.2 Measures for announcing and implementing rules

Actors saw opportunities for fixing netiquette guidelines by writing them down especially in situations which were seen as crises or transitional phases, when what had hitherto been a matter of course was no longer generally seen or accepted as a fundamental element of network communication. Netiquette texts are usually addressed at new users of an Internet area and are effective as an instrument for keeping up traditional values. A longish RFC, solely dedicated to the subject of Netiquette, was written in 1995 as a reaction to the widespread changes in the network's population as a result of the Internet hype, an encyclical from the traditional centre of Internet development:

> "In the past, the population of people using the Internet had "grown up" with the Internet, were technically minded, and understood the nature of the transport and the protocols. Today, the community of Internet users includes people who are new to the environment. These "Newbies" are unfamiliar with the culture and don't need to know about transport and protocols. In order to bring these new users into the Internet culture quickly, this Guide offers a minimum set of behaviors which organizations and

[39] Those interested in statistics can find a large amount of data at and work out how many people in a representative study group, as constituted by the participants of USENIX conferences, really do have beards (http://facesaver.usenix.org).

individuals may take and adapt for their own use." (RFC 1855; cf. Djordjevic 1998, 21f.)

In combination, RFC 3 and RFC 1855 refer to an open development on the one hand which was possibly more marked in the beginning, and on the other to the meaning of the order based on the free flow of data, of which is said that it is understood by anyone belonging to that culture, but must be explained to those new to the network.

Keepers of traditional network values are posted in many places on the network and have more than merely verbal power, for example "IRC admins", "channel ops", "news admins", newsgroup or mailing list moderators, or systems administrators[40]. As is the wont on the Internet, the Sysop's positional status as a *primus inter pares* can be found throughout the network at its nodes. There, at the seat of power, is the traditional place of the "Bastard Operator from Hell" (BOFH), whose diabolical dblquote clickety clickety" causes shivers to run down the spines of mere mortal network users[41]. The BOFH is neither didactic, nor does he try to educate users with pedagogical sensitivity. He is, however, arrogant and enjoys tormenting his dumb users with training methods. The newsgroup alt.sysadmin.recovery[42], aimed at providing a possibility for letting of steam which accumulates when dealing with dumb users and nasty systems, is as equally popular as the BOFH.

> "1.1) What is alt.sysadmin.recovery? Alt.sysadmin.recovery is for discussion by recovered and recovering sysadmins. It is a forum for mutual support and griping over idiot lusers, stupid tech support, brain dead hardware and generally how stupid this idiotic job is. Think of it as a virtual pub, where we can all go after hours and gripe about our job. Since the concept of 'after hours' (or, for that matter, 'pubs') is an anathema for your average sysadmin, we have this instead."

"User bashing" is a popular and widespread sport, as is "Microsoft bashing". The sysop is on the threshold of an elite circle of insiders and the culturally strange world outside, or, speaking as regards status, the world above and the world below in the murky depths of ignorance and ignorance towards the art of computing. Those who have studied RTFms, RFCs and FAQs and are willing to keep to the rules that have been made inside, can enter and participate in the free flow of data. Others, such as spammers, could be kept from the network by sysadmins: "Senders of mass mailings do not regard the Internet as a collective property, but only as a further distribution medium. In such cases, the only answer is to use administrative measures such as blocking sites." (Djordjevic 1998, 39). Simultaneously to cultural changes, the number of BOFHs is diminishing, as is that of fight spam activists. Ultimately, the Luser and DUI (Dumbest User Imaginable) has become a customer, and is therefore king.

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[40] quote The Ninth Commandment of Cyberspace: Thou shalt honour thy sysop and the other Net gods, that thy days on the Net shall be many" (Mandel & Van der Leun 1997, 203)

[41] During his job in systems administration, Simon Traviglia described how to deal with systems administrators and users "properly" in exemplary anecdotes: "Talk to me and I' ll kill –9 you!". http://www.cs.tufts.edu/~gowen/BOfH.html

[42] Cf. the alt.sysadmin.recovery FAQ. http://www.cs.ruu.nl/wais/html/na-dir/sysadmin-recovery.html

Door-openers in the widest sense of the word are – if successful – the hackers who enter systems and have more than merely verbal power. The still young sport of lock picking, in Germany, organized by the Friends of Locking Technology Club (Verein Sportsfreunde der Sperrtechnik, or SSDeV for short)[43], is part of the "Hackers don't like locked doors" tradition, as do system hackers or phone phreaks. In 1986, The Mentor writes about hacking in his manifesto as follows: " And then it happened... a door opened to a world...rushing through the phone line like heroin through an addict's veins, an electronic pulse is sent out..."

In 1989, twenty years after the first RFC was written, the Internet Activities Board published RFC 1087, "Ethics and the Internet" as a "statement of policy". In this brief memo, the network's cultural values such as "common infrastructure", "common interest and concern for its users", "responsibility every Internet user bears" as well as "access to and use of the Internet is a privilege and should be treated as such by all users of this system" can be found. The final paragraph is about the free flow of data as an important cultural value, about security measures that could possibly oppose this value and the IAB's determination to act in case the appeal should fall on deaf ears: "to identify and to set up technical and procedural mechanisms to make the Internet more resistant to disruption. Such security, however, may be extremely expensive and may be counterproductive if it inhibits the free flow of information which makes the Internet so valuable."

3.3 New rules vs. old

Seen from this background, the first "junk mails" and "spam attacks" with commercial advertising that appeared around 1994 seem quite sacrilegious: "Culture Shock on the Networks. An influx of new users and cultures could threaten the Internet's tradition of open information exchange." (Waldrop 1994, 879) Unsolicited and possibly mass-sent advertising such as that in the case of "Canter & Siegel[44]" wastes network resources and the time of those who are not interested in receiving such mails. Thefts of collective and personal "computer time" such as these were vehemently followed up, as in the days of the research network, the "free flow of information" was not synonymous with the "free flow of my own data and money". The traditional sense of free-flow puts communal use before personal use. Technical filtering methods that stop junk and spam have been developed wherever junk has been distributed: Email (mail filters), WWW (Junk Buster, Anonymizer), IRC (ignore, channel kick and ban, site exclusion by IRC admins), Usenet (killfiles, cancelbots, site exclusion by News admins, "Usenet Death Penalty", cf. Hoffmann 1997a and 1997b). The fact that countermeasures have become fewer despite the rising amount of junk mail is an expression of cultural change.

The Netiquette that came into being around the time that the World Wide Web was developing can only be described as "insipid". This is connected to the defensive character of Web pages, as it were[45]. In contrast to junk mail, a junk page is unobtrusive. A classic

[43] The SSDeV has translated the "MIT Guide to Lock Picking", written by Ted the Tool, into German and uploaded it to the webserver. The sport of lock picking is attributed to the hacker community at MIT and its custom of "Roof and Tunnel Hacking".

[44] Cf. Waldrop 1994, 880; Hoffmann 1997, 26; Djordjevic 1998, 31ff., 39; Helmers & Hofmann 1996 and .

[45] Compare the strong reactions to "push media", for example Frey 1997; Winkler 1997a.

text on Web page design from 1995 is "Top Ten Ways To Tell If you Have A Sucky Home Page" by Jeffrey Glover (www.glover.com/sucky.html), which deals with subjects such as rdblquote obnoxious background music", the HTML <BLINK> tag or "bad, bad, bad, bad scans". Making Web pages is all about design. From HTML 1, a very simple language for constructing Web pages and therefore an easy possibility for participating on the WWW, a very complex structure has arisen, split by company policies. HTML is for HTML editors and design is for Web designers. Pages are supposed to look good and should really also load quickly. Whether they can be read with a text browser such as Lynx is something most Web designers don't bother about. Lynx compatibility is only relevant in areas where traditional demands upon ubiquitous connectivity is known and esteemed as a value – unless Lynx users make up a clientele marketing strategists are interested in. Since the WWW has become the dominant Internet service rather than just another new face, search machines and other much clicked-upon sites have been able to position themselves as "strong network actors" on the WWW, new and influential centres of power - currently especially banner advertising centres - have come into being on the Internet, which could act as the new guardians of an order, whatever shape it might take (Rilling 1996; Winkler 1997b; Baumgärtel 1998). At present, the market defines the WWW's order.

4 Our continuing mission: To seek out knowledge of C, to explore strange UNIX commands and to boldly code where no one has man page 4

Netscape's announcement that they would publish their sources was the trigger for a new path taken by the free software scene: Open Source (http://www/orpensource.org/).[46]

> "The prehistory of the Open Source campaign includes the entire history of Unix, Internet, free software, and the hacker culture.... The Future is here. Open-source software is an idea whose time has finally come. For twenty years it has been building momentum in the technical cultures that built the Internet and the World Wide Web. Now it's breaking out into the commercial world, and that's changing all the rules. Are you ready?"

At least two questions remain that are of interest to cultural scientists: Firstly, the question as to what makes the Internet specific in a heterogeneous networking world, and secondly the question as to what remains – regardless of the rapid changes.

If one tries to give uniformity a name in a network that is heterogeneity itself, then this programmatic heterogeneity must be part of a possible answer. The Internet pioneers and activists Leiner, Cerf, Clark, Kahn, Kleinrock, Lynch, Postel, Roberts & Wolff (1989) write in their "Short History of the Internet":

[46] The Open Source Initiative dates back to February 1998

"The Internet as we now know it embodies a key underlying technical idea, namely that of open architecture networking. (...) In an open-architecture network, the individual networks may be separately designed and developed and each may have its own unique interface which it may offer to users and/or other providers, including other Internet providers. Each network can be designed in accordance with the specific environment and user requirements of that network. There are generally no constraints on the types of network that can be included or on their geographic scope, although certain pragmatic considerations will dictate what makes sense to offer. (...) A key concept of the Internet is that it was not designed for just one application, but as a general infrastructure on which new applications could be conceived, as illustrated later by the emergence of the World Wide Web."

Seen from a technical point of view, the Internet's heterogeneity seems to be limitless, the only restrictions are pragmatic ones. To this marked degree, the characteristic integration of variety is idiosyncratic to the Internet. And everything should be possible on the application level as well. The power of integration does not stop at – seen from a conventional perspective – other types of media: Over the past years, print media, radio and television all went online. And in 1998, the German Telecom, hitherto a reluctant participant where the Internet was concerned, started a field test on Internet telephony. During the early Nineties, large experiments which attempted to establish exclusive networks, either technically or by way of access limitation, such as the Microsoft Network or Apple E-World, were scrapped in favour of the Internet. As the network has changed, so have the users. Anything that is non-contemporary is renewed or done away with.

One of our project's aims was to show that the Internet model works based on a closely-woven foundation of handed-down assumptions and rules, which works as a whole as to guarantee the free flow of data. It may be possible to predict that the free flow of data will be preserved in the Internet's future. In view of the massive legal attempts at influencing what happens on the Net, this prediction could show itself to be a pipe-dream or hot air. The Internet's death knell will sound at the latest when the technological foundations of open architecture networking mentioned above are relinquished. Where the Internet's free or regulated ride is headed, remains open anyway.

The network's current state is still under the flag of the "free flow of information", albeit updated. The World Wide Web Consortium's motto, "Leading the Web to its Full Potential"[47] not only smacks of ancient entelechy, the motto is totally conformant to the Internet and therefore suitable for the future. Consequences of the cultural change as a result of adapting to changed users and usage, which can be seen from the Internet's change from a research network to a global network, consist of attempts at integrating the new whilst keeping up the free flow of data. Transposed to the world of Star Trek, this could be compared to the constant attempts and the Kung-Fu qualities of the Starfleet heroes at peacefully coexisting and even cooperating with the Klingons. Singular elements of Internet culture which do not have these qualities – and even if they are traditionally as important as Unix – could disappear down the next wormhole. And what comes out will be some kind of Next Generation. Possibly, this generation will wear T-shirts.

[47] http://www.w3c.org for more on integration policies, cf. ../Policy/statement.html especially.

II Governing Technologies and Techniques of Government: Politics on the Net

> "Fixing society to make folks to be rational is ok as an interim solution but it is just plain easier to fix technology in the long run." (Antonov, IPv6-haters, 12.1.96)

When people talk about the political significance of the Internet they usually mean its influence on existing forms of political organisation and participation: How do the parties present themselves on the Net? Who uses this service? Can the Net be expected to yield new, more direct forms of political participation? These are the questions posed from the political Science perspective (see, e.g., Gellner & von Korff 1998; Hagen 1996; Wagner & Kubicek 1996; London 1994). It is not the nature of the medium itself that is considered interesting, but the effects it has on the political landscape. But what about the Internet's constitutional framework? Do the development and use of the Net themselves give rise to an independent political dimension?

At first we simply asserted that the Internet had an internal political dimension rather than actually justifying this claim systematically (see Helmers, Hoffman & Hofmann 1996, p. 36ff.). The thrust of the argument was that in a technically constituted space, in which all action is in the form of data flow, the common concerns of this action, the *res publica* so to speak, is also technically constituted. Following this reasoning, political significance can be attributed to all those events and objects that affect the constitution of the Net and the conditions under which the users operate.

From an empirical point of view, the political quality of the Net has both a normative and a procedural form. The Internet is based on the idea of *good network architecture* and on a set of rules which are intended to ensure the good quality of its development. This *goodness* is meant quite in the Aristotelian sense: the manner in which the early Internet community "felt" its way to the principles of a good digital data network is comparable to the quest for the rules of a just and good life (Cerf, cited in Salus 1995, p. 29). The notion of what constitutes a good data network corresponds to the practical goal of "global connectivity", and the pursuit of this goal is what gave the Internet its current make-up. In summary, "Connectivity is the basic stuff from which the Internet is made" (Mahdavi & Paxson 1997). Accordingly, those rules or technologies that serve the project of global connectivity are good and just rules.

Making a central political motto out of a maxim such as global connectivity may at first seem trivial. Wasn't this aim reached long ago by the telephone? When compared with the telephone system, the Internet in a sense radicalises the idea of being connected to a network. It equips the physical cables and appliances we are familiar with from the world of telephones with a new philosophy of use or, more precisely, with other software-based transmission technologies whose core elements are found in the family of protocols called TCP/IP (Transmission Control Protocol/Internet Protocol).

Perhaps the most important difference between the idea of connectivity in the "telco world" and "IP land" is the type and the scope of the conditions under which the users and the applications of the networks must operate. The difference between the telephone – which for a long time reserved connectivity for linguistic transactions – and the Internet is that the latter aims to support all forms of communication and service that can be digitalised.

Unlike the proprietary technologies of the telephone world, which are protected under property law, Internet Standards such as TCP/IP are open and may thus be used by anyone without any limitations. The consequences for the establishment of a good architecture are wider reaching than one might think. Open standards mean a renunciation not only of patent rights but also of all control over use and above all over further development. Everyone is free to develop new transmission procedures or services for the Internet. Neither the Internet community[48], at present the most important authority with regard to standardisation on the Net, nor other organisations can effectively control the further development of the Internet. The target of global connectivity is thus being pursued on the Internet under conditions and with aims and consequences that are different to those obtaining in centralised networks administered by organisations under governmental control such as the ISO (International Organization for Standardization) or the ITU (International Telecommunication Union) (see Werle & Leib 1997). Without any means of sanctioning, governmental power on the Internet relies almost exclusively for support on the general recognition of its rules and products.

The political dimension of "Internet Governance" (Baer 1996; Gillet & Kapor 1997; Gould 1997) can be seen in the pursuit of a good architectural order, which is understood as a common good that serves global communication. This order is not, incidentally, the only option, but it has been developed in explicit competition with other concepts of communication networks, above all with those of the "POTs" (Plain Old Telephone Systems). We characterise the results of these efforts, the specific architecture of the Internet, as *governing technologies*.

The fact that the properties of Internet architecture can be described in terms of ancient political categories does not mean that those carrying out the project wish their activities to be understood as political. On the contrary, the Internet community insists on a concept of technology which is strictly removed from politics. According to Net engineers, the differences between the architecture of the telephone network and that of the Internet derive from the fact that the former was developed from a political and the latter purely from a technical point of view (see Hofmann 1998a).

However, contrary to the self-image of those involved, we perceive in the institutions and values, and in the strategies of inclusion and exclusion that characterise the development of the Net a further dimension of political power, which we call *techniques of government*.

[48] The terms "Internet community", "community" and "IETF" are used synonymously here – in accordance with the usage of the IETF. This is not, however, an entirely unproblematic decision because there is no longer just one but rather many communities on the Net. The fact that the IETF still sees itself as *the* community has to do with its own tradition, but it also reveals a certain claim to authority over other groupings on the Net.

The interplay of governing technologies and techniques of government serves as a conceptual means of access to the practices of political ordering on the Internet. We decided to examine the question of practices and objects of governance on the Internet by means of a case study on the development of the next generation of Internet Protocols "IP" (or IPng), the most important of Internet Standards. How does the Internet organise its own continued existence and what choices are seen to be available? What interested us here were both technical aims and conflicts as well as the specific procedures involved in making and implementing decisions. The emphasis in this text will be more on governing technologies than on techniques of government. We will provide an exemplary outline of the architectural dilemmas of the Internet in order to then investigate the question of how matters that apparently cannot be decided on technical grounds are in fact decided in the IETF.

The choice of IP for the case study seemed justified by its fundamental importance on the Internet. After all, IP contains the set of canonical rules that allow computers to contact each other and to exchange data in the first place to then join autonomous networks together in the Internet.

IP defines:

- the addressing system (the order of the net's address space),
- the characteristic format in which data is transmitted (packet switching),
- the type of data transmission ("connectionless", i.e. hopping from one router to the next) and
- the reliability of data transmission (best-effort service, no guarantees).[49]

IP is regarded as the mother tongue of the data-communication space. It contains the minimum binding rules for the exchange of data and thus also the key to the achievement of global connectivity (RFC 1958). A few months before this study began, the Internet community agreed on a model for IPng and called it IPv6. Our case study reconstructs the prehistory of the lengthy selection process and looks at the process of specification and implementation of IPv6 up to the stage of readiness for application. What insights into the constitution of political authority on the Internet can be gained from the development of IPv6? Our answers to this question are influenced by the ethnographically oriented research method and the types of sources used.

1 "Meta matters": developing the research methods

> "If no-one has any objection, I will setup a daemon to automatically post random postings from the big-internet [mailing list] archive until we all travel sufficiently far back

[49] On the rationality of these principles see Saltzer, Reed & Clark 1984; Cerf & Kahn 1974.

in time that we can prevent the spice girls from meeting."
(Chiappa, IETF list, 15.7.98)

Studies of political powers based on ethnographical methods focus on actors, resources and strategies that normally have rather marginal significance in political science. On the Internet these would include, for example, the customs, rituals, sacred values and almost religious convictions that come into play in struggles for sovereignty to define matters of public interest The advantage of cultural research approaches to the net is their ability to question the prerequisites and conditions of existence of social associations. These usually seem self-evident and in no real need of clarification in empirical political science, whose thinking is shaped by societies organised on the model of the nation state. Internet governance cannot fall back on the usual repertoire of organisational resources found in states (see Reidenberg 1997; Willke 1997). The Internet has no Constitution, no government and no parliament; it does not even OBEY a legal system. Binding sets of rules such as the Internet Protocol derive acceptance, respect and recognition exclusively through the agreement of its users, or of their network administrators. Paradoxically, it is the architecture of the Internet that is responsible for this decentralisation of decision-making powers. The more successful the project of global connectivity is, the more uncontrollable will be its effects on the architecture of the Net.

The aims, strategies and conflicts associated with the further development of the Internet's architecture were examined with the aid of four different types of source material:

1. Document analysis: Internet Drafts and Requests for Comments (RFCs), the IETF's two publication series, allow very fruitful document analysis. Together they give a good overall picture of the current state of the entire standardisation procedure in the community, and are more up to date than any other source of documents.. RFCs are also occasionally used to communicate other announcements, and some have even included poems (see RFC 1121) or April Fool jokes (see Footnote 19). In the eighteen months since the beginning of 1997 the IETF has published over 3,000 Internet Drafts and almost 400 RFCs. Specifications of IPv6 are currently described in 29 Internet Drafts and 16 RFCs.[50]

2. IETF Conferences: The working conferences of the IETF, which take place three times a year, were another source of data collection. The five-day meeting of between 2,000 and 2,500 engineers provides an opportunity to study the practical working methods, the form of internal organisation, the typical customs and, not least, the relationship between the electronic form of communication and that of the real world. During the conferences participants hitherto known to us only from their written contributions on the Net became recognisable faces and personalities. For one thing, we could now match names and opinions to physical appearances; for another, individuals now had specific roles (paternal, functionary or outsider), reputations and statuses – these are fundamental steering influences in the development of the Net, which we had not deduced merely from observation on the Net itself, but which were nonetheless useful in acquiring a better understanding of structures and the course of electronic debates.

[50] http://www.ietf.org/html.charters/ipngwg-charter.html

A good example of the way authority and status are expressed in the community is the organisation of discussions at the meetings of the working groups. It is not the order of the queue behind the microphone that decides who gets to speak next, rather the status of the speaker, or of his intended contribution. Status is both claimed – e.g. in the decisive manner in which the microphone is approached – and readily conceded: those of higher rank are allowed to skip the queue.

3. Interviews with experts: Participation at the conferences of the IETF also allowed us to conduct interviews. On the one hand, the interviews were intended to supplement the history of the development of IPv6 – as reconstructed from electronic archives – with the actual memories of those involved (also see Hofmann 1998b). On the other, the questions were aimed at clarifying problem areas – such as the question of alternatives to IPv6 or the consequences of private address space for the network architecture – which were unrelated or somewhat tangential to the discussions of the working groups.

> Despite its influential role in the regulation of the Internet, the IETF has not even begun to establish coherent development strategies. Debates that go beyond concrete standardisation programmes at best turn out to be (usually short-lived) incidental contributions to the relatively strictly regulated flow of communication in the working groups. An authority of the community described this phenomenon as follows: "There is a lack of a comprehensive 'business plan' within the IETF. There is no consensus or discussion within the entire IETF about the direction of an area, for example".[51]

4. Mailing Lists: Mailing lists in fact proved to be the most important source of information for the case study. This distributed communication service represents the most important development centre for Internet technology. Each of the approximately 100 working groups in the IETF maintains its own mailing list, which on principle is open to anyone interested. The IPng mailing list is read by around 1,400 subscribers at present; the number of active members is, however, far smaller, amounting to barely 5% of the mainly "lurking" list members. Since the establishment of the list exactly four years ago in mid-1994, around 6,000 contributions have been made.

We have described reading mailing lists as a qualitatively new kind of "window" on the research area of technology development on the Net (Hofmann 1998b). What is special about mailing lists in terms of research strategy is that one can closely observe the reasoning of the engineers without being addressed oneself. This research source opens up access – as otherwise perhaps only archive research can – to the area of investigation without even indirectly leading to undesired interventions. Although they are as present as the active participants on the list, the spectators are not heeded by them. This lack of attention to the spectators is evidenced by the fact that there are no attempts to translate or

[51] One obvious explanation for this lack is the composition of the IETF: the majority of the engineers see their contribution to the Internet as the solution of clearly delineated, "well-defined" problems. Not only the "Charter" of the working groups, but also the discussion culture on the mailing lists, reflects this attitude. Without disciplined restriction of the discussion to the agenda perhaps very few of the IETF's working groups would ever achieve their goals. Both of these prerequisites are missing when it comes to the task of developing a "business plan" for the Internet.

de-contextualise. The engineers communicate with each other on the mailing lists in their own particular written language, characterised by a strict economy of words and letters (countless acronyms) and a specific linguistic wit.

Mailing lists are sources with many voices. They permit subscribers to follow and be present at conflicts about the architecture of the Net. In other words, one is participating in an ongoing discussion in which the various protagonists are articulating positions on one's own research topic. In 1997, the IPng mailing list, the official development workshop of the new Internet Protocol, even fell victim to a kind of counter-attack: Critics of IPv6 and those interested in this opposition founded the "IPv6-haters list".[52]

To be sure, mailing lists are not a replacement for other sources such as interviews, but, on account of the special conditions of observation that exist on the Net, they do allow a kind of "being there" which cannot be attained by traditional investigative methods. One of the "generic" insights into governmental power on the Net gained from this source is the breadth of the spectrum of diverging but equally plausible positions on Internet architecture which are represented in the community. The observation of the collective and public development of technology as a kind of "live show" allowed us to realise that there are actually different development options associated with the project of global connectivity. In the name of good architecture engineers battle over which course of action comes closest to achieving the goal and over which compromises are acceptable. The problems involved and how they are assessed and processed will be reconstructed (very) roughly in the following on the basis of the developmental history of a technology which will soon perhaps be a governing technology. Extracts from interviews (anonymous) and contributions to mailing lists[53] are included for illustration and increased plausibility.

2 Problems with scaling on the Net

2.1 The Internet's constitution: the Internet Protocol

> "Scalability is not only a technical term these days. It is quite worrysome to see how many dependencies there are on the network, and what it takes to make solutions viable, acceptable, implementable and manageable, including in a global and also quite politicized arena." (Braun, big-I, 3. 7. 92, 0531)

[52] The founders of the list issue the following invitation: "Come see Noel and Sean display the emotionally immature, abusive, mean-spirited, vindictive and dark sides of their shabby smug childish vain characters as they viciously, cynically, cruelly and spitefully indulge their emotion-laden bias, belligerence, prejudice and uncontrollable hostility in an unparalleled display of unprofessional and unfair attacks on the technical quality of a protocol design which their jealousy and resentment does not allow them to admire...".

[53] The mailing lists cited here are "big-Internet" (abbreviated as big-I), now inactive, on which the future of network and routing architecture was discussed across the IETF until the decision process had gone so far that the precision work on IPv6 was handed over to the working group's list IPng. Other mailing lists cited are the official IPng list, the IPv6-haters list, "diff-serv" (differentiated services), POISED (The Process for Organization of Internet Standards) and the IETF list.

The more the Internet expands, the more precarious becomes any form of coherent coping with the crises caused by its own growth. Around 1990 the Net seemed to come under pressure in two important areas. On the one hand, the numerical addressing capacity began to exhibit bottlenecks. The address space decides the number of possible nodes and users who can receive a unique identity on the Internet – and thus also the maximum size that the Net can reach. A similar kind of problem was encountered in the area of routing. The number of routes on the Net grew more rapidly than the capacity of computers to compute them.[54] The routers' capacity for storage and computation ultimately determines the number of accessible objects on the Net, i.e. nodes or sites to which data routes can be traced.

The project of global connectivity had come up against two complicated and also ominous problems of scale. The situation at the beginning of the 1990s appeared ominous in so far as the Internet was heading for collapse; it was complicated because the difficulty was not the absolute number of available addresses and computable data routes between them – IPv4's 32-bit address field can still identify approximately 4 billion host computers in 16.7 networks (RFC 1752) – but an aspect to which the engineers had not paid much attention up till then: the organisation of the address space. The procedure of allocating Net addresses then in use proved to be too generous and even wasteful, as well as being extremely unsystematic in view of the new size of the Internet (see Ford, Rekhter & Braun 1993, p. 14). Many Net addresses remain unused today because networks and sites only use a fraction of the address volume they received in the past. Estimates suggest that approximately a tenth of the addressing capacity of IPv4 is actually in use.[55] The problem of the "routing explosion" is also only indirectly related to the growth of the Internet. The address space lacked a systematic order which would allow to disassociate the increase in the number of data routes from the increase in the number of sites. The key notion became "aggregatable address allocation".

According to the recollections of our interviewees, the structure of the address space did not play a role in the development of IPv4. As long as the Internet remained small and only had one backbone, i.e. only one transit route for all data packets, the efficiency of the addressing procedure was of as little interest as its "routing friendliness". Addresses principally served the purpose of identification and not of localisation of objects on the Net. Up to 1993/94 addresses were issued sequentially, i.e. in the order in which they were applied for, without taking the geographical or topological position of the networks into consideration.[56] From the routers' perspective the address space of IP is therefore a flat object. Because there was no subdivided structure according to which Net addresses could be organised, they all had to be "advertised". And the more the number of networks seeking

[54] The routers used at the beginning of the 1990s could compute approximately 16,000 routes. Forecasts were made in 1992 that this number would be reached between twelve and eighteen months later (RFC 1380). Routers at the level of the big backbones currently compute up to 40,000 routes (see King et al. 1998).

[55] This is a considerably poorer rate of use than that attained by the telephone networks, for example, see Huitema (1996).

[56] To clarify, imagine if the address space of the international telephone network were not structured either by region or by service provider. The telephone exchanges would then need data banks the size of all the valid telephone numbers in the world in order to set up connections between one number and another.

a connection to the Internet increased, the longer became the tables in which routers stored Net addresses and the routes to them.

Higher addressing efficiency, as was proposed by some members of the Internet community, could indeed have remedied the problem of the scarcity of addresses in the short term, but it also threatened to make the routing bottleneck even worse. Conversely, while the introduction of a hierarchical addressing system could be expected to improve the routing situation, the already low use-efficiency of address allocation would have been lowered even further (see Huitema 1996).

These inter-related problems of scaling provided the context for the development of a variety of contradictory solutions which perforce led on to two central questions about government on the Net. One concerned the architecture of the Internet: Are the current scaling problems an indication that the project of global connectivity requires a fundamental reform of the organisation of the Net, or does it only require an improved implementation of its principles? The other concerned the distribution of power in the IETF: Who is responsible for making a decision on this issue?

2.2 Regulating the Net: The Internet Engineering Task Force

In 1998, the Internet Engineering Task Force is still the most important regulatory authority on the Internet. Many of the de facto standards which together constitute the Internet come from its working groups.[57] However, the existence of the "non-governmental governance of the Internet" (Baer 1996) is largely unknown outside the world of the Net. This is especially true of Europe, where only a few companies and research institutes have so far shown any interest in becoming involved. That can partly be explained by the unusual image of the IETF, as well as its form of organisation, which differs from that of official, international standardisation committees. The Internet community possesses neither litigable status nor formal rules of membership. Everyone who subscribes to the mailing lists of the IETF and who participates in their meetings can and ought to consider himself a member. The IETF is open to anyone who is interested, provided they have the necessary technical competence and practical engineering skills. The exclusionary effect of this prerequisite should not be underestimated. The IETF has traditionally understood itself as an elite in the technical development of communication networks. Gestures of superiority and a dim view of other standardisation committees are matched by unmistakable impatience with incompetence in their own ranks.

> "As in the early days, when the Internet community was still a small and mainly academic grouping, the rule is still "one man, one vote". Everyone speaks only for himself and not for the organisation he represents in the IETF: "all participants in the IETF are there as INDIVIDUALS, not as companies or representatives thereof. (Whether this is a quaint fiction is an interesting discussion given enough beer, but it is certainly the historical basis of the organization (…)." (O'Dell, 18. 12. 97, POISED)

[57] Given the complexity of the Net, the community is agreed that the IETF can only look after parts of its technical development. However, probably nobody is able to say which parts these are, or why some standardisation projects "migrate" into the IETF and others out of it (see Eastlake 3rd, 1. 6. 98, POISED).

Majority decisions and contentious votes are frowned upon. The members continue discussing an issue until broad consensus ("rough consensus") emerges.

The impression that the IETF is a grassroots community is strengthened when you see the clothing worn by its members. T-shirts, shorts, sandals and an aversion to suits and ties play such an important role in the Internet community's self-image that novices are explicitly made aware of the existence of the "dress code" (see RFC 1718). The rules regarding both the formation of a consensus and the dress code are manifestations of the programmatic attitude of the technical community to the Internet. From the perspective of the engineers, the Internet reflects a tradition of technical development in which those who make decisions are also those who do the practical work, i.e. those who write programme code. Suits and ties, on the other hand, symbolise a division of labour according to which decisions are made by management and marketing. The technicians believe that the Internet should be governed by technicians. The primacy of standards development is expressed in the community's form of organisation:

> "One of the things that no one seems to get is that voluntary standards groups are bottom-up organizations. The program of work is set by who shows up and what they want to work on. If people quit attending they have no raison d'etre. Voluntary standards are just that: 'use them if you want.' (...) Voluntary standards have weight in the market place because vendors and users decide to implement and buy products using those standards and *choose* to attend meetings of those organizations." (Day, IPv6-haters, 16. 2. 96; 2. 3. 96, 0468, 0540)

The idea is that governance on the Internet should be based solely on the recognition of procedures and products. According to the technicians, the quality of a standard should determine its success.

What was once a relatively small community has grown to an organisation of several thousand engineers working mainly in the Internet sector. While in the early years of the community they met in university rooms, today the largest existing conference hotels have to be booked several years in advance if there is to be enough space for the almost one hundred working groups to meet.[58] Companies such as Cisco, IBM, Microsoft and Sun, whose future products are directly dependent on Internet Standards, send up to 40 of their staff to the meetings of the IETF.[59]

The continuing expansion of the Internet community is an expression of the growing regard in which Net technology and indirectly also its standards committees are held. Companies have discovered the IETF as a "vehicle" (Day) for coordination in a new market: "It used to

[58] One of the rituals preceding the IETF conferences is the flood of complaints that the conference hotel is already booked out. Many blame this on the rampant "goers" who, unlike the "doers", travel from conference to conference instead of writing code.

[59] This figure is based on the list of participants at the 39th conference of the IETF, which took place in Munich in the summer of 1997. We are obliged to Volker Leib for making this list available to us in tabular form.

be that the phone companies went to ITU and the computer companies to ISO. Now the computer companies go to the IETF and IEEE. (...) Someday the same fate will befall the IETF when they are viewed as a bunch of old farts." (Day, IPv6-haters, 2. 3. 96, 0540).

From the point of view of the companies, the Internet community is attractive not least because the IETF's own institutional weight has little influence on standards development. Despite its size and economic significance, the Internet community is trying hard to hold onto its informal organisation and its practical overall objective of producing efficient technology.

However, increasing problems of scale are also emerging at the organisational level. One indication is the growing size of the working groups, where the proportion of active participants decreases as the number of passive observers increases. Popular working groups now have to hold their meetings in the large ballrooms of American hotels. Under such circumstances contributions to discussions become more like formal presentations and it is hardly possible to establish a serious working atmosphere.

As in the area of standards development, there is also a pragmatic solution to this expansion problem. The former working conferences of the IETF are undergoing a change of function. The large working groups especially are increasingly becoming venues for presentations which serve to inform a wide audience of silent observers about the current state of affairs and unresolved problems. The actual development work is shifting from the working groups to so-called "design teams" (see Bradner 1998). These are small, non-public working groups of around three people which are either coopted by the "chair" of a working group or which constitute themselves. The formation of design teams can be understood as an attempt to replicate the working conditions of the early days – by excluding the public – when all the participants could fit around one table. Typically design teams come up with first drafts (in the form of Internet Drafts), which are then discussed in the working groups. The chairman of the IPng working group comments, somewhat laconically:

> "… almost *all* protocols considered by the IETF are the work of a small number of people and, where that number is greater than 1, the result of closed design meetings/ mailing lists/phone calls/whatever. IETF working groups seem to have two roles:
> - adding value by identifying bugs or issues that the designers overlooked and would wish to know about
> - subtracting value by forcing compromise and featuritis into a design against the best judgement of the designers." (Deering, IPv6-haters, 3. 2. 97, 0783)

Even if the community is effecting its rise to the status of an influential standardisation committee apparently rather hesitantly and reluctantly, there are increasing signs of a growing formalisation of its decision-making structures. Customs and rules ("process issues", see RFC 1396) formerly passed on by word of mouth are now more frequently subject to the process of standardisation that was hitherto reserved for technical conventions: a working group is founded, a mailing list is set up, a chair and a document editor are nominated, and a charter, including "milestones", is formulated (RFC 2026;

Bradner 1998). The tendency to codify traditional forms of organisation in the IETF has been noticeably strengthened by the conflicts about the next generation of IP. The Internet's problem of scaling in fact turned into a structural crisis for its community.

3 Governing technologies: The old and the new Generation

3.1 The Interim Solution: CIDR

> "Sometimes in life 'merely surviving' is a major accomplishment. As superchicken said: 'You knew the job was dangerous when you took it. Aaaack'" (Fleischman, big-I, 16. 5. 94, 0810)

At the end of 1991 a group was formed within the IETF which took the name of ROAD (ROuting and ADdressing) and whose job was to examine the possible solutions to both problems. In contrast with customary procedures, this working group did not meet in public. Six months later the group presented its recommendations along with a timetable for action (for details see RFC 1380).

The extension of the addressing capacity as part of a new Internet Protocol was suggested as a long-term measure. The ROAD group felt that several working groups should be founded in order to explore the various ideas circulating in the community about the question of "bigger Internet addresses". The acute need for some sort of action was to be satisfied by an interim solution until the new protocol was ready. Somewhat less drastic than interfering with the architecture of the Net, this interim solution had to fulfil the task of slowing down the speed of both the consumption of addresses and the growth of routing tables. The solution was available a year later and is still in use: Classless Inter-Domain Routing, CIDR for short.

As the name suggests, CIDR is an addressing system which gives precedence to the localisation function of addresses. In order to simplify the computation of routes and to permanently uncouple the increase in the number of routes from that of the networks on the Internet, a hierarchy, labelled as "provider-based", was inserted into the address space: all numerical Net addresses distributed after 1994 begin with a so-called prefix – similar to a dialling code – which identifies the Internet Service Provider. This prefix – which the provider shares with all its customers – enables the addresses at the farthest ends of the Net to be grouped under the hierarchical (provider) level immediately above them (RFC 1519).

An interim solution was also found for the bottleneck in addressing. Thanks to CIDR, the address blocks can be adjusted more flexibly to suit the size of the networks concerned.[60]

[60] CIDR (pronounced as in apple cider) is actually the second repartitioning of IPv4's address space. Originally the 32-bit long address space consisted of two parts. The first 8 bits identified the network, while the following 16 bits addressed the individual hosts. So-called "subnetting" was developed in 1981 after it

This job has been entrusted to the providers – which has led to considerable tension between customers and suppliers, or the trustees of the precious address space.

CIDR has prevented the Internet from collapsing, but the price are new ownership and power relations on the Net. Internet addresses issued according to the allocation principles of CIDR do not pass into the possession of the sites, but in fact belong to the providers, who had previously only passed them on.

In order that a lasting aggregation effect can be achieved in the area of addressing, Net addresses must be returned to the provider and replaced by new ones as soon as topological changes occur. According to the logic of "provider-based" addressing, however, topological changes always arise when a network (or indeed its provider) changes provider. The more computers a site involves, the higher the costs brought about by changes in the topological framework.

Looked at from the perspective of just and good architecture, CIDR is regarded to be a mortal sin. The dictate of "renumbering" networks shifts the costs of topological change in the Internet unilaterally to the lower levels of the Net and thus not only hinders competition between the providers but also institutionalises dependencies between the hierarchical levels of the Net (see RFC 1518; RFC 2008; Ford, Rekhter & Braun 1993). On the other hand, CIDR is still helping to prolong the lifetime of IPv4 and is thus providing breathing space (how much is uncertain) to rethink the architecture question.

3.2 IP, the Next Generation: Good architecture between reform and revolution

> "A beautiful idea has much greater chance of being a correct idea than an ugly one." (Roger Penrose)

"Must IPng embody a new internet architecture or can it simply be a re-engineering of IPv4?" (Deering, big-I, 15.5.94, 0789). This was the question oaf principle to which no clear answer had been found even in 1994, four years after the beginning of the debate about the future of IP.

Those proposing a fundamentally new protocol made reference to the invention of the principle of packet switching. They concluded from the history of the Internet that only another radical new step could continue its tradition with some prospect of success. The installation basis of IPv4 was so large, they argued, that a voluntary "migration" to a new

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became apparent that the Internet would involve more than one hundred networks in the foreseeable future. Three different size classes (recognisable from the number of bits which are available to identify the hosts) multiplied the addressing capacity of IPv4 (see RFC 790). As most organisations wanted a medium-sized address block for their sites, the first bottleneck came about in the area of so-called "Class B addresses". A study carried out at the beginning of the 1990s showed that 50% of the Class B addresses, which are capable of identifying no less than 65,536 host computers, actually identified less than 50 (see Ford, Rekhter and Braun 1993).

CIDR, the "classless" addressing procedure, also called "supernetting" (RFC 1338), does away with the rigid bit boundaries between the size classes and leaves it to the providers to adjust the remaining addressing capacity of the Internet more precisely to the needs of the networks.

protocol could only be expected if it offered truly conspicuous improvements over its predecessor. This position could be dubbed: achieving global connectivity through a courageous break with the technical conventions prevailing on the Internet:

> "When I was at MIT, I got in a protocol war (my first – wheeee :-) between CHAOS and TCP/IP. TCP/IP lost. Not for any *technical* reason, but because of installed base. With editors, if you have a 10% market share, you're OK. With communication protocols, you're dead with 10%: people want to use them to communicate, and who wants to use something that doesn't let you talk to 90% of the world? From which I deduce that you need a massive capability edge to overcome installed base. (...) In a market competition, IPv4 has the massive edge in installed base. IPv6 is a dead duck." (Chiappa, IPv6-haters, 18.2.96, 0497)

The supporters of a less drastic solution based on IPv4 also used the history of the Internet to support their view. The long life of IPv4, despite the unforeseeable number of users and applications, had to be seen, they argued, as proof of its flexibility and robustness, i.e. of its architectural quality. Moreover, precisely the large installation basis, they said, was an argument for restricting changes to a minimum. And, as it was no longer possible to decree a change of generation of IP, there was every reason to support a version which maintained compatibility and could thus gradually establish itself alongside IPv4.

> "I do not believe the Internet needs a new internet-layer architecture. The current architecture has proven remarkably flexible and robust, due to its minimal requirements from lower layers, its minimal service 'promises' to upper layers, and its simple, stateless, datagram routing and forwarding model. As a result, it has survived the introduction of many new lower-layer technologies and many new applications." (Deering, big-I, 15.5.94, 0789)

IP is considered a simple artefact. Not making any demands upon the underlying hardware and only of minor use to the services residing above IP, it has been compatible with technical innovations so far.[61] This simplicity constitutes the specific quality of the architecture; it is the reason behind the universal applicability of IP. Were the technical trivia associated with IP now an argument for making as little fuss as possible about its further development?

The opponents of a radical solution were also further divided into two irreconcilably opposed camps. This dispute was about whether the next generation of the Internet Protocol would have to be developed by the community itself or whether an existing standard could be used, which had already been implemented and which had the necessary addressing capacity: CLNP (Connectionless Network Protocol), a development of IPv4. The supporters of CLNP argued that, in the interest of a truly global connectivity, it would only be sensible to agree on a worldwide single standard for the "Internetwork layer", and to agree on one which was known to work.

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[61] For more on the layer model, which begins with the bare cable, ends with the concrete application and in between piles up the various operative functions of the Net, see, for example, Comer 1991 and Tanenbaum 1996.

> "One of the reasons I was personally trying to get CLNP accepted – I wasn't the only person to believe this – but I was convinced that IP itself is inherently simple. It has to be. What is really interesting and what we should have been spending a lot of time on is not mucking around with the header format for IP, but thinking about the way the routing protocols (...) needed to be made. (...)Those technical advances that had been made in the IETF would have been different in very minor ways, whether in CLNP or IPv6. (...) The Internet protocol itself is not the important thing, what is important is all the stuff that supports its operation." (L.C.)

> "The main point of using CLNP is that it allows us to make use of the installed CLNP base, including existing specifications, implementations, deployment plans, deployed routers, etc. Probably the most important part of this is that CLNP is currently available in products. Using CLNP also means that we don't have to sit down and argue about the design of a new protocol, and that we will be sticking with a basic communications paradigm that we understand and know works (given that CLNP design is based on IP)." (Ross Callon, big-I, 22.6.92, 203)

So what was the problem with CLNP, when it had even been developed under the sign of IP's "paradigm" and organised the exchange of data in a relatively simple and undemanding manner? The resistance to CLNP was rooted less in technical than in political or even ideological convictions, as was recognised within the IETF in retrospect. Unfortunately, CLNP had been developed by the competition, by the International Organization for Standardization (ISO). And although the OSI network model (Open Systems Interconnection), of which CLNP is a component, had had the political support of the participating countries, it was the open Internet Standards that had become established and, judging by the installation basis, had clearly won the battle against OSI. Was the Internet community now to fall back on the technology of the defeated opponent for pragmatic reasons? And what would be the consequences of using an official, protected standard for both the open architecture of the Internet and its regulation? Negative, even devastating, technical and economic effects were forecast:

> "... the political repercussions could well end the Internet as we now know it. (...) It means that once the network can fully route CLNP traffic there will no longer be any reason for the TCP/IP stack to exist. (...) It is also a kiss-of-death for all the emerging internet technology companies. The OSI marketing droids will have a field-day with this. Gee, I hope this is all wrong." (O'Dell, big-I, 3.7.92, 0487)

The key in the dispute about CLNP was the question of "change control". The IETF in principle claims sovereignty over all technologies out of which Internet standards are developed. This is seen to be the only means of ensuring that the development of the Internet does not become dependent on particular economic or political interests (see RFC

2026). The risk of endangering the technical autonomy of the Internet by choosing CLNP seemed unacceptable to the community.[62]

The conflicts between the conservationists and the innovators extended to individual details of IPng. The format of numerical addresses was the subject of the most heated arguments. The convention concerning the notation of sender and addressee is one of the important ordering elements in the data space. It supplies the nodes with an identity, describes the type of topological relationship they have with each other, and it also intervenes in the relationship between providers and networks. Structural decisions regarding both the administration and organisation of space – the effects of which can reach right into the economy of the Net, as a few examples will illustrate – converge in the question of address format.

3.2.1 Address format I: Semantics

Addresses have two functions. They name or identify an object and they indicate where it is to be found. What is characteristic about Internet addresses is that no distinction is drawn between the identification function and the localisation function. The name contains the information about the location and vice versa.[63] However, the Internet address shares one other feature with the traditional telephone number system: it is not the individual apparatus that is addressed, but the connection between the apparatus and the network (Comer 1991; Kuri 1996). Both of these features have many consequences for the operation and the use of the Internet, for example because they limit the mobility and flexibility of Internet addresses.

One part of the community proposed a different semantics for Internet addresses as an alternative to CIDR's architecturally "ugly" address format. "Endpoint identifiers" like those used in CLNP were suggested for identifying the network nodes themselves in a way that would be independent of local position and thus transportable and protected against renumbering. The argument against this idea is that the uncoupling of the two functions of addresses opens up numerous possibilities for forging and hijacking data packets. The assumption that the name or address space fulfils both functions is one of the axioms of the philosophy of Internet architecture, and changes at this level are thus regarded as a huge risk to the stability of the Net (see Crawford et al. 1998).

3.2.2 Address format II: Address lengths

Unlike the telephone number, the length of the IPv4 address is fixed.[64] The advantages and disadvantages of fixed address lengths had already been assessed in different ways while

[62] How realistic this threat actually was is still a matter of dispute. Some members of the IETF believe that the supporters of CLNP had planned to hand the Internet over to the ISO. Others are convinced that the ISO had given the IETF the "change control" over CLNP.

[63] In the telephone system there is a clearer distinction – the first digits of a telephone number indicate the topological position and the last the identity of a user. Renumbering in this system thus always only affects parts of the whole number (on the "behaviour" of IPv4 addresses see RFC 2101).

[64] The address always remains the same length, regardless of the topological distance between the communicating units. If the telephone network were based on fixed address lengths, the international dialling code would have to be used even for local calls.

IPv4 was being developed. The argument in favour of variable address lengths is that they would apparently permanently do away with the danger of addresses ever running out. An addressing system that expands from the bottom up would supply the objects at the periphery of the Net with short addresses and generate ever longer addresses as it advances up the hierarchy. If need be, the size of the address space could be extended by inserting new levels into the hierarchy (see Chiappa 1996). The argument against variable addresses, however, is that they require more computing power to calculate routes and thus further stretch the already tight resources of the routers.

The most sceptical members of the IETF agreed that IPv4's 32-bit address space would become too small in the long term, even given a more skilful allocation policy for the remaining addresses. How large a future address field should reasonably be was, however, hotly disputed among the supporters of a fixed address length. Again, the notion of *good architecture* allowed opposing positions to appear plausible. On the one hand, a good architecture demanded the smallest possible address field, at most double the size of that in IPv4, in order to minimise both the extra digital baggage that every data packet carries as a "header" and the consumption of bandwidth. For not only do long addresses discriminate against low-delay applications on less efficient connections, but they also make data traffic more expensive. Critics of a generously proportioned address space thus continue to warn that commercial users could reject a new Internet Protocol simply because of the expense (see Baker, IPng, 12. 11. 97, 4787). On the other hand, global connectivity demands reserves of address capacity because future services whose address needs cannot yet be predicted might otherwise be unintentionally excluded. The possibility of "auto-configuring" host addresses was another argument cited in favour of a large, 128-bit address space.[65] The continuing lack of consensus concerning the optimal length of addresses was treated humorously in an "April Fool's RFC".[66]

3.2.3 Address format III: Principles of space administration

CIDR introduced a first hierarchical level to the originally flat address space between the Internet Service Providers and the Internet Service Subscribers. The effectiveness of this measure is founded on the aforementioned expropriation of the subscribers. Sites no longer possess their addresses; they merely "borrow" them from their providers.

The alternative to this model – which, of course, has been discussed at great length – consists of a geographical addressing plan similar to what has hitherto been used in the telco world (see Andeen & King 1997). With "metro-based routing", aggregation effects are achieved by means of regional structuring of the address field. As the hierarchical order

[65] Auto-configuration means that computers receive their numerical identity automatically. Thus, as soon as a computer is linked to the Net it "propagates" a "link-dependent interface identifier", typically the number of its network card, in order to then be assigned a prefix of the site by the nearest server or router. These two components would then "automagically" give rise to a complete Internet address. The format of "auto-configuration-friendly" addresses would be necessarily larger than 64 bits because the number of the network card alone comes to at least 48 bits (see Thomson & Narten 1998).

[66] "Declaring that the address is the message, the IPng WG has selected a packet length format which includes 1696 bytes of address space. (…) Observing that it's not what you know but who you know, the IPng focussed on choosing an addressing scheme that makes it possible to talk to everyone while dispensing with the irrelevant overhead of actually having to say anything." (RFC 1776)

is organised around geographical places and not organisations, the provider can be changed without having to change the Net address.[67]

Under the geographical addressing model the providers are charged with connectivity costs that CIDR imposes on the users or sites. In order to guarantee the flow of data within and between the regions, so-called information exchange points are required, whose accessibility must in turn be ensured by routers between them. Both information exchange points and routers would have the status of *virtually public property* for which, however, as Hoffman & Claffy (1997, p. 302) put it, there is as yet no "satisfactory commercial model" (also see Chinoy & Salo 1997). But no-one can compel providers to submit to a topological order whose commercial prospects are uncertain: "The Internet has no mechanism for enforcing topology control, and it's probably 'politically' infeasible to create such a network" (Chiappa, IPv6-haters, 16. 1. 96, 0206). The new addressing system's prospects for success thus not only depend on the technical quality of the standard. And, as long as no stable commercial model has established itself for controlling the flow of data on the Internet, the standardisation of the address format can only ensure that at least the formulation of the address format will not exclude any future variation of topological order.

4 "The Internet Way of Doing Things" - Net techniques of government

The various proposals for the design of the address format represent the range of options that, from the point of view of the various factions in the community, are compatible with the traditional architectural principles of the Internet. The different ideas do not in fact seem any less plausible than the objections raised against them. The fact that relatively uncontroversial principles of network design are interpreted differently is all part of standards development. What is particular about the IETF is the way in which it copes with such apparently irresolvable problems:

> "It's a little hard to say why it works, but part of the thing that made the IETF work in the first place was that if people couldn't agree on between two or three proposals, you'd just send them off in two or three working groups and let the folks do whatever they wanted to do, (...) and you'd just end up with alternatives (...).
> I mean, frankly, democracy does not necessarily produce the best results, if you have to vote up front as to what's the best approach (...) A much better approach is to just allow the technical proposals to get done in detail and figure out which one works. You know, deploy them on at least experimental basis. People may find they may learn things; they may learn things that apply to the other proposals (...)." (R.C.)

The community believes that the value of technical ideas should not be decided by vote but by empirical proof of feasibility or, in the language of the engineers, by *running code*.

[67] According to the logic of geographical addressing, it is changes of place which cause topological changes having an effect on the address. The networks of multinational organisations would require a different address for each location – just as is the case with telephone numbers.

Running code is software that proves itself to be functional in test runs. For technical drafts to be recognised as Internet Standards, several "genetically" independent implementations demonstrating the interoperability of programmes are required. (RFC 2026)

Running code represents a consensus-building procedure steeped in legend, and at the same time is what the IETF probably sees as the most important distinction between itself and other standardisation bodies:

> "In the IETF world we produce running code that has documents that describe it. A lot of other standards organizations produce documents and that's the end of it." (M.D.)

> "Probably, the most fundamental difference is that in the ISO community, the highest goal is global consensus. (...) In the Internet Community, the highest goal was inter-operability and getting something to work. Something that worked was its own advertisement." (L.C.)

As a "hard-nosed notion of correctness", running code symbolises the ideal of a purely technical debate, which results in sensible, robust and – above all – useful standards. This is the basis for its almost mythical status in the Internet community.

It is therefore no coincidence that the tradition of empirical testing is repeatedly presented as the better alternative to the "democratic approach" to standards development. Politics might rule decision-making in official standardisation bodies, but the "technical reality" of what is possible rules in the IETF. (R.C.) The IETF's key slogan, coined in 1992 by one of the "fathers" of the Net, passionately pinpoints the difference between these two types of government:

> "We reject presidents, kings and voting,
> we believe in rough consensus and running code." (Dave Clark)

Presidents, kings and elections represent types of government that are unpopular in the IETF because in political regimes political will wields more power than technical reason (see Hofmann 1998a). Rough consensus, on the other hand, is believed to be reasonably immune to the corruption associated with political power. "The Internet way of doing things" is thus taken as a kind of guarantee for the quality of standards development, and many IETF members believe that the decision about the next generation of IP should also be made in accordance with this set of rules.

> "What I think the IAB should have done, was [to] follow the IETF tradition of allowing alternative proposals to go forward to the point where you could actually tell what proposals made sense technically and what didn't, with the basis that technical reality should be the ruling factor and not what some group of people think." (R.C.)

4.1 "Fiddling while the Internet is drowning" – goodbye rough consensus

> "Well, do we love to throw rotten tomatoes and clink with old medals!" (Antonov, IPv6-haters, 22. 1. 96, 0306)

Against the recommendations of the ROAD group, which had advocated a systematic analysis of the various approaches toward IPng, in the early summer of 1992 the IAB made a decision - thus not only consciously over-riding the differences of opinion in the Internet community, but also violating the community's rules on consensus. The justification given was the existential threat to the global connectivity project:

> "The problems of too few IP addresses and too many Internet routes are real and immediate, and represent a clear and present danger to the future successful growth of the worldwide Internet. The IAB was therefore unable to agree with the IESG recommendation to pursue an additional six-month program of further analysis before deciding on a plan for dealing with the ROAD problems." (...)
> "However, we believe that the normal IETF process of 'let a thousand [proposals] bloom', in which the 'right choice' emerges gradually and naturally from a dialectic of deployment and experimentation, would in this case expose the community to too great a risk that the Internet will drown in its own explosive success before the process had run its course. The IAB does not take this step lightly, nor without regard for the Internet traditions that are unavoidably offended by it." (Chapin, big-I, 1.7.92, 0450)

Rough consensus and *running code*, which in combination, especially, had represented the "road to truth", suddenly began to pose a risk to each other. According to the IAB, the "dialectic" development process, which used both experimentation and application, was no longer able to keep up with its own success. As another member of the IAB put it: while the community was good at implementing technical projects it believed in, it was not good at coping with situations requiring a decision, where a choice had to be made between a number of proposals. According to this member, none of the bodies in the IETF had experience of decision-making procedures of this kind: "There is simply no process in place for those necessary activities." (Braun, big-I, 3. 7. 92, 0524)

The IAB had decided in favour of CLNP – not because it believed that this protocol was technically superior, but because it thought CLNP would provide a quick solution. The choice of CLNP led to a wave of protest of hitherto unknown proportions within the IETF. Not only the decision itself, but also the way in which it was reached and the institutional structures that had allowed such violations of the community's bottom-up tradition, came in for criticism (see, e.g., Rose, big-I, 7. 7. 92, 0631).

Against the background of the growing threat to the Internet's existence, the problem of defining a good architecture began to overlap with the problem of who was to define it. The architecture crisis became a crisis about the regulation of the Net: "One dimension was technical: What is the best course for evolving the IP protocol? (...) The other dimension was political: Who makes decisions within the Internet community? Who chooses who

makes these decisions?" (RFC 1396). Regardless of whether this distinction between technology (the protocol) and politics (the process) is valid or not, the IETF found itself unavoidably confronted – albeit against its will – with the problem of power in the development of the Internet.

The protest being voiced on the relevant mailing lists against the IAB announcement proved to be so immense that the vote for CLNP was first weakened and shortly afterwards – at the next IETF meeting – fully retracted. The result of the failed attempt to quickly define a model was that the hunt was reopened and even extended beyond the limits of the IETF. A "Call for White Papers" was issued with the aim of achieving "the broadest possible understanding of the requirements for a data networking protocol with the broadest possible application." (RFC 1550)

At the same time a new working group was founded, which was unique in the history of the Internet community: POISED (The Process for Organization of Internet Standards Working Group; see RFC 1396). POISED was given the task of investigating the decision-making structures and rules of recruitment operating in the IETF. The POISED mailing list became a place where the community reflected loquaciously on its own constitution: "An estimated 20 MB of messages filled up disks all over the world" between August and mid-November 1992 (RFC 1396). POISED resulted in a redistribution and formalisation of decision-making powers in the IETF. The influence of the Internet Architecture Board (IAB) was reduced in favour of a body said to be in closer contact with technical developments, the Internet Engineering Steering Group (IESG), which is made up of the IETF's "Area Directors" (on the organisational structure of the IETF see RFC 2028). At the same time, formal nomination procedures were introduced for appointments to the community's "official positions" (see RFC 1603 and RFC 2027).[68]

Kobe, the Japanese city where the IAB announced its vote in favour of CLNP, has become the catchword for a traumatic moment in the history of the IETF. It was not so much the dimension of the battle that was traumatic as its assorted causes. The history of the development of IPng – starting with the diagnosis of imminent collapse and ending with the decision in favour of IPv6 – is today associated with *politicking*. *Politicking* describes a type of behaviour that infiltrates the hegemonic technical debate with non-technical considerations. In a sense the technical debate becomes the servant of other interests – with all the imaginable negative consequences for the quality of the products under discussion.[69]

The belief in a "technically excellent solution" (Huitema 1995), which is practically the natural result of the *rough consensus* approach, might be the reason why so much attention had been given until then to the rules regarding standards development and so little to those

[68] POISED had barely completed its task when a new working group called POISSON was founded. This group is responsible, for example, for elaborating a "Code of Conduct" for members of the IETF (see O'Dell 1998) and for revising the catalogue of rules and principles for working groups previously drawn up by POISED. "The Internet Way of Doing Things" has presumably now become a permanent topic on the IETF agenda.

[69] Technically ugly or bad solutions, whether developed inside or outside the community, are usually blamed on *politicking*. The most infamous example is OSI (Piscitello & Chapin 1993; Rose 1990; Hafner & Lyon 1996), and cartoons about the political background to its design are even sported on T-shirts (see Salus 1995, p. 122; Ferguson, IPv6-haters, 16. 2. 96, 047).

regarding selection procedures. The ultimate decision-making process regarding IPng consisted of two steps. First the technical criteria for selection were announced publicly, and the individual proposals were then evaluated on this basis. (RFC 1752)

4.2 IPv6: A new model order for the Internet

In July 1994 the directors of the IPng Area recommended SIPP (Simple Internet Protocol Plus), which, alongside CLNP, was one of three drafts that had still been in the running at the conclusion of the selection process. The IESG followed this recommendation and called SIPP "IPv6". SIPP was the pragmatic solution. It was the most similar draft to IPv4 and THUS defined as an "engineering task". The authors of SIPP intended to maintain almost all the characteristic features of its predecessor, including the “datagram” as the regular unit of data, and the "best effort service", which delegates control over data flow to the next-highest layer in the network. The address field in the original version was only slightly different to the CIDR format (RFC 1884), and the fixed address length was also maintained.

The most important modification of the address field was its expansion to 128 bits. This seemed acceptable because the size of the data-packet header would only be doubled, although the address itself would become four times longer. In addition, a further reduction of the address field by means of a compression procedure was planned. Auto-configuration, security and authentication measures, a new address type called "anycast address" and the possibility of adding additional headers ("extension headers") to the data packet’s header were among the other rather moderate innovations included in SIPP (details in RFC 1752).

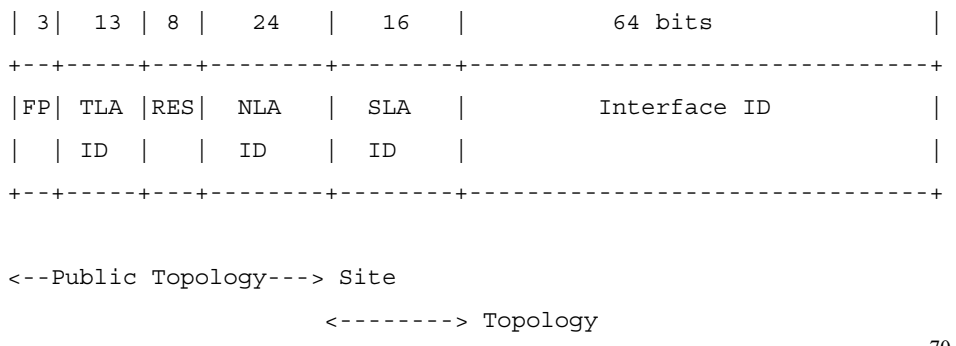
The subsequent years, which really were supposed to be used specifying and testing IPv6, brought a number of unpredicted and fundamental changes to the draft. The first four Internet Drafts specifying IPv6 thus only achieved the level of "Draft Standards" in August 1998 – a year later than planned (see RFC 2300; RFC 2400). Impetus for the reformulation of IPv6 came, for example, from the Routing Area, which deals with procedures for reserving bandwidth and for the transmission of time-critical services. For data packets to enjoy such types of special treatment in the future, their heads had to be equipped with special fields to label data types ("traffic class") and data flows ("Flow Label") (see Deering & Hinden 1998). These features enable the formulation of service demands that would be processed by the routers, assuming they will be able to do so some day.

In 1997 – the year in which the core specifications of IPv6 were to become the "Draft Standard" – significant changes to the format of the address field were again demanded. This was probably the last attempt (for the moment) to separate the identification and localisation functions of the IP address, in order, on the one hand, to remove the undesirable side-effects of the current addressing model and, on the other, to introduce more hierarchies in the address space (see O’Dell 1997; Crawford et al. 1998; Hofmann 1998b).

Although the initiative was unsuccessful, it did lead to a new partitioning of the address field. This is worth looking at in detail because it clearly illustrates both the fact that, and the means by which, the design of IP intervenes into the administration of Net space.

The address field is divided into individual segments, which represent the hierarchical levels planned for in the address space. Its pyramid-like structure corresponds in turn to the desired ranking order between service providers and users on the Net (see RFC 2374):

The aggregatable global unicast address format is as follows:



[70]

The first field (3 bits) reveals the type of address in question, and functions as a type of reading guide for all following bits.[71] The remaining 125 bits are divided into a public and a private topology – a delimitation of the data space that does not exist in IPv4. According to the philosophy of IPv6, the "transit domain" of the data, i.e. the levels of the network hierarchy used only to transmit data flows, are public. All locations without transit traffic, by contrast, are private.

The private sphere, in other words the interior of a site, is codified in two fields in the IP address: the identifier or name, which defines the interface between the computer and the network, and the site-level aggregator, a field used to subdivide large local networks.

The fields used to describe the public topology also structure the relationship between the providers. Two levels of the address field are allocated to this task, the lower of which is equipped with no less than 24 bits in order to represent the hierarchy between the providers in a way "that maps well to the current ISP industry, in which smaller ISPs subscribe to higher level ISPs" (King 1998). While the lower-level field in the public topology more or less corresponds to the current constellation among the providers, the field at the top of the address pyramid is consciously aimed at imposing a specific order on Internet providers. The 13-bit address space limits the number of organisations that can inhabit the "default-

[70] Where

FP	Format Prefix (001)
TLA ID	Top-Level Aggregation Identifier
RES	Reserved for future use
NLA ID	Next-Level Aggregation Identifier
SLA ID	Site-Level Aggregation Identifier
INTERFACE ID	Interface Identifier

[71] IPv6 has three types of address: unicast addresses identify a single network node (host computer or router); multicast addresses identify a set of nodes; and the new anycast addresses also identify a set of nodes, but only contact the nearest node (see RFC 2373).

free region" to a maximum of 8,192 (see Löffler, Sand & Wessendorf 1998). From the point of view of data-flow control, this means that the routers at the highest level of the hierarchy in the communication space need only compute connections between a maximum 8,192 objects in the network. The size of the top-level address field is thus a means to control the extent of topological complexity in the Internet. These 13 bits do, however, represent "significant constraints on operations, business models and address space allocation policies" from the point of view of service providers (Karrenberg, IPng, 4996, 1. 12. 97), and this was one of the more important reasons why the IETF sought information on whether such serious interventions into the economy of the Internet were even legal:

> "I asked the lawyers that do work for the IESG what restrictions in flexibility we (the IETF) have in the area of defining rules and technology that restricts ISP practices. I was told that the only time we can be restrictive is when there is no other technically reasonable option ..." (Bradner, IPng, 4997, 1. 12. 97)

And thus one may ask whether the 13-bit option really is the only way – technically speaking – to organise the highest level of the address space:

> "if anyone expects a magic formula which says '13' and not something else, you won't get it. (...) would 14 work? – certainly.
> Like everything else, 13 is an engineering compromise – chosen to balance one set of considerations against a bunch of others, and after ruminating over it a long time, the consensus was 13 was the best choice." (O'Dell, IPng 5000, 2. 12. 97)

Design decisions such as the partitioning of the address field exemplify the fact that in the interpretation and allocation of individual bits in the headers of data packets *spatial politics* are being pursued. In the name of good architecture, which is supposed to guarantee global connectivity without scaling problems, the performance capacity of the routers, for example, is being offset against the business interests of the providers. The result is a draft version of the future order of the Internet. Whether IPv6 is ever implemented also depends on those who will have to bow to this order – the providers and users.

The development of IPv6 seems to be nearly finished. Not only have the most important components of IPv6 reached the penultimate step in the standardisation process, but the large number of implementations and the increasing testing going on in the "6bone" testbed are also signs that completion is imminent.[72] At the same time, speculation is growing about the intentions of the manufacturers, because only standards for which products are developed and which are supported by existing products can compete with the current installation basis.

[72] Details of IPv6 implementations can be found at: http://playground.sun.com/pub/ipng/html/ipng-main.html; information about 6bone at http://www-6bone.lbl./6bone/

5 "IPv4ever"?

> "IPv6: the service provider general has determined that ipv6 cannot do any harm to asthmatics, pregnant women and men, dislexics, or ipv4." (Crowcroft, IPv6-haters, 12. 1. 96)

In the summer of 1998, shortly before the completion of such extensive development work, nobody in the IETF is able to say whether IPv6 will actually ever replace IPv4 as the new Internet Standard. It even looks like the number of those who are distancing themselves from IPv6 and forecasting its downfall is growing.

Desirable as a larger address space might be, its realisation has become less urgent, and IPv6 thus has no guarantee of succeeding. Moreover, because the prospects of IPv6 becoming the standard are generally thought to be doubtful, almost all new products for the Internetwork layers are being developed not only for IPv6 but also for IPv4. Encryption and authentication tools, for example, which are used by IPv6 to increase the security of data traffic, have long also been available for IPv4. Yet another reason for providers and network operators, at least, to migrate to the next generation of IP has thus become obsolete.

Not only has the once existential urgency of IPv6 diminished over the years, but its reputation in the IETF is also disintegrating. Speaking for many, the chairman of the IETF recently expressed his opinion on the subject of IPv6 on the IPng mailing list:

> "But what we thought at one time we might be forced to deploy as early as 1993 looks like (according to Frank Solenski's Address Usage statistics the last time I saw them) it might not be needed for as much as another decade. And in that time – well, maybe your crystal ball is clearer than mine, but my crystal ball doesn't preclude somebody having a better idea than IP6 as presently formulated. If we do indeed have a better idea in the meantime, I said, we would deploy that better idea." (Baker, IPng, 12.11.97, 4787; also see the reactions in IPng 4775 and especially IPng 4788).

An addressing system that, according to popular opinion, was heading straight for collapse at the beginning of the 1990s has now suddenly been granted another ten years of life. And the Draft Standard, which may not have achieved *rough consensus* in the IETF, but did – according to majority opinion – come closest to the internally defined technical criteria, has now become a second-best solution.

If we remember that the Internet community took a number of years to reach agreement on a draft for IPng and a working group then laboured for another approximately four years on the development and implementation of IPv6, we need to ask what brought about this change of opinion in the IETF and so thoroughly undermined the status of the former number-one development project. Several explanations circulate in the IETF, and they sound like a distant echo of the different positions formed at the beginning of the 1990s, when the problems of scaling first emerged, on what constitutes good network architecture.

5.1 Network Address Translators: self-help on the Net

The first warnings were made in the early 1990s: if the IETF did not quickly deal with the shortage of addresses on the Internet, decentralised solutions would be invented, which would make the establishment of a new, globally standardised address space more difficult, if not altogether impossible. Shortly afterwards the decentralised solution was on the market: so-called NAT boxes, or Network Address Translators, which are able to turn a single Internet address into a new address space of unlimited size. Behind a globally legible IP address an address space of any size desired is created, which contains addresses that are not globally legible and are thus only valid inside the site in question. NAT boxes allow large organisations, in particular, to meet their needs for additional addressing capacity, which either cannot be acquired from providers or only at a high cost. Because the new local name spaces are usually aggregated under only a few IP addresses, they not only remove some of the burden on the network's limited addressing capacity, but from the point of view of routing they also appear to be "topologically correct":

> "NAT leads to IPv4ever (...) because I see NAT deployed and working on extending the lifetime of IPv4 addresses both in terms of sheer quantity and in terms of making the allocation [of addresses] more hierarchical and better aligned to topology." (Doran, diff-serv-arch, 10. 3. 98, 00338)

Looked at from the perspective of global connectivity, the decentralised "NAT box" solution is considered a "kludge" – an ugly temporary solution that makes the Internet less transparent and more difficult to administer the more widespread it becomes. NAT boxes not only promote the possibly irreversible collapse of a global address space, but they also – along with popular "firewalls" – violate some of the architectural axioms of the Internet.[73]

The spread of NAT boxes, firewalls and similar solutions to Internet problems illustrates an insight accepted in the community long ago, namely that the IETF is gradually losing its influence over the evolution of the Net. Its authority is dwindling at the same pace that the strength of unity – which proceeds from the vision of the Internet as a collectively defined good – is decreasing. Both the project of a good network architecture geared towards the public good and the power to regulate the Net, based in both normative and practical terms on the architecture, are facing competition from individual interests that are gaining in weight both at the development and the user level. IPv6, which was understood as an Internet-wide solution to problems of scaling, is now only one of many development options.

While it was possible to prescribe the introduction of IPv4, the predecessor to IPv6 and still the Internet Standard, in "big bang" form (see Helmers, Hoffmann & Hofmann 1997), the future of IPv6 depends on whether its implementation appeals to enough actors on the Net: "The deployment of IPv6 will totally depend on the users. We can design the most beautiful protocol on the world, if the users don't buy the software or see the merit of

[73] These include, for example, the "end-to-end" principle, which leaves the supervision of data flow to the applications at the periphery of the network (RFC 1958; Hain 1998). The Net's transport and control mechanisms are also based on the assumption of unchanging receiver and sender addresses.

switching over to IPv6, technically speaking, it won't work. I think everybody in the IETF realizes that, that we are working on a protocol that might not be recognized by the market." (E.H.) The longer users have to wait for IPv6 to mature to application stage, the more its prospects for success seem to be diminishing. Another problem is the pace at which the Internet is developing.

5.2 Data flows

The design of IPv6 is based on the assumption that data packets will continue to be the norm and that other modes of transfer will remain exceptions that require identification. The classical packet transmission procedure treats all data in the same way. All types of application have to share the available transmission capacity with all other data packets. Even related and homogeneous quantities of data with the same source and target addresses, for example, are sent through the Net as individual packets with full senders and addresses. What can be a strength in the event of malfunctioning connections (lost data can be easily sent again) can become a weakness when large volumes of data need to be sent as quickly as possible.

A significant increase in transmission speed can be achieved when data packets with the same destination are grouped together in data flows. Data flows are a hybrid phenomenon. They consist of data packets that have the same receiver address or at least share part of the same route (e.g. the connection between the exchange points for transatlantic traffic). Data packets in a flow are labelled with a "tag" that tells the router or switch that they belong to a "flow", so that all the packets can be waved through without each destination address having to be read individually. The effect of this "tag switching" or "IP switching" is similar to that achieved by reserved lines on the telephone network and, accordingly, high economic expectations are associated with this transmission procedure (see Sietmann 1998).

Routing procedures of this kind have been on offer as commercial Internet products for some time, and the competing manufacturers are trying to agree to a common standard in an IETF working group (see Gillhuber 1997; Schmidt 1997; Callon et al. 1998).[74] If data flows ever achieve the status of a generic transmission dimension on the Net and even replace data packets as paradigms, then IPv6, which only treats data flows as an exceptional case, would have been leap-frogged in the development of the routing procedure of the future.

Looking back, it becomes clear that the real problem facing IPv6 is not so much the predicted addressing crisis as the high speed at which the environment in which IP is embedded is changing. "Yesterday's technology for tomorrow's customers", was an acerbic comment made on the IPv6-haters list (Yakov, 4. 12. 97). Such mockers remain unmoved by the quandary that while tomorrow's technology is difficult to define today and even

[74] MPLS (Multiprotocol Label Switching) is one of the first working groups (and is thus closely observed) in which the IETF principle of "one man, one vote" clearly no longer applies. Not individual brilliant brains, but the representatives of IBM, Cisco and smaller enterprises like Ypsilon, are fighting for recognition and standardisation of their own switching procedures – a situation that does not fit into the self-perception of the community and is clear to anyone following events in this working group.

more difficult to standardise, today's technology may no longer be able to meet the demands of global connectivity by the time the community has agreed on a standard via rough consensus and running code. The expansion of the open community and the growing competition, capital power and impatience of the interests represented on the Net is accompanied by a formalisation and slowing down of the standardisation process in all areas, while product development within the enterprises involved continues. Thus, the ambivalent status of IPv6 within the community can also be traced back to the growing gap between the pace of standard-setting in the IETF and the speed of product development on the market.

5.3 "IP Written in Stone?"

> "... but this is what the IETF seems to excel at, taking your pet dream, your clear and unfettered vision, and seeing it get all cloudy as everyone pees into it ..." (Knowles, IPv6-haters, 10. 12. 97)

IPv6's critics believe the uncertain future of the protocol proves that Simple Internet Protocol (SIPP) was the wrong model from the start, that the authors of SIPP were the wrong people and that the IETF is now the wrong place for new network technology to be developed.

In the interests of a stable Internet, a majority of the IETF had favoured the traditional alternative of simply updating IPv4 and had entrusted its realisation to a "conservative design nature", who explicitly shies away from the risk of "promising new architectural features" (Deering, big-I, 15. 5. 94, 0789). One of the probably unforeseen consequences of this move was that a problem that had previously been at the centre of attention now lost its attraction. SIPP was considered so "simple" and "well understood" that those interested in breaking new technical ground turned their attention to other challenges:

> "The people you would immediately recognize as the best and the bravest minds of the Internet were not going to IPng and IPv6 meetings. (...) They were going to working groups that were looking at the kinds of technical issues that were really unsolved ..." (L.C.)

> "IPv6 is the 'b-ark' of the IETF." (N.C.)

The early days of the Internet had an aura of singularity and willingness to cut loose – not only from the "design hegemony" of the telephone network, which had been unchallenged for decades, but also from internal architectural shrines. Recently describing this attitude on behalf of the Internet community, IAB chairman Carpenter wrote that no procedure was a protected species: "Principles that seem sacred today will be deprecated tomorrow. The principle of constant change is perhaps the only principle of the Internet that should survive indefinitely." (RFC 1958) Should IPv6 be taken as evidence that the Internet community is losing its detachment from its achievements and thus one of the preconditions for proper

observation of the "principle of constant change"? Are technically outdated conventions being imposed in the interests of global connectivity? In short, is the Internet facing a problem of scale not only as regards its governing technologies but also with respect to its techniques of government?

Critical voices in the Internet community claim that the IETF has got *religion*. TCP/IP, seen originally by its developers as no more than a gradually developing experiment that was never more than "a few steps ahead of our success desaster", is said to have turned into a set of holy axioms that has become so deeply embedded in the foundations of the Net and in its community's thinking that it is now almost untouchable and insurmountable:

> "Oh no (...) 'I feel a RANT COMING ON!!!'
>
> <begin RANT!>
>
> along the way of becoming the sanctified protocols, we managed to breath way too much of our own gas.
> one of the great strengths of IP is that you can glue together all kinds of feckless, misbegotten networks fragments and make something that has operational connectivity.
> somehow we decided, though, that networks *should* be built like that (...)
> that pervasive religious position is just plain wrong. we have transformed the liability of having only a hammer into the design principle that everything except nails is the work of the devil.
> that's just patent, braindead bullshit!" (O'Dell, IPv6-haters, 12. 7. 98)

Pragmatic interim solutions (O'Dell's RANT takes the Internet's hop-by-hop routing technique as an example), which only came about because better procedures were not available at the time, turned into technical virtues, with nobody remembering the circumstances of their emergence.

This cheerful sanctification of what in fact were improvisations is traced back to the growth and cultural transformation of the IETF. The approach to existing technical and social conventions is said to show the difference between the academic world, from which the first and founding generation of the Internet community was recruited, and the industrial sector, which dominates the next generation in the IETF. On this view, the large majority of the current community sees the Internet as a fact, as a manifest technical construction, which should be further developed, but not fundamentally questioned: "Now you have people coming along who weren't part of that thought process, who think these things are essentially God-given and are the scientific laws for building networks when in fact they are not." (J.D.)

The ideal of an Internet in continual metamorphosis seems to be increasingly giving way to the reality of a permanent construction site – one that can constantly be patched up and repaired, it is true, but none of which can be torn down. And IPv6 is seen by critics only as a flagrant example of the IETF's inability to revolutionise its own thinking. The pioneering

spirit of the past is being supplanted by an "unimaginative" politicised bureaucracy, which is making the Internet community more similar to its opponents, ISO and ITU.

And thus, while the IETF – according to the righteous and incorruptible – is increasingly distancing itself from the ideal of a radically open technical debate, the voices asking whether the IETF is still the right place for developing a new Internet protocol or even good network architecture are getting louder:

> "I don't think that the IETF is really the right place to start this effort. (...) Look back at how IP happened; a small number of people felt their way towards what was later recognized as fatesharing, as a fundemental advance over the original basic packet model of the ARPANet and Baran's work. (...) I just think the organizational dynamics [of working groups in the IETF] are all wrong. You'll never get the kind of large group you'd wind up with in the IETF which is a basically unimaginative organization incapable of taking a real step forward, viz IPv6) to make that big step forward, and come to agreement on it." (Chiappa, IPv6-haters, 12.1.96, 0140)

> "I am actually surprised that the Big Players haven't formed a closed group to propose new standards. you can keep the useful side of the IETF process (open, free standards) while punting the downside (meetings open to clueless people who have every right to speak...)." (Knowles, IPv6-haters, 13. 7. 98)

"And how do you know they haven't?" was the prompt reply. (O'Dell, IPv6-haters, 13. 7. 98)[75] The irony of the story is probably the fact that neither the small, hand-picked design team nor the "Big Players" can guarantee the development of a transmission protocol which is as successful as IPv4. On the one hand, the consensus among IPv6's opponents probably does not go beyond rejecting it. In the IETF, at least, which represents a broad spectrum of the communications technology sector, there is still no agreement on the features that would characterise the good architecture of the future. On the other hand, even a small group of network architects free of bureaucratic constraints would be unable to avoid thinking about the conceptual consequences of IPv4's broad installation basis. How can hundreds of thousands of Internet sites be persuaded to switch to a new protocol at the same instant just because the global connectivity of the Internet would otherwise founder on Babylonian multilingualism?

If we bear in mind the size, the complexity and the level of decentralisation the Net has attained, we have to ask whether the uncertain future of IPv6 really is the result of bad decisions or whether it simply illustrates the fact that the Internet is becoming increasingly difficult to regulate. Seen from this perspective, the growing complacency of the IETF would only reflect the unwieldiness of the vehicle it is trying to steer, and the criticism of the body's procedures and decisions would be no more than pining for the old days, when the Internet still only had marginal significance and the community's playing fields seemed to have no boundaries at all.

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[75] Fourteen days later, AT&T and British Telecom announced that their planned joint venture, which would merge their international service operations, would also develop a new Internet protocol. (FAZ, 27. 7. 98)

Like the Internet itself, the IETF has also entered the normal world, which entails faction fighting between reformers, conservatives and revolutionaries, and perhaps also the creation of legends and the exaltation of gods and sacred cows. Is IP on the path to beatification?

The current assumption in the IETF is that the transition phase from IPv4 to IPv6 will last at least ten years, if it has a limit at all (RFC 1933; King et al. 1998). The diffusion of a new transmission standard would probably not significantly affect IPv4's durability, because its open architecture could even cope with competing mother tongues, provided compatibility is maintained. Thus, to sum up: "The Internet will 'get big' whether or not IPv6 makes orbit." (O'Dell, IPng 6000, 7. 7. 1998)

6 "So long, and thanks for all the packets"

The development of IPv6 was used as a case study for investigating the political dimension of the Net. Thus, it is time to ask which insights IPv6 has revealed about the regulation of the Net and how the perspective of this study differs from other case studies.

A similar, at first glance much more spectacular, case example could have been provided by the controversy that started a year ago about the future administration of names and addresses on the Internet (see Recke 1997). The conflict about the long-overdue reorganisation of the name spaces had got so intense towards the end of 1997 that the regulation of the Net has finally become an issue at the level of international politics. Several international organisations expressed an interest in supervising the Internet (see Cook Report 1998).

The struggle for supremacy over the Internet's name and address spaces demonstrates the growing sources of friction between the decentrally organised Internet, which had largely been left to its own devices until recently, and its relatively highly regulated social environment. The Internet has become the scene of a battle for political, economic and moral spheres of influence, which only marginally concerns the issue at the centre of the conflict over the future of the Internet protocol: agreement on the features of a good network architecture.

Unlike the question of name and address administration, the development of IPv6 rarely ever crossed the threshold into the general public spotlight. The conflict about IPv6 remained an issue that interested only the Internet community and the associated enterprises. Spared dramatic interventions from the outside world, the conceptual and practical reform of the architecture was thus carried out largely in accordance with the traditional rituals and principles of the community (which were being reformed at the same time).

Looked at from the research perspective, IPv6 gave us an opportunity to observe social and technical order on the Internet from "within", a perspective which would be impossible in

this form if, as in the case of address and name space administration, these orders lose influence or are completely removed.

The case study about IPv6 gave us access to a melange of architectural, organisational and symbolical principles that were specific to the Internet world. Clothing and communication rituals, and technical and social values and conventions together provided a framework of reference from which we could discern political contours while reconstructing the history of IPv6. The fundamental architectural axioms and ideas which together comprise the Internet Constitution we call *governing technologies*. From these we distinguish the *techniques of government*, i.e. the rules of procedure that are expected to make the wholly impossible permanently possible: the continuous further development and transformation of the Internet without changing its identity.

The reform of a governing technology on the Net may generate dynamics that are more similar in ways to the usual patterns of conflict and consensus-building found in social reform projects than one might have expected. While global connectivity can be formulated as a collective project, it is a project that can never be fully realised collectively. One reason is that the implementation of a good architecture – no matter how incorruptible "rough consensus and running code" may be – comes up against ambiguous problems that can be interpreted in different ways and thus require solutions that involve compromise.

Even if the Internet's techniques of government are also seen consciously as an alternative to democratic decision-making procedures, the content of the problems that are solved one way (technically) or the other (politically) is similar.

The development of IPv6 not only illustrates the different approaches to the common goal, but also how little influence the IETF now wields over the development of the Net and likewise over the future of good architecture. Whether the Internet community's loss of authority will cause problems for the further development of the Net remains to be seen. Experience with decentralised regulation of global affairs is so rare that little can be said about its success.

As long as IPv4, or a related protocol like IPv6, remains the governing technology on the Internet, IP land will probably continue to resist conventional forms of top-down regulation. Even a brand new network protocol developed outside the IETF will at best be able to coexist with IP, but not replace it.

III Hello Usenet - Goodbye? Agency and Ordering in Electronic Communication

netnews /net'n[yooz]/ /n./
1. The software that makes Usenet run. 2. The content of Usenet[76]

200 hello, you can post

Living and working in modern societies is made up of an increasing amount of communication. In view of the increase in communication - deeds must be communicatively prepared or assessed or even expressed by way of communicative activities only - our society can be described as a "talkative one" (Knoblauch 1996, 19) The different types of network communication - Mailbox "noticeboards", discussion forums, video conferences, groupware, email, IRC channels, the virtual worlds of MUDs and MOOs or network radio, to name but a few - have contributed in no small part to the multiplication of communicative forms and traditions77. Network communication may only have become accessible to a large public since the Internet's increase in popularity, but many of their forms have existed for quite some time.

The period during the late Seventies and early Eighties was a time of particular development for electronic communication. Computer networks were increasingly seen as a communication medium, rather than mere code crunchers[78]. During this period, as well as the first mailbox networks and the first commercial online service, Usenet developed and with it, News - or, more or less synonomously, Netnews, a collection of subject-oriented newsgroups. Originally an offshoot of Unix, news becomes the Internet's most popular communication service over the years. During mid-1993, Usenet's participants are estimated at approximately three million.[79] For many people, reading news has become part of their daily routine: "I read netnews right after my mail most mornings." (Raymond 1994, 298)

During the mid-1990s, Usenet represented a service with a tradition on the one hand and on the other hand, it was subject to an influx of new users to whom Internet culture was more or less unknown: the customers of commercial online services and Internet Service Providers. Seen from this background, this paper aims at answering the following questions: Is Usenet an "information-ecological niche" (Schmid & Kubicek 1994, 188) or

[76] The Jargon File (http://earthspace.net/jargon/jargon29.html#SEC36)
[77] Cf. The CMC Information Sources (http://www.december.com/cmc/info/), one of the most comprehensive online resources on network communication. In German-speaking countries, empirical studies primarily focussed upon mailbox users (Stegbauer 1990; Wetzstein et al. 1995; Barth & von Lehn 1996). Apart from this topic, numerous studies have mostly concentrated on the use of email in various contexts.
[78] Cf. Heilige (1992 and 1996); Rheingold 1993 and Hauben & Hauben 1997.
[79] Brian Reid: Usenet Readership Summary Report for July '93 (news.lists), quoted in Baym (1995a).

is it also fit to be used as a service for the masses? In other words: Will Usenet's medial order prove to be scalable or will its "collaborative anarchy", as the network is known, collapse under the strain of its increasingly heterogenous participants? Do comparable crisis situations exist in Usenet's history and how were they overcome? Is Usenet growing in a merely quantitative sense or can we speak of an upward transformation and what changes will this bring about? Will Usenet stay "the same" or will it become something different?

The paper is divided into six parts. First, the conceptual background and method used will be described (The medium as artefact). Then follows a chronological sketch of Usenet's development (Periods of medial (dis)order). After that, we will turn to the resources of establishing order on the network ("How to do things with words"). The next two parts are devoted to Namespace management and Dealing with net abuse. Finally, the network's characterisational framework and limits for action ("Default policy") are dealt with.

1 The medium as artefact

1.1 The computer as a "new" medium

In network communication, instrumental and medial aspects of computers fuse. Traditional CMC research mainly dealt with the quality of computer-mediated communication together with the question as to whether network communication could replace direct forms of interaction. For a very long time however, the area connected to the technology behind the services and applications examined here - the materiality of communication - was neglected. In contrast, this made network communication appear to be a medium with more or less generic qualities: "These studies presuppose that CMC is a tool rather than a context that affects communication." (Patterson 1996, Ch. IV). In recent context-based CMC research which has turned towards the ethnographic exploration of forms and cultures of use in MUDs, Internet Relay Chat and Usenet newsgroups, the medium's structures are of more interest - as a resource which users take advantage of, with expressive or strategic intentions, as well as a context for interaction in which both humans and computers play the role of actors. An integrated definition of the medium which transcends the usual opposition of (material) technology and (social) context becomes the guiding cognitive principle: "The material definition is grounded in what the artifact 'is. The social definition is grounded in what the artifact 'is perceived to be.' The integrated definition is grounded in what the artifact 'does.'" (Jackson 1996, 254)

In Germany, the discussion on the computer's peculiarities - and related to this - on forms and consequences of informatisation took the opposite route, from the computer as machine or tool to the computer as medium.[80] When applied to network communication, an integrated view of computers which talks of "a programmable medium" (Coy 1994) or "an instrumental medium" (Nake 1993) has proven increasingly fruitful. In the interplay of transfer and processing, the computer is seen as a "mediator who not only connects and

[80] Cf. Schellhowe 1997 on the computer's metamorphosis from machine to medium. For an up-to-date list of literature on the computer, the "new medium" cf. Ellrich 1997.

links, as does every medium, but can also bring about changes to whatever is connected to it" (Nake 1993, 182). Seen from this background, network communication can be characterized as "telematic interaction", a concept coined by Esposito (1995). On the one hand, the concept of "telematic interaction" includes the computer as a technical object which acts. On the other hand, this form of interaction gives users the possibility of symbolic agency in which keystrokes can be used beyond merely interacting with other participants to interact with structures and technical processes. As well as the traditional text which relates to the communication of ideas, network communication also includes an "operative text" with which users can interact with the programme-controlled operation process of messages. In "telematic interaction", instrumental and medial aspects of computer use are intertwined; the medium's habitual latency has been revoked.

The idea of the existence of different textual levels in network communication fits in with the idea of conceptualising network interaction as a new form of writing. This concept is based on the realization that network commnication eludes the anthropomorphous model of situated communicative acts. What goes on during the medial use of a computer cannot be adequately described within a categorial framework of interpersonal interaction (cf. Krämer 1997). The fact that network interaction can manifest itself as or is at least based upon an intertextual communication process is empirically comprehensible in face of hypertext systems such as the WWW. Hypertexts as a specific type of discourse infrastructure are not the only form of "electronic writing" (Wehner 1997). On the Internet, a plethora of new forms of writing and reading can be encountered. Individual network services differ in both the number of textual layers as well as characteristic and valid operations. Mailing lists, Usenet, Internet Relay Chat channels and the virtual worlds of Multi-User Domains (MUDs) all make up their own spaces of interaction.[81]

1.2 Communication on and about Usenet

During the past few years, an increasing amount of literature has been published presenting Usenet in all its guises. The emphasis is upon the study of electronic communities in various newsgroups and their form and function (Aycock 1995; Baym 1995a, 1995b and 1998 Patterson 1996; Philipps 1996; Tepper 1997). In addition, the distinguishing features of Usenet's "written world" as a distinct society have been the subject of research (MacKinnon 1995; Overby 1996). The origins and forms of a genuine Usenet culture have been looked into (Hauben & Hauben 1997; Jones 1991; Pfaffenberger 1996). The network has been regarded as a medium for political commnication and a place of political socialisation (Jones 1996; Hill & Hughes 1997). Light was shed on the rules of self-governance and conduct control (Donnerhacke 1996; McLaughlin et al. 1995 Pfaffenberger 1996). Usenet messages have been analysed as regards their media genre (Knapp 1997) and anatomy (Donath 1998). Instruments for a quantitative analysis have been developed (Smith 1997).

The focus of this paper is the medial materiality of communicative acts within Usenet. Usenet is viewed as an artefact both from a historical as well as a systematic perspective.

[81] E.g. cf. Grassmuck (1995, 54), who characterises three textual levels for MUDs: (1) The descriptive text, in which the game's scenery takes shape, (2) the oral texts in dialogues between participants and (3) the operative text, which is used for programming virtual spaces or objects

The examination is directed towards processes and forms of a medium's creation and change during its use. The element of communicative acts whose subject or object was the medium itself is examined. Our perspective towards communicative acts within Usenet complied with an actor model consisting of the concepts actor, roles, framework, areas and chains of action (aggregated and integrated courses of action)[82].

The rules and procedures which make a Usenet article a technical object are constitutive for Usenet as an artefact. Usenet enables communication of a certain type: "multilateral asynchronous interactive communication" (Bins & Piwinger 1997, 38). Usenet participants send "articles" addressed to thematically-based newsgroups which are distributed to a more or less large number of Usenet "sites".[83] There, they can be read by other participants and commented upon publicly (via Usenet) or bilaterally (via email). One of the main characteristics of a Usenet article is its hybrid character: On the one hand, it transports a message and is a technical object comprising specific rules and procedures on the other. Not all articles are directed towards human participants. Control messages take the same route as other articles and can be sent by all participants for host computers on the network to read and execute. Issues regarding network administration are dealt with like any other subject within newsgroups created for this purpose. Usenet is a particularly self-reflexive medium - its control, administration and communication occur within itself with the network's own means. Because of this, the "creation of a medium during its use" can actually be determined.

Methodologically, the analysis is based upon the observation of communication in selected newsgroups, especially those belonging to the news. hierarchy.[84] These groups are strategically relevant locations of Usenet having itself as their theme, it being both the location and object of communication. At this point, the paths of the discursive (re)constructions of the envisaged order and the interested representation of Usenet's reality cross those of the synchronisation of intended actions directed towards its change. Thus condensed, the medium's structures gain plasticity and become "legible".

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[82] By using this approach, we show our predisposition towards system-oriented media research (cf. Faulstich 1994) one the one hand and also especially actor-network theory on the other. With the latter we share the assumption that non-humans "act".

[83] For example, cat lovers all over the world congregate in the rec.pets.cats groups, whereas de.rec.tiere.katzen is its German-speaking counterpart. Friends of Australian walkabouts would read aus.bushwalking, alt.arts.origami is geared towards afficionados of Japanese paper-folding, alt.fan.letterman is the home of the TV entertainer's fans and de.talk.bizarre that of Germans with a weird sense of humour. Researchers in the field of cellular automata should find what they are looking for in comp.theory.cell-automata; soc.religion.quaker deals with the religious denomination of the same name. Vegetarian restaurants in Berlin can be found in bln.freizeit.essen and whoever wishes to converse in Polish should do so in the pl. Groups.

[84] By the beginning of July 1998, the news hierarchy had grown to accommodate over 30 groups. After an initial phase in which research was more widespread, the main point of concern was especially focused towards the groups news.groups and news.admin.net-abuse. The other news.admin groups, news.software.* and alt.culture.usenet were also studied, as were new hierarchies, especially those containing administrative groups. Document analysis (particularly those of a self-descriptive nature periodically issued on Usenet as well as archive material) and interviews with key actors supplemented the participatory study. The observation of communication acts was unregistered by Usenet and mailing lists (cf. Hofmann 1998b) and therefore did not affect the object of observation. News was initially obtained from the Freie Universität Berlin and, as from the summer of 1998, from an own server (news.wz-berlin.de, currently running InterNetNews version 1.6). The reader used was NewsWatcher for Macintosh.

2 "Imminent Death of the Net Predicted!" – Periods of medial (dis)order

The situation is hopeless, but not serious. – This somewhat hyperbolic formula characterises the strange mixture of portent and "business as usual" which make up Usenet's prevailing tone. "Imminent death" has been a truism in Usenet's field of self-perception since the early Eighties. Such invocations make up a separate sub-genre for which the following article is a recent example:

> Newsgroups: alt.culture.usenet
> Subject: Usenet needs a big cleanup
> Date: 1998/05/25
>
> More than 75000 newsgroups …
>
> Who the hell is going to clean up that mess? All these newsgroup with no message or with maximum one every other week. It's really boring.
>
> And not to forget those newsgroup with the most ugly, vulgar, evil and outrageous names and content (that even some very respectable and eminent universities are hosting/managing). But I guess there's no way to avoid having them on the Net.
>
> Last but not least the Useless of Usenet: the newsgroups created by some individuals to discuss with their friends and family How interesting that is for a guy from Paris, Milan or Amsterdam to read the conversations of the members of the Atkinson family in North Dakota Are you kidding?
> But who is managing all that? (The alt hierarchy and all the others outside the big 7 (comp, soc, rec, talk, misc, news, sci)) What are doing the universities and the ISP's?
>
> Isn't there a way to remove the newsgroups created by some brainless idiots?
> Or couldn't the ISP's find a system to no longer publish the newsgroups that never had any message and/or that have such a ridiculous level of useage that everybody ignore them? That should not be too complicated, neither technically nor "ethically".
>
> A good thing would be that the ISP's, the universities and other institutions who are hosting and creating newsgroup create an international control organization to keep the house in order.
>
> Let's get serious with UseNet. Some guys should stop abusing or it will become unmanagable and unusable.
>
> It needs a big clean up, guys...

The claim in the article that Usenet is operating on the brink of chaos can not stand up to a thorough examination, no more than the associated idea of "the good old days", when one

was part of an elite group and all was right in the world of Usenet. In retrospect, three periods with characteristic forms of medial (dis)order can be discerned which will subsequently be outlined. An interim synopsis will then follow, describing the typical modes of creating order on Usenet as seen from a systematic perspective.

2.1 "Hello Usenet" – The founding years

Usenet's origins in the Unix community are well-known. The beginning was constituted by a software innovation, which can be dated precisely:

> "Usenet was a combination of several things. It goes back to late 1979 with the upgrade of UNIX from Sixth Edition to Seventh Edition. The particular version of Sixth Edition UNIX we were running had a facility for notifying people of operator messages, news items, in a way that you only saw them once at login time. We wanted something different in Seventh Edition when the code changed. Tom Truscott and Jim Ellis got the idea that Usenet should be distributed. UUCP came out in Seventh Edition UNIX so we got the idea to use this to distribute news items remotely. We saw several uses for this initially. One was administrating news when people weren't at their computers, we also saw it as something that could be used by our department for department news announcements and we also saw it being used for comparatively casual purposes. The main thing we saw it used for in a network sense was UNIX support. The way the original code worked was that any newsgroup whose name began with the word 'net' was distributed and anything else was local." (SB)

In 1979, the first Usenet articles are exchanged between tow universities on the east coast of the USA. Subsequently, Usenet was initially only able to establish itself in universities, research institutes, computer firms and phone companies. A first increase in growth arose in 1981/1982, when mailing lists propagated on ARPANET whose access was limited found their way into Usenet which was open from the beginning. The first graphical representations of the network which was still reasonably small at the time date from this period.[85]

A distributed network was a model for the medium's basic structure which relies on the control of communication on the receiving side as opposed to a communications network with a central control authority. "Usenet was organized around netnews, where the receiver controls what is received. The ARPANET lists were organized around mailing lists, where there is a central control for each list that potentially controls who receives the material and what material can be transmitted." (Daniel, cited in Hauben & Hauben 1997, 42)

After a time, the possibility of sending control messages joins the basic functionality – posting (in several groups simultaneously), transporting and reading articles. Control

[85] The first maps from about 1981 had about 15 sites on them and were drawn in ASCII. They grew until in 1983 or so they were too big for ASCII and they were drawn on paper. My ex-wife Karen and I did these early maps, got copies, and handed them out at Usenix conferences. After awhile, Bill and Karen Shannon took this over (around 1984-5) and made multi-page ASCII maps of Usenet. After about 1985 the net was too big for this. "(Horton, usenet.hist, 28.9.1990, http://communication.ucsd.edu/bjones/Usenet.Hist/Nethist/0009.html)

messages consist of cancel messages, which enable articles to be removed subsequent to posting, and of group-related control messages used to add (*newgroup*)or remove (*rmgroup* = remove group)groups.

> "The very first version [of *Usenet software*] did have multiple newsgroups and crossposting between different newsgroups. We went through a couple of other versions. One of the more interesting things we considered and rejected was the idea of control messages. One of the reasons we rejected them was because we didn't think it was feasible to do authentication and the notion of control without authentication seemed to be a broken notion. (...) It wasn't very many years later before they became necessary because you have to have some means of control. (...) Control messages came in early 1982." (SB)

Usenet Sites in June 1981

```
Aucbvax.1745
NET.general
utzoo!duke!decvax!ucbvax!mark
Sun Jun 14 20:45:22 1981
current usenet map
After welcoming several new sites to Usenet, I'm enclosing the current
map.
Any sites which are missing or wrong please let me know.

               USENET Logical Map
               June 1, 1981
               !-      Uucp links
               :       Berknet links
               @       Arpanet links

                                  pdp
                     (Misc)         ! (NC)       (Misc)
               decvax sii  reed  phs--unc--grumpy  duke34  utzoo  cincy
               teklabs
                  ! !  !    !     !    !             !       !      !      !
                  ! +--+----+-----+-+--+-------------+-------+------+      !
                  !                 !                                      !
                  !               duke                                     !
                  !                 !                                      !
                  !          +------+---+-----------------------+--------+ !
                  !          !          !                       !        ! !
     ucbopt       !  hocsr--mhtsa----research   mh135a        harpo-----chico
        :         !          !  !                  !
     ucbcory      !          ! eagle    ihnss   vax135  (Bell Labs)
   (UCB) :        !          !  !        !         !
     ucbvax--++----------+--+--+-----+--+------+--------+
        :    @               !        !              ! (Silicon Valley)
     ucbarpa @      (UCSD) sdcsvax     !            menlo70--hao
        :    @     sdcattb-----+       !            !    !
     ucbonyx @               +-----ucsfcgl        sytek sri-unix
             @     phonlab-----+
         cca-unix          sdcarl
```

The Usenet Oldnews Archive: Compilation Copyright© 1981, 1996
Bruce Jones, Henry Spencer, David Wiseman.

In 1983, Usenet articles are given their data format, which is in principle currently valid (RFC 850). Following the form of an Internet mail message the protocol not only specifies the type and size of headers and control messages, it also - which is remarkable for a "technical" document - rules for their use by users, administrators and third parties. Around

this time, first forms of written netiquette arise (Djordjevic 1998, 17). Newsgroup creation is an informal process.

> "There was net.news.groups, a newsgroup where people could discuss new newsgroups. And it was just a discussion-consensus process. And people would say, 'here's a new group', and everyone would say, 'that's no good', 'that's good', 'that sucks' – whatever they would say; and of course, my favourite non-issue: 'what name should it have?' But what became clear was that people would come up and once that process got established, it was sort of felt to be good manners that you would suggest and discuss things before you went and did it. You still just went and did it. It was a long time before you asked someone else to do it." (BT)

Although no written rules of conduct pertaining to the creation of new groups yet exist, a list of "official" groups is already available which marks out the contents. This list, which is regularly posted as an article, opens an own genre of relevant articles which are useful for Usenet administration ("holy documents").

During the mid-Eighties, when Usenet grew to accommodate 1000 sites, not only increasing traffic becomes a problem, but also the behaviour of some users:[86]

> "There is strife and hostility over when and how to create and delete groups, and the sheer volume of postings is drowning sites. (...) Posters are becoming ruder, maliciousness abounds (...). Cancellation messages are being forged, 'rmgroup' messages have been forged, and articles and replies have been directed to the wrong places on purpose." (Spafford, Usenet-II, 10.11.85)

This results in pressure to develop filtering methods. Two basic patterns evolve during the attempt to find solutions. One orientation is disposed towards "local control", another towards "network control". From a local point of view, the users' ability to act is reinforced by the increased functionality of newsreaders:

> "At that point there were only two options to read the news. There was a program called readnews and there was just a new thing called v-news. I only had readnews but was very frustrated with it for several reasons. One of them was that it would only show the newsgroups in the orders they were in the systems, the active file, and I thought that was really bogus because I wanted it to read it in the order of interest. (...) The other prime motivating factor was that every time I wanted to read an article with readnews, it would start up a new process and on that old machinery it took about five seconds to start up the process and I got tired of waiting for it. (...) The first prototype of rn was actually a shell script which invoked readnews on an individual newsgroup. To tackle the problem with the slow down I eventually wrote my own program that would actually do things on the fly. It would open the article you wanted to read and while it was still reading it in from the disc it would already be starting to display things on the screen and would also go off and do things on the

[86] Thanks go to Gene Spafford for providing us with a printout of communication on the Usenet II mailing list (10/11/1985 - 22/3/1986).

> background while you were reading things, so it actually was trying to be efficient psychologically. (...) Even back then there were people whose articles people wanted to avoid reading. (...) I put in kill files and they were very warmly received. Basically it took people up to another level being able to stay reading their interesting newsgroups without having to give up on them because there was just too much stuff. Eventually the kill files were refined to where you could not only select things that you didn't want to read but also say by default 'Show me stuff made by such and such an author or that contains such and such a keyword'. (...) I think they contributed to the notion of local control over the news." (LW)

One group of network administrators of larger sites (Backbone Cabal) was more inclined towards controlling the network and made attempts to formalise the creation of new groups to a greater extent than in the past and to change the network's namespace, which had hitherto been "flat", into a hierarchic system. Instead of one network-wide top level category (net.*) there should be several hierarchies which could be extended by any number of subhierarchies which would make it easier for news administrators to choose. This was not only about the amount of news but also about groups for potentially "controversial" subjects (at that time, homosexuality for example). The cost model of the founding years, when news was still distributed by UUCP (Unix-to-Unix CoPy) via modem connections and phone lines, has direct consequences for the network's inner structure.

> "For users, the cost was effectively zero. For site admins, they largely became significant Usenet sites if they were able to bury the connection costs so it didn't come out of their budget or they were able to have someone else pick up the cost. When AT&T sites came on the Net, they were able to use their internal long-distance connections to connect sites together. When government agencies came online, they were able to use their long-distance government phone number system. When a lot of universities came online, they were able to bury the cost on trunk lines that the university owned and just paid bulk fees. With many big corporations the system admins buried the bills in the long-distance calls that were otherwise down for customer service. (...) It was because of that ability to hide the cost or bundle it in with something else that Usenet grew (...) and we were very hesitant to do anything that might endanger connectivity. The naming scheme and the scheme of creating groups grew out of the backbone collective desire to remain low-profile." (GS)

Namespace reorganisation was not the only attempt made during the mid-Eighties at catching the growing news stream beyond the possibilities of individual filtering or clearing a new path for it to take. The results of all these projects take Usenet into a second period. In summary, the founding years can be outlined as a phase in which permanent and characteristic features of Usenet were able to develop: the model of control on the receiver's side, the autonomy of individual sites, the article format, self-reflexive forms of administration, the topic of "abusive" usage and -the first discernible signs of -diverging regulative orientation.

2.2 "The Control" – The emergence of institutions

Expansion and internal differentiation both developed simultaneously and characterise the network's second period. At the same time as the network grows, it becomes more confined. The Internet provides news with a new carrier which increasingly takes over from UUCP connections and advances the flow of communication. During the mid-Eighties, the network's central theme became its growth and how to deal with it.

> "Growth became an issue more around 1986-87. There were several reasons for that. In that time period, we saw that multi-user UNIX-based machines were becoming more affordable, outside network connections were becoming more affordable and because of initiatives such as the NSFnet initiative, many more places were getting computers in-house that students and faculty had access to. Whereas before, there were perhaps only 500-600 locations around the country that had machines and network connections where they could afford to participate in Usenet and had the population that was dynamic with new users. After 1984-85 that population began to explode. The VAX 750 and 730 became more widely available as major machines, SUN and Powell were out marketing their workstation and sever-based systems, so cheap UNIX was available. I don't know the dates when 1200 and 2400 baud modems became available, but those also became more common. There were a lot of issues that began to push that connectivity. Nationally, there was also a huge increase in the number of undergraduate majors in computer science, almost tripling each year for several years, so that had a major impact." (GS)

The efforts supposed to help cope with the increased growth have varying levels of success. One initiative started in 1984 aimed at news transport via satellite (Weinstein 1984). In retrospect, "Project Stargate" was a promising project technically[87] but failed due to Usenet's cost model at the time. News via satellite would not only have meant a need for individual sites to add new hardware and software, but would also have made the cost factor for news visible to many people for the first time ever. After initially supporting Project Stargate, Usenix, a Unix users' organisation, later gave special support to the establishment of a firm which provided UUCP connectivity to guarantee a continual and extensive newsfeed, originally free of charge, later charging money. This firm later evolved into UUNET Communications Services (UCS). As from the late Eighties, this company developed into an important resource in the field of Usenet administration as well as the maintenance and further development of Usenet software.[88]

A groundbreaking element in Usenet's further development is the reorganisation of namespace. "The Great Renaming" ends in 1987 with the switch to the "Big Seven" hierarchies: the subject categories comp, misc, news, red, sci, soc and talk.[89] In the history of Usenet, this renaming is the only case of a network-wide organisational change. Not only the implementation of a new name scheme, completed in 1987, but also its unintended

[87] "There was an experimental trial done, Lauren Weinstein put together the prototype technology and made the connection with WTBS, Ted Turner's superstation in Atlanta at the time, and arranged to borrow their vertical interval." (MO)

[88] In pre-WWW days, the UUNET FTP server was used as a comprehensive archive. In addition, the company also furthered the development of C-news software.

[89] The "Big Eight" since the addition of the humanities hierarchy in the mid-Nineties.

side-effect gave shape to its character. The attempt at controlling the network gives rise to endeavours to withdraw from the "Big Seven" name scheme as well as from the new conditions imposed upon the creation of new groups introduced at the same time as the renaming.[90] An effective way of doing so is by developing an alternative route of transportation circumventing the backbone sites and the Backbone Cabal's influence.

What starts out as an alternate backbone soon becomes part of the communications network. The alt. groups, introduced in 1986, form the heart of today's alt. hierarchy, in which every user can create groups without any formal procedure. The establishment of the alt. groups brought out the "interpretative flexibility" (Pinch & Bijker 1987) of Usenet technology.

> "I mean, the central insight of all was that the software existed independently of the social structures around it, and that we could use the same software with an explicitly different set of social structures and social conventions, and that would be okay. There was almost no technical hacking involved. It was just a social hack." (JG)

As part of namespace reorganisation the diverging regulative tendencies and practices become firmly established, not only ideologically; at the same time, independent self-governing areas are set up. On the one hand, the introduction of hierarchical namespace means that news administrators can easily remove "unwanted" or "superfluous" hierarchies:

> "Alt. was sort of in retaliation, I guess, as much as anything else – as a way of creating newsgroups in an ad hoc fashion. I believe, even for larger companies like myself at Pacific Bell, that we really steered clear of a lot of the alt. groups. I just didn't want to deal with all the bandwidth of it, I didn't really want to deal with all the problems of managing it. I felt that most of the content that would be useful in a company was in the comp. and rec. and soc. ones. So I did a certain amount of censorship of news coming in." (DStP)

On the other hand, there is also the possibility of creating other hierarchies outside the "Big Seven" and alt groups.

> "In the mid' 80s they [*the Backbone Cabal*] pretty much controlled what newsgroups were created. A meeting that we had in the Bay Area was to discuss, 'Well, since they are doing this, let's have our ba. newsgroup hierarchy, and let's do our own thing, too' And that was fairly big news at that time." (DStP)

On the transport side, the situation changes drastically with the introduction of the Network News Transport Protocol (NNTP) in 1987: Now, news can not only be transported via the UUCP network, but also use Internet connections (TCP/IP; RFC 977). This not only leads to a distinct growth in bandwidth and speed (an article now no longer takes days to reach its destination but hours), but also brings a new dimension of connectivity to Usenet. Chances of participating in Usenet multiply with the expansion of the Internet. Individual sites have more (multiple) feeds to choose from and it is now also possible to read news at

[90] New groups are only added after a taking of votes carried out via email.

remote sites. More powerful transport software (C-News, introduced during the late Eighties and INN (InterNetNews), introduced during the early Nineties), assist in coping with the ever-increasing news flow.

In the field of network administration, hierarchically-specific rules and procedures develop. As an "institutional field", the creation of new groups undergoes further development in the "Big Eight" hierarchies. Here, integrated chains of action are formed over time along the lines of an increasingly formalised process with written rules, fixed points of joining and leaving, discussion and voting procedures and specific functional roles and group. The act of creating a new group - by sending a *newgroup* control message - lies in the hands of a person in a position of trust ("The Control"). The administrative model and also partially "Big Eight" namespace becomes a role model for rapidly-developing national hierarchies (such as de. Usenet, uk. or fr.). As one of Usenet's main communicative functions in its early days was bridging the gap between ARPANET (then still closed-off) and the world of Unix, so the "Big Eight" hierarchies that grew were principally those that made the network a commonplace medium, such as soc or rec.[91]

In summary, during the second period, Usenet takes on the shape of a segmentarily-structured organisation based upon the grounds laid down in the founding years. The formation of institutions occurs within individual hierarchies, but no longer on a network-wide basis. On the transport level, a radical innovation enables and facilitates the network's further expansion and, due to the speeding-up of communication, changes Usenet from a "correspondence" into a "conversation medium" (Rheingold 1993, 121). Were there around 1000 articles posted daily on Usenet in 1987 (Hauben & Hauben 1997, 44), the number of daily postings in July 1993 rose to around 27,000.[92] Had the second period been one of advancement, the third announced a decline.

Usenet connectivity in May 1993
(ftp://gatekeeper.dec.com/pub/maps/letter/worldlinksfine.ps)

2.3 "The sky is falling" – Decline?

During the early Nineties, news becomes one of the main attractions on the Internet and a preferred communication service together with email. In 1994, when commercial online services (Compuserve, America Online, Prodigy) start developing into Internet providers and the WWW expands into one of the network's attractions soon to eclipse the popularity of news, Usenet enters a new phase.

Had the second period brought about radical changes to the transport side, the third period mainly brings about innovations to the interface. Although the WWW is initially seen by some people as a threat and competitor, it actually helps in making Usenet more accessible and transparent: Web browsers with built-in newsreaders help even clueless newbies to start reading news; with search engines that also traverse and archive Usenet (http://www.altavista.com) and special interfaces that provide hitherto unknown

[91] In 1992, Baym (1995b: 34) counted 32,000 articles posted to the rec.arts.tv-soaps (r.a.t.s) group over a period of ten months. With around 150 postings a day, r.a.t.s is among the top 15 newsgroups (Baym 1995a)
[92] Brian Reid, 1993: Usenet Readership Summary for July 1993 (news.lists), cit. in Baym (1995a, 138)

possibilities of all-embracing newsgroup navigation and research (http://www.dejanews.com), accessing ongoing and past communication is furthered; a growing amount of resources on the network's technology, organisation, usage and contents is now only the click of a mouse away.[93] Not everyone is pleased about this opening:

> From: jeremy@exit109.com (Jeremy)
> Newsgroups: net.subculture.usenet
> Date: 1998/07/10
> Subject: "Surf" Usenet? (was: nntp benchmark?)
>
> > This message sent via http://www.talkway.com/. Surf Usenet!
>
> Good God. You don't "surf" Usenet! The sky is falling.
>
> (Actually, I just tried their site, and it doesn't suck all that much, at first glance. Presuming you don't actually want to do any serious Usenet. Which, if you're going to a site like this, you probably don't.)
>
> Still, though. "Through its service and interface, Talkway brings Usenet to the Web masses..." This is a *good* thing? I'm all for newbies and everything, but the *Web masses*?

The world of Unix, which was beating a retreat on the newsreader side, still holds fast on the server side, where Unix machines are used as Usenet workhorses, so to speak.

> "The value of Unix is only to keep up with the volume in most respects of news out there. If you get a really high-performance, multiprocessor system that runs some other operating system and can keep up with five gigabytes a day, then I don't think anyone necessarily cares. But most of the development, at least up to now, for the better performing servers has always been on Unix." (DStP)

(Still-) Existing Unix connections at the cross-section between computers and users are a sensitive point if they (could) lead to an exclusion on the user's side.

> From: centiped@xs4all.nl (Roelf Renkema)
> Newsgroups: news.groups
> Subject: Re: RFD: news.admin.nocem.policy
> Date: Wed, 24 Dec 1997 08:32:37 GMT
>
> (...)
> >But we need to bear in mind that NoCeM works only on Unix systems
> > right now, and it may be a while before it is included in non-Unix
> >newsreaders. So the only people who could evaluate the prospective
> >moderators would be people who can run Unix readers.

[93] Examples are the archive of historical news articles from the founding years (http://communication.ucsd.edu/A-News/index.html), the FAQ collection (http://www.faqs.org) or Netscan (http://netscan.sscnet.ucla.edu) as an instrument for measuring and visualising Usenet traffic.

> Mwoh what do you need, what kind of machine are you talking 'bout?
> As a matter a fact I'm currently generating NoCeM with a bot under
> windows'95 and Forte's Agent, so don't give un(othing)ix all the credit :-)

One of the things able to firmly establish itself was the hacker culture's legacy, the "open source" movement. The Internet Software Consortium (http://www.isc.org) under whose roof the most popular news software InterNetNews (INN) is maintained and further developed, is part of this tradition. Server systems and reader programmes crucial to participating in Usenet have always been freely available on the net. The WWW has expanded access to reading news. Since the Linux operating system was developed, the threshold to server-side participation has sunk. Using Linux as "public domain" software, a Usenet site can be run from home; every user is in theory able to be their own administrator. One can - as does Brian Pfaffenberger (1996, 30) - view the "democratisation" of the means needed to run a Usenet site as a technologically-based deprivation of the power formerly wielded by news administrators ("technology is eroding the power of system administrators"). The new ways which enabled the unit of user and administrator can also be seen as an indication for a return to the roots. In the mid-Nineties, initial forms of use are currently experiencing a renaissance on Usenet.

Old traditions are also taken up as part of the "Usenet II" project. Ten years after the creation of the first Usenet II mailing list, a list of the same name is established in July 1995. Two years later, it develops into the net. Hierarchy (http://www.usenet2.org). With strict rules ("Soundness Doctrine") for news administrators, the prohibition of posting anonymously, an expertocratic namespace management system (the naming of net. groups lies in the hands of so-called "hierarchy czars") and a "Steering Committee" which appoints and dismisses "hierarchy czars", the introduction of net. Groups gives rise to controversy, but does not create much traffic.[94]. In a same vein, the "Mod Squad" adheres to old traditions, namely that of the mod. hierarchy which collected all moderated newsgroups in a separate hierarchy for a short time in 1986.[95] The "Mod Squad's" intention is to revitalise the alt. groups by way of moderation, as their propagation within the network has deteriorated during the last couple of years.[96] Such initiatives are not so much serious movements aimed at restoration but rather an indication for the "pluricultural" state of Usenet which cannot be circumnavigated. The pattern of diversity and doubling also appears when newsgroups with the same subjects and a different status become established:

> From: rosalind@xs4all.nl (Rosalind Hengeveld)
> Newsgroups: news.groups

[94] In April 1998 with around 150 participating sites, Usenet II was the size of Usenet in 1981 (cf. Goltzsch 1998)

[95] The bundling was intended to facilitate the transition from unmoderated to moderated groups. The majority of newsgroups still remain unmoderated today. In March 1997, about 280 newsgroups in the "Big Eight" hierarchy and 80 newsgroups in the alt. hierarchy had one or more moderators (McKeon 1997).

[96] Draft: The mod.* Manifesto (Last updated: July 30, 1997) (news.admin.hierarchies) The name "Mod Squad" not only reflects Usenet-internal traditions but could also refer to the football team or the Hollywood 1960s/70s series of the same name. Another example for terms common to Usenet that refer to American popular culture.

Subject: Re: RFD: news.admin.nocem.policy
Date: Wed, 03 Dec 1997 14:01:24 GMT

> A tendency lately is for 'useful' newsgroups to exist in: an unmoderated version, a moderated version, a retromoderated version, and a Usenet II (net.*) version, or at least a subset of the above. (...) It gives newsgroups a chance to compete on a 'survival of the fittest' basis. I prefer that to endless arguments over these newsgroup statuses between people who have their mind made up anyway.

What serves as a method for avoiding a lack of friction within the groups also pushes their number sky-high. Due to this context, Usenet more or less generates growth internally. This is nothing new in itself, but is helped by the "surplus economy" which took the place of the "shortage economy" of the founding years. With the group of the Internet service providers, a growing group of actors has arrived on the scene with a commercial interest in offering as broad a range of newsgroups as possible (mainly for marketing reasons and not because they make money out of it).

Topological Representation of Usenet in September 1997
(http://www.reference.com/usetop/maps/hosts_5000_0_30_0_0.jpg)

Usenet still continues to grow during the phase of its perceived decline. During early 1998, there are 1534 hierarchies recorded in the Internet Software Consortium's archive.[97] In the summer of 1998 200,000 articles are posted daily in over 70,000 groups. A considerable amount of these articles is made up of a new type of unwanted mass posts. The first "Make Money Fast" article can be dated back to 1987, but spam does not become a widespread problem until the mid-Nineties. Dealing with such ill-usage leads to the collision of diverging regulative orientations once again and opens a new round in the struggle for "constitutive rules" (Höflich 1996) for its use.

Shadowed by the vocal debate between "net.control.freaks" and "net.kooks" on the boundaries of what is permitted, attempts at securing Usenet's unity move to the lower levels of network technology. In the years 1996/97 two working groups are formed under the roof of the IETF which deal with the norms of interoperability on Usenet. This protocol, which forms the base of the transport of news on Usenet, is subsequently examined under the microscope, as is the file format for Usenet articles, decided upon in 1983.[98] After strenuous debates, a draft of the revised article format is available in the spring of 1998.[99] This document illustrates the price which the "instrumental medium" asks both from users and developers of network communication: "This draft defines the format of network news articles, *and defines roles and responsibilities for humans and software*" (our italics). As medial and communicative aspects merge when using computers for communicative purposes, so "technical" and "social" elements become inseparably

[97] Additionally, there were up to 2117 hierarchies registered in the *active* files of seven selected Usenet sites (grobe+news@netins.net, news.admin.hierarchies, 3/2/1998).
[98] Charter, mailing list and results of both working groups are available via WWW: NNTP Working Group (http://www.academ.com/academ/nntp/ietf.html) and Usenet Article Standard Update Working Group (http://www.landfield.com/usefor/)
[99] "News Article Format" (draft-ietf-usefor-article-01)

interlinked during decisions pertaining to design. Via the localisation of possibilities of action, specifications belonging to Usenet's "technological core" informally evolve into a moral "geography of responsibilities" (Akrich 1992, 207).

3 "How to do things with words" – Resources for the creation of order

We have summarised the history of Usenet in three periods: Founding years, the formation of institutions, decline. Although the participants might not use exactly the same words, we still assume our chronicle portrays a common perception as seen within the network. The founding years represent a period which is fondly remembered but is most definitely history ("the good old days"). The phase of the formation of institutions is still influential - the resources created at that time are still lived off of, installed rules are fought against or defended, their extension or revision is more or less followed with interest. The decline not only evokes talk of the imminent death of the Net, typical of this genre, but also new ways of coordinating translocal action.

Usenet is a medium which reproduces itself to a great extent by its usage and is intended for the renewed revitalisation of the constitutive rules of this usage under ever-changing conditions. This also includes scope for the extension and revision of existing practices. The interplay of design, use and interpretation brings about change. The resources of the creation of order are also subject to such change. One of these resources which was introduced in the first years of the network, are control messages. With a cancel message, posted articles can be removed, group-related control messages are used to create ("newgroup") or remove ("rmgroup") whole newsgroups. The flow of news can be edited using control messages. In principle, control messages can be sent by every Usenet participant, whether or not they are carried out lies in the hands of the individual local news administrators.

The observation that in the early days, April Fool's jokes on Usenet were often in the form of a (forged) control message and hardly ever nowadays not only points to the change in humorous practices on Usenet; the control messages themselves have changed. If a substantial number of control messages is forged before or after April 1st, a *rmgroup* announcement can no longer be regarded a good April Fool's joke - if only because of the fact that the majority of genuine control messages carry a "digital signature" and the message meant as a joke would merely be regarded as a primitive forgery attempt. Since the introduction of a regularly-posted list[100] who is an authorised sender of control messages in each hierarchy, the fun has ended. The joker could try to forge the digital signature in order to outwit even those server configurations that by default carry out authorised control messages completely and without any further ado and ignore those that are unauthorised. The joke might have then come off, but its author would be rather unpopular.

[100] The list in question being the document "Usenet Hierarchies: Config Files FAQ" (news.admin. hierarchies)

This example helps to illustrate various basic aspects of the creation of order on Usenet: There are a) miscellaneous article categories on Usenet, b) then as now, each article category can be sent by every participant, c) some articles have undergone supplementary operations (a "digital signature") in order to make forgery more difficult. There are d) further articles (here the "Config Files FAQ") communicating this which authenticate the instances authorised to send control messages. Furthermore, there are e) possibilities to send control messages "automatically" and also not to do so. Anyone forging a (group-related) control message must take the possibility of their article becoming the target of a f) cancel message into account which has g) been declared legitimate by a further document.

The creation of order on Usenet is based upon the assumption that the participants share a complex knowledge of which rules and procedures are "legitimately" linked to which sort of articles at a given point in time (and therefore which jokes are "allowed" and which are not). To a great extent, this knowledge is accessible to anyone and itself is in the form of an article or a document, it can partly be deduced by observing meta communication, for example on practices of network abuse, and it must partly be recognised when actually using the network. This knowledge defines the action frame for actors on the network. It describes and defines "what the artefact does".

Beyond all substantial change this knowledge has undergone over the years, there are staple types of texts and textual layers which enable communicative action ("do things with words"). This elementary stock is comprised of three modes of control, which can be labelled first, second and third-degree levels of control following a concept first developed in organisational research. However, these categories take on a different shape to their real-world counterparts in organisations.

"*First-level control*" on Usenet includes such textual forms of behaviour control (of human and non-human actors) implemented via programming and software options. These can include specifications in protocols; configuration files on news servers; "patches", subsequent extensions to the server software; control messages; digital signatures; moderator programmes or cancelbots.

"*Second-level control*" is realised by way of written rules or lists of a semi-official nature, such as: "Request for Discussion" articles, "Call for Votes", "List of New Groups", the "Config Files FAQ". They are all instructive texts posted regularly or used in a ritual manner on certain occasions.

"*Third-level control*" is effected in a narrative manner - by way of stories and episodes in which expectations as to what is "natural" and "appropriate" and why the Net is the way it is are communicated and discussed. Stories and episodes such as these can be woven around precedents, Net legends, "clueless newbies", and come in the shape of a cool argumentation or a flame.[101]

[101] Among the exemplary documents are "The net.legends FAQ" (http://www.ews.uiuic.edu/~tskirvin/faqs/legends.html), "The Great Renaming FAQ" (http://ww.vrx.net/usenet/history/rename.html) or Netiquette texts such as "Emily Postnews Answers Your Questions on Netiquette" (news.announce.newusers).

During Usenet's development an apparent tendency towards an influx of the first-level control mode has become discernible. This is not to be taken as an indication that users and administrators are increasingly being bulldozed by technology but rather as an expression of the fact that an growing number of processes (can) run "in the background" and both users as well as administrators have greater possibilities of intervention (although they may not necessarily be symmetrical). The abundance of resources for forms of first-level control also means that there is an increase of human and non-human actors' power to act in this dimension. "Agency" increases, but remains distributed.

The second-level control mode by means of official documents also shows an expansion of certain fields of action but is on the whole less pronounced. This observation could support the thesis that - as an essential feature – on Usenet, solutions based on software technology are preferred to organisational ones. First-level control mechanisms are often accompanied by semi-official documents - as instructions for use or as a means of legitimitation.

Whether or not more stories are told, whether corrective episodes increase or decrease and develop differently, which changes occur in the third-level control mode is most difficult to monitor. It seems at least that the registers are broadening. On the one hand, the store of stories Usenet produces is ever-increasing - and with them the possibility of creating internal combinations which can be "instructive". On the other hand, new user groups bring with them real-world references, the art lying in the development of a feeling for which analogies on Usenet meet with a response. Over time, Usenetters become experts of analogy reasoning almost as a matter of course. It goes without saying that an appropriate image of the futility of all analogy reasoning is already in existence on Usenet:

> From: spaf@cs.purdue.edu
> Newsgroups: news.announce.newusers,news.misc,news.admin.misc,
> news.groups,soc.net-people
> Subject: That's all, folks
> Date: 29 Apr 1993 19:01:12 -0500
>
> Axiom #1:
> "The Usenet is not the real world. The Usenet usually does not even resemble the real world."
> (...)
> Corollary #2:
> "Arguing about the significance of newsgroup names and their relation to the way people really think is equivalent to arguing whether it is better to read tea leaves or chicken entrails to divine the future."
> (...)

We will examine the meaning of newsgroup names mentioned in the article above (http://www.cs.purdue.edu/homes/spaf/farewell) in further detail in the following part. The aim is to shed light on why naming plays such a central role in the order of Usenet. A concrete example taken from recent network practice illustrated some of the problems which can arise when creating a new group. Naming is an established "institutional field"

(Knoblauch 1995, 249-252) on Usenet. The institutionalisation of ways of dealing with Net abuse which will be discussed in the paragraph after this has not yet proved stable, although this field has brought about a software technical innovation.

4 "What's in a name?" – On Usenet toponomy

4.1 "Today we have naming in parts"[102]

From the users' point of view, network communication is characterised by "superconnectivity" (Hiltz & Turoff 1985, 688). The number of communications partners who can be reached within a common location of interaction is notable. This enables social propinquity, in spite of the de-localisation of interaction.[103] A disadvantage of the chance that participants might be able to connect to communication relations otherwise closed off to them by other media is the problem of selecting communication addresses.[104] "Addressability" (Fuchs 1997) is created on Usenet by way of thematically-oriented newsgroups. Usenet encompasses a communication space structured by its namespace. Every newsgroup has a name consisting of several independent and hierarchically organised components separated by a full stop. Within the hierarchical name tree, the text of Usenet, extending radially in all directions and constantly updated, branches out materially in more or less specialised subject areas and spatially in several overlapping local, regional, national and global arenas. Main categories such as soc., net., alt., or de. are known as "top level hierarchies". More or less staggered subcategories localise a newsgroup's subject according to certain topical subdivisions, for example operating systems (comp.os), sociocultural aspects (soc.culture) or television-related phenomena (rec.arts.tv).

This toponymic order is the heart of Usenet.[105] While structure and management of the Internet address space has reached a vehemence that goes far beyond the network itself, naming affairs have remained an internal matter on Usenet whose central significance can only be deduced after a closer examination. Its significance is derived from the face that the name of a group is (at least) coded fourfold:

(1) The naming scheme makes it possible to *find* addresses. As soon as the principle behind the location of subjects in a hierarchy is understood, finding an appropriate group should be easy.

---

[102] "Guidelines on Usenet Newsgroup Names" (news.groups)

[103] Usenet may only enable asynchronous communication, but a swift enough circulation of articles permitting, the merely virtual existence of a dispersed public seems to take on the guise of close-knit interaction.

[104] "Finding communication addresses and wielding the possibility to function as a communication address oneself is a prerequisite for the development of attention and therefore communication itself" (Brill & de Vries 1998b, 292)

[105] In contrast to the topology of Usenet which describes inter-site connection, toponymical order represents a purely logical structure. The term "toponomy" is not a neologism on our part, but rather denotes the - hitherto exclusively real-world-oriented - science of place-names (cf. the lemma "names" in the Encyclopaedia Britannica).

(2) Has an electronic community been established as the result of continuous and substantial communication, the group name marks out this community's territory. Names function as a boundary by establishing identity (Kollock & Smith 1996). There are few groups with a moderator who actually wields his power as a gatekeeper to any extent. Group-specific forms of humour and a local netiquette are common forms of marking out and protecting boundaries between groups. Moving the boundary's posts, as is the case when splitting existing groups up into subgroups as the result of a reorganisation, often leads to conflicts. (3) A newsgroup's name, indicated by the top level category, makes it possible to deduce which "self-governed area" within Usenet it belongs to. These areas can differ substantially when it comes to forms of cultivating their own namespace. Some, such as the "Big Eight" groups share a standardised procedure and participatory forms. New group creation, including the intended name, is voted upon. Other hierarchies thrive on simple principles, such as the alt. hierarchy ("use common sense") or the free. hierarchy ("absolutely NO rules"). Others have provided for special functional roles, for example the "hierarchy czars" in Usenet II, or supervisory organs.[106] However a group's name should come about, individual news administrators are always free to decide whether or not to include newly-created groups on their server. (4) The hierarchically structured namespace is a starting-point for technical operations carried out by news software. In accordance with the name tree's hierarchical pattern, a news server saves incoming articles: every newsgroup has its own corresponding subdirectory. On a Unix server, our first example taken from the group alt.culture.usenet would be saved in the directory /var/spool/news/alt/culture/usenet. The substitution of full stops by slashes signalises a change in materiality has taken place: the newsgroup tree's semantic space has been "translated" to the digital space of software.

This translation, giving news administrators intricate local selection options among the newsgroups and hierarchies that exist altogether, was introduced in 1987 as a feature of a new software version (BNews 2.11) during the Great Renaming. It had been considered years before but postponed. Here we have an example of how certain operations for quite different problems are de- or reactivated on Usenet.

> Aucbarpa.484
> net.news
> utzoo!decvax!ucbvax!ARPAVAX:glickman
> Fri Dec 4 15:31:15 1981
> Re: heirarchical newsgroups, a warning
>
> During the design of version B, I made and then un-made the '.' <-> '/'
> change. This was to preseve compatiblity with mhnews, part of RAND's
> MH system. However, compatibility with MH has yet to be used and the
> change might be worth putting back in. Once MH compatibility is abandoned,
> there are a few data-base changes that can be made and would make things

[106] For example, the task description of the UK Usenet Committee reads as follows: "The remit of the UK Usenet Committee is to provide leadership in policy concerning the uk.* news hierarchy. The committee is concerned with issues such as naming, voting and management of the hierarchy. It will monitor the naming of new groups to insure they fit in with an acceptable structure. It will ensure that the rules for group creation are documented, followed and applied. It will appoint, and oversee the work of, the person to act as Control." (http://mx.nsu.ru/FAQ/F-uk-committee/Q0-0.html)

faster.

The Usenet Oldnews Archive: Compilation Copyright© 1981, 1996
Bruce Jones, Henry Spencer, David Wiseman.

The multiple coding of a newsgroup's name lends a meaning to it of which the subject is only one aspect. In Usenet toponomy, taxonomical, regulative and operative processes of communication flow ordering interconnect. On the one hand, this makes namespace the network's "invisible glue" (John Gilmore). On the other hand, as several levels of order overlap within it, a newsgroup's name is a boundary object, and therefore a popular source of conflict.

4.2 "Grouping the Man of Steel"[107]

In past years, there were several more or less spectacular name conflicts during the creation of new groups within the "Big Eight" which were due to various reasons. In the following example, the choice of a group name is connected to problematic design decisions on Usenet namespace architecture as a whole. The discussion pertains to the order of the rec.arts hierarchy which includes over 100 different subject groups (July 1998) and mainly caters to readers interested in the cinema (rec.arts.movies.*), the theatre (rec.arts.theatre.*) and television (rec.arts.tv.*). Some rec.arts groups are gathering-grounds for fan communities which group around specific series or characters and can develop a strong social cohesion.[108]

During the end of April 1998 a debate commenced in news.announce.newgroups with a "Request for Discussion" (RfD) on the creation of the unmoderated newsgroup rec.arts.superman. According to the RfD, the proposed group's purpose was for the discussion of Superman encompassing various types of media. The following "follow up" appeared in news.groups post-haste:

From: Russ Allbery <rra@stanford.edu>
Newsgroups: news.groups
Subject: Re: RFD: rec.arts.superman
Date: 1998/04/26

In news.announce.newgroups, KalElFan <KalElFan@aol.com> writes:

> REQUEST FOR DISCUSSION (RFD)
> unmoderated group rec.arts.superman

> Newsgroup line:
> rec.arts.superman Discussion of Superman in all media.

Ugh.

[107] The Kryptonian Cybernet, Issue # 51 – June 1998 (KC # 51, June 1998, 1/8; sykes@ms.uky.edu; alt.comics.superman; 29.6.1998)
[108] Cf. For example Baym's ethnographic study (1995a, 1995b, 1998) of the group rec.arts.tv-soaps.

> While I agree that alt.comics.superman probably has enough traffic (along with the Lois and Clark list and other such places) to support a Big Eight group, I think the naming choice here is extremely bad. "Superman" is not an art and does not belong at the third level of the rec.* hierarchy.
>
> Superman is, and has always been, a comic book character. (...) We don't move discussion of Spiderman, Batman, and so forth out of rec.arts.comics.* just because they're also in movies, cartoons, and on children's lunchboxes. In fact, there was enough discussion of other media in rec.arts.comics.* to create a whole newsgroup for it, and while the success or failure (and reasons for same) of that group are open for debate, the obvious fact that media besides comics when relevant to comic book characters *are* discussed in rec.arts.comics.* is not.
>
> I think rec.arts.comics.dc.superman would make a great deal of sense, along the lines of rec.arts.comics.dc.lsh. I will definitely and without question be voting against the proposal with the current name.
>
> (Apart from that, I must say that this is a very well-written RFD.)

This article questions the name proposed by the proponent and gives rise to a controversy which came in several waves and came to a conclusion in November 1998.[109] For the most part, the controversy is divided between three groups of actors: (1) the new group's proponents and a few supporting voices, (2) the news.groups "regulars" (regular readers who participate in RfDs by contributing both comments and recommendations and (3) the opponents, who in this case are recruited to a large part from the circle of "news.groupies" as well as readers of the rec.arts.comics groups. In the course of their argumentation, supporters, "regulars" and opponents become spokespeople for further groups of actors who may not participate in the debate but are interested in how it ends or provide further input ("Superman fans", "Usenet newbies", "news administrators" or the "library world"). In the middle of the naming debate, a flame flares up, a heated and personal argument between one of the proponents and some "news.groupies", in which the spirit of Usenet is evoked:

> From: bill@scconsult.com (Bill Cole)
> Newsgroups: news.groups
> Subject: Re: Re-opening the Superman newsgroup discussion
> Date: Mon, 20 Jul 1998 22:02:26 -0500
>
> (....) You are a customer of one of the few entities that can by fiat create a discussion forum with millions of potential participants,

[109] A first discussion thread developed shortly after the RfD and lasted until around April 30th (about 150 articles). A second thread started around the middle of May (about 200 articles) after one of the group's proponents summarised the previous discussion and presented a compromise as to the group's naming (rec.arts.multiple-media.superman). After this suggestion did not find favour, the second proponent took control of the discussion during a third thread (about 250 articles between July 8th-22nd) in which he proposed the new name rec.arts.adventure.superman. Finally, closure is achieved after a third RfD on the creation of the group rec.arts.sf.superman obtained the required number of yes votes.

> yet you come here to ask a hundred thousand smaller systems to give you a discussion forum to fit your precise specifications on all their systems, for free. No one forces you to use the rec.* Usenet hierarchy as your place of discussing Superman. You could ask AOL to make an area. You could start a mailing list. You could set up a website with a bulletin board area. You could even start a group in alt.* or start a whole new superman.* hierarchy. What you are asking for when you ask for a group in the Big 8 is for Other People to help you do that. Being an arrogant, rude, insulting fool is not a good way to get Other People to HELP you. (....)

Factually, the conflict over the naming of rec.arts.superman is centred around the question as to what the third location in the "Big Eight" naming scheme is for, whether a definition actually exists and who decides upon it. Thereby touching upon basic issues regarding namespace design. During the debate, the proponents concede to the news.groups regulars' argument agreed upon by all that the third-level hierarchy should be reserved for categorising things pertaining to the newsgroup's subject rather than singular phenomena. However, they do not initially take the suggestion to call the group rec.arts.sf.superman any further, which would have resulted in a mutual agreement, which eventually comes about after four months of debate. The fact that things categorised in rec.arts.* are subject to various principles of order (medium vs. genre) complicates the matter even more, as does the fact that supporters and opponents of rec.arts.superman are at cross purposes among themselves. The following article manages to epitomise the proponents' dilemma as well as the ambiguity of the matter quite well:

> From: sbhattac@u1.farm.idt.net (Shankar Bhattacharyya)
> Newsgroups: news.groups
> Subject: Re: RFD: rec.arts.superman
> Date: 3 May 1998 11:29:24 -0400
>
> (...)
> I do believe that the proponents have a set opinion on the namespace and are more interested in deflecting other choices than in finding a namespace choice that gets the newsgroup created. (...)
>
> However, the proponents have a choice to make. Are they making the argument that cross-media newsgroups should go in rec.arts.*? If so, they should make that case and then stick to their guns. If rec.arts.superman gets created it will reinforce that as part of the rec.arts namespace architecture. That's a perfectly reasonable thing to try to do, in general terms. I think it is the wrong design choice here, but it is not out of line to say that they think this is a generally applicable namespace choice and they intend to stick with it.
>
> On the other hand, are the proponents trying to create a newsgroup with a certain character, for discussion of superman-related topics? If so they should design their group and then find reasonable namespace for it. (...)

> It is time to choose: is this a newsgroup proposal or a namespace proposal? Is it intended to be both? (...)

The heart of the conflict surrounding rec.arts.superman is comprised of the costs for opportunity concerning naming decisions. It is about namespace architecture and the art of making design-related decisions in such a manner that an extensible space for communication is *created*. And it is also about the question as to who the architects of this space are.

4.3 "Hello, I'd like to have an argument"[110]

The rules for creating "Big Eight" groups were developed less according to principles but experience. Even in Usenet's early days the rule question was asked:

> Amhuxa.314
> net.news
> utzoo!decvax!ucbvax!mhtsa!eagle!mhuxa!presley
> Mon Nov 30 15:01:34 1981
> net.* names
>
> I personally prefer the specialized groups. While we're discussing this subject, I'd like to see a method established to name a new newsgroup (if there is one, already, ignore the rest of this message).
>
> If someone wants to start a new newsgroup, he should announce his intentions over net.news or net.general, suggesting a name. If there are no complaints after a decent interval (2-3 days?), that's that. It's possible that someone would come up with a better name or point out that such a group already exists with a different name.
>
> *The Usenet Oldnews Archive: Compilation Copyright© 1981, 1996 Bruce Jones, Henry Spencer, David Wiseman.*

Early attempts at formalising the process go back to the mid-Eighties as part of the Backbone Cabal's endeavours "to put some control on newsgroup creation" (GS). It formed an "institutional field" in the second period, although another formalising surge can be registered after 1993. The gathering-place for naming debates and resolutions is traditionally the unmoderated group news.groups, whereas RFDs and other documents whose status is "official" are traditionally posted in the moderated group news.announce.newgroups (n.a.ng) The group's moderator ("The Control") also publishes the group-related control messages for the "Big Eight" hierarchies.

Fixed rules of procedure aside, a part of naming debates is often the question as to whether regulations are to be applied to a certain case and if so, which ones. The knowledge of

[110] news.groups: A survival Guide [FAQ], http://www.tzcat.com/~josephb/newsgroups/debate/html

these regulations is distributed and n.a.ng's moderator (in the following article "David L.") is reluctant to provide interpretations:

> From: Dmckeon@swcp.com (Denis McKeon)
> Newsgroups: news.admin.hierarchies
> Subject: Re: Discussion of Mod Squad and Usenet II groups and designs
> Date: 1997/12/03
>
> (...)
> It occurred to me last night that getting David L. to comment on n.a.ng policy or practice is rather like getting Alan Greenspan to comment on the future of interest rates – any response might cause turmoil, so hardly anything is ever said that is publicly available. (...)

As an area for action, creating new groups is a vivid example for the basic pattern on Usenet that "constitutive rules" are simultaneously open to debate during ongoing procedures. Over the years there has been a number of attempts at exonerating naming debates from this kind of meta-communication. Proposals aimed at creating some kind of organisation have regularly led to nothing. Solutions which aim at the reorganisation of the procedural steps or at the revision of the voting process seem most promising. "news.groupies" are unanimous in their opinion that the prevailing method is in need of reformation, although views on what should be changed in what way diverge. In the mid-Nineties, the news.groups group expected an imminent revision of "Big Eight" group creation procedures. All eyes were upon the moderator of news.announce.newgroups who, contrary to a previous announcement, did not produce a suggested amendment. The reorganisation of news.groups was often brought up regardless and the group news.groups.questions actually created, so as to separate informational questions regarding the creation procedure from its execution. A further advance attempted in the second half of July 1996 towards splitting up news.groups into various groups along the lines of various procedural components, fell through.[111] A definitive proposal towards regulation of the group creation process was not again presented until the beginning of April 1998 and in a rewritten version in the end of June 1998.[112] A brief debate, confined to questions of detail, follows. A reform of the procedure, however, does not come about.

The proposed new rules do not aim at a revision of existing forms of self-regulation, but most clearly their continuation and expansion.[113] With this, a pattern of development is maintained which can be termed "change by integration" (Hoffmann 1997a, 24-25). The existing chain of events of (materially heterogeneous) elements of group creation is suggested to be supplemented by a further element consisting of a mechanism for *removing*

[111] The aim was to create the groups news.creation, news.groups.info, news.groups.preliminary, news.groups.policy and news.groups.where-it-is. A similar attempt made in April 1995 which intended to replace news.groups with news.creation.answers, news.creation.group, news.creation.meta and news.creation.status, was also unsuccessful (Thomas Cuny, news.groups, 18/4/1998).
[112] Russ Allbery, [DRAFT] New Guidelines, news.groups, 2.4.1998; Russ Allbery, [DRAFT] Guidelines: Big Eight Newsgroup Creation, news.groups, 29.6.1998.
[113] In contrast to the Internet's Domain Name System (DNS) which has developed into a turbulent battleground since the middle of 1996 (Recke 1997) including governmental participation, Usenet namespace management has remained an internal affair.

such groups as have no or few traffic with the objective of relieving the news transport of "dead groups" and lending more clarity to the "Big Eight" hierarchies once again. The path leading up to a new "Big Eight" group consists of 27 steps according to the new/old regulations. The procedure in the "institutional field" of group creation seems by now to have become so chock-full of pre-conditions that fundamental revisions are opposed by its own gravity. The group news.groups itself develops conclusive powers of attraction. If toponymical ordering is the heart of Usenet, then it beats here:

> From: abby@ucan.foad.org (Abby Franquemont)
> Newsgroups: news.groups
> Subject: Re: rec.arts.superman RFD: An open letter to news.groups and KalElFan
> Date: 20 Jul 1998 19:17:52 -0700
>
> (...) But for the folks to whom USENET gives something good and worthwhile, and who stick around and keep using it, eventually there tends to come a point where you end up in news.groups.
>
> It can be maddening, a frustrating ordeal, this is true -- but, in many ways, it's the gateway to a sense of ownership of USENET. And once you have that, I don't know if you ever look at it the same way. The long-term denizens of news.groups are, for the most part (a few kooks aside), people who'll fight tooth and nail to keep it going. It's a passionate fight, these days, and tempers do run hot. (...)

5 "What about abuse of the network?" – The boundaries of permission

The question as to who or what is a possible message address is a fundamental problem of communicative acts. On Usenet, addressability is newsgroup-bound. Within toponymical ordering, - as shown above - characteristic forms of address construction and address construction procedures have developed. Addressability management is not the only field within Usenet that is concerned with the inclusion and separation of messaging. A second field, in which inclusion and separation of communication play a vital role, results from the question as to the differentiation between the (legitimate) use and abuse of network resources and the authoritative instances thereof, in other words: which types of messages are included in or excluded from Usenet, who makes such decisions and how are they put into practice?

Discussions on the limits between use and abuse and how to deal with usage perceived as being of an abusive nature have been a constant part of Usenet since its early days. As cited in the announcement of the first public presentation of Usenet in January 1980,: "In general, it will be straightforward to detect when abuse has occurred and who did it. (...) Experience will show what uses of the net are in fact abuses, and what should be done about them." (cit. in Bins & Piwinger 1997, 349) However, the initial optimism that abuse

and the people responsible for it would be plain for all to see and counter-measures would be applied as a matter of course has been refuted.

5.1 "Cyberporn is not a real problem"

Traditionally, Usenet's entrance barriers have always been very low, not only for readers and authors of articles but prospective site managers as well. Apart from the server software, the only other thing required is a regular "newsfeed". By the mid-Nineties the network has grown to accommodate more than 300,000 sites. It presents itself as a regulative environment in which there is only one fundamentally valid rule: the sites' local authority over their own computers ("Each site owns its own machines").

Seen in light of this background the outbreak of network-wide culture-clashes between old and new user groups does not occur to the extent one might have expected. The invasion of "strangers", often vocally proclaimed on Usenet and referring to the users of online services, the infamous "clueless newbies" has proven to be a further and by no means dangerous episode in Usenet's history, seen from today's vantage point. The "culture clash" occurs during the struggle against net abuse in two different places: at the intersection of Usenet and "real life" instances and on the network between various groups of guardians.

A conflict zone in which the interior and exterior perspectives clearly separate is formed by the content control of the newsflow. When the online service CompuServe barred its users from accessing the alt.sex.* newsgroups at the Munich public prosecutor's behest around the beginning of 1996, there was a subsequent storm of protest on the network. Usenet, which was briefly wrongly stigmatised as the hub of pornographic activity on the net, soon handed its role as an outstanding object of governmental attempts at intervention over to the WWW.[114] What has remained is the attitude prevalent on Usenet, that contents *per se* do not constitute abuse. Net abuse is seen from within the net as being a "real" problem only if and when the net's ability to function could be harmed: "Cyberporn is not a real problem." (The Net Abuse FAQ). Not "content" but "conduct" is the object of regulation and control on Usenet.[115]

5.2 "Welcome to news.admin.net-abuse"

With the Internet's advancement into a commercially-used mass medium, a network-wide breach of netiquette has materialised which concerns mostly the email and news services: "spamming" (http://spam.abuse.net/). On Usenet, it soon became apparent that conventional filter mechanisms such as moderator programmes or kill files were ineffective when faced with unwanted mass postings. Organisational forms of spam-fighting have been evident since the mid-Nineties, out of which the beginnings of an "institutional field" have crystallised with its own newsgroups, temporary specialisations, conventions and new techniques. What started this off was an occurence hitherto unknown to Usenet: one and

[114] The complete text of the verdict passed by Munich District Court on May 28th 1998 on CompuServe's director at the time can be found at http://www.digital-law.net/papers/index.html. For more on the legal problems surrounding hyperlinks cf. Eichler, Helmers & Schneider 1997.

[115] Conduct control with the subgenres "reproach messages" and ensuing "remedial episodes" make up about 15% of newsgroup traffic (McLaughlin et al. 1995, Smith et al. 1995). For more on the subject of content control on Usenet cf. Bilstad 1995 (alt.sex.*) and Shade 1996.

the same article was posted to over 6000 newsgroups. Ever since this spectacular "Green Card" spam incident, it has become a common feature of some newsgroups that more than 50% of posted articles consist of spam. Sending spam has become a commercial business. Countermeasures on Usenet start in two places: the removal of unwanted articles and the sources of spam.

With the creation of the news.admin.net-abuse.* groups in the spring of 1995 a forum for the co-ordination of "spam cancel" measures has been established.[116] Spam detectors were developed and a limit decided upon according to which an article is classified as spam based upon how often it appears, regardless of its contents. If the limit is exceeded, scripts aimed at preventing the incriminated article from being propagated any further are run. Regular bulletins name the sites responsible for the most spam sent out and give further information on the numerical development of cancel measures.[117] Certain conventions require that the senders of cancel messages identify themselves. Cancel articles themselves are to be marked in such a way that they cannot only be carried out by large sites, but also ignored, as an "opt-out"-option geared toward promoting acceptance.[118]

Sending cancel messages is supplemented by collective sanctions against the sources of spam articles. For example, unreasonable Usenet sites that are unwilling to undertake any measures prohibiting spam from being sent from their systems can be subjected to the "Usenet death penalty" (UDP). If this is imposed, individual news administrators are called upon to edit their newsfeed file in such a way that in future, no articles can be received from the incriminated site in question. Contrary to this passive form of the Usenet "death penalty", the active variant entails deleting all messages sent from a "bad site".[119]

Drastic measures such as these call for strong legitimation. Spam is seen as theft of common resources. Accordingly, the IETF aspires to provide further information and help by issuing educational documents.[120] Spam is theft seen from the background of the Internet cost model because the senders impose the cost of transporting unwanted messages upon the recipients. As far as news is concerned, these costs also take on specific non-monetary forms (e.g. "Spam is theft because it pushes legitimate traffic into early expiration"). This view on things is, however, not generally shared on Usenet, so not only are "spammers" and "spam cancellers" at loggerheads, but also the various attempts at

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[116] news.admin.net-abuse homepage (http://www.ews.uiuc.edu/~tskirvin/nana/)

[117] A recent count recorded one million cancel messages for the "Big 8" hierarchy from the 8th-14th July 1998. Among them were 900.000 "Spam Cancel" messages, making the number of 10.000 articles cancelled by the original author seem paltry in comparison. A good 200.00 cancels were categorised as being "suspicious". (Andrew Gierth, Cancel Analysis Report for 8th-14th Jul 1998, news.admin.net-abuse.bulletins, 15/7/98).

[118] For detailed information on marking spam cancel messages, cf. the "Cancel messages FAQ" (http://www.uiuc.edu/ph/www/tskirvin/faqs/cancel.html).

[119] Conventions are also being developed for the UDP, for example in regard to the spam volume leading to the classification as a "bad site". Defined periods between the announcement and implementation of a UDP are intended to give news administrators and ISPs a chance for reformation.

[120] Within the IETF itself, the working group "Responsible Use of the Network" (RUN) deals with creating material geared towards educating new users in particular (http://www.ietf.org/html.charters/run-charter.html). Contrary to the "spam is theft" attitude prevalent on the Internet, governments plan legal regulations for spam. This concerns e.g. a law passed in May 1998 by the US Senate, which includes an "opt-out" option for users, similar to the Robinson list used for postal advertising, and otherwise explicitly legalises mass advertising on the Net.

protecting the network's integrity which aim in different directions and can be seen as programme and anti-programme.

5.3 "Declaration of Free Speech"

Usenet knows no measures to effectively stop abuse, but instead, an ongoing discourse on the "proper" starting-point and the acceptable range of corrective or controlling measures. Spamming leads to two different attitudes coming into conflict which are organized around the poles "freedom of speech" and "preservation of public welfare". Semi-official spam cancellers - "Usnet's Etiquette Enforcement Agency" (Frauenfelder 1997) - define net abuse as follows: "To qualify as true panic-inspiring net-abuse, an act must interfere with the net-use of a large number of people." (The Net Abuse FAQ). This includes, as well as the flooding of newsgroups with spam and other forms of identical articles appearing in large numbers, wide-ranging or organised forgeries and attempts at censorship.[121]

On the other hand, according to the stipulations of absolute freedom of speech, there are next to no legitimate reasons for impairing the flow of communication. Seen from this perspective, net abuse occurs when someone attempts to interfere with the relay function of Usenet's transport system: "What is net abuse? Any action that stops a properly configured transport system from performing its normal store and forward services."[122] The aim of "True Free Speech" is mainly postulated by the "Freedom Knights of Usenet" (http://www.jetcafe.org/~dave/usenet). In practice, their programme of action not only demands that they carry out all newgroup control messages, no matter from where they originate, or ignore rmgroup messages that are aimed at cancelling groups. Third-party cancel messages which are generally seen as abuse, are not only not carried out but deleted. On the other hand, spam is not regarded as net abuse.

> "My newsgroup policy has always been 'I allow all newgroups and ignore rmgroups. If you want a new group, forge a new group, come on in.' Newsgroups names are becoming free, there's something called a cyclic file system which stores all news in one file. I think that's the way things should be handled in the first place. I don't think there's any way you can abuse the net if not technically. I could go and crash somebody's news server, but posting spam is not abuse. Posting spam is not abuse, given that I can ignore all those messages in that newsgroup. I must agree that 100.000 messages in the space of one hour constitutes abuse. What do I do? I wrote a posting limit on my news server that says 'you can't post more than this amount in one hour,' it's an exponential backup. You're sitting there trying to post and the server makes you wait. Given this, no-one can damage the system. It's content-blind and I took steps to ensure it's not unfairly applied. (...) We're working on a project to do anonymous news so you can post to a newsgroup and not be traced. The posting can't be traced either, it's a cloud of news servers. If there's enough of them and enough places

[121] Examples for this are a "hate attack", as a result of which more than 27.000 articles were deleted in September 1997 by cancelbots (cf. O'Connor 1996) or the arbitrarily sent HipCrime cancel messages which plagued the news hierarchy groups in the summer of 1998, although the debates in news.groups on the creation of the rec.arts.superman group were affected as well.

[122] An Alternative Primer on Net Abuse, Free Speech and Usenet (http://www.jetcafe.org/~dave/usenet/freedom.html).

in different countries, no-one can figure out where it came from, like the anonymous remailer system. My goal is to further the cause of people to post." (DH)

If sending a spam deletion message is already seen by the "Freedom Knights" as net abuse which justifies countermeasures, this holds even more true for the Usenet "Death Penalty" (UDP). Means of support were developed to enable UDP-sanctioned sites to become unrecognisable and so circumvent the sanctions connected therewith.[123]

Net abuse forms a semantic and technical field in which programmes of action come together that are not involved in a common plan of preserving and reconstituting of the communication space called Usenet. Just as conventional filtering mechanisms are no longer effective in preventing spam, the mechanism commonly used on Usenet for neutralising or avoiding conflicts fails when dealing with net abuse: the separation of spheres of influence.

5.4 @@ BEGIN NCM HEADERS

As well as incompatible control orientation, practical network translation problems contribute to the fact that the act of dealing with net abuse can be standardised, although it is difficult to stabilize it as an institutional field. It is forseeable that current forms of cancelling spam will only be of limited use in the future. Administors of such sites that agree to third-party intervention in the newsfeed in principle are now inclined to ignore spam cancel messages. As far as third-party cancels are concerned, which includes spam cancel messages, the wheat is difficult to separate from the chaff: "legitimate" cancels cannot always reliably be distinguished from "suspect" or simply forged ones. Third-party cancels themselves all make use of security holes in the Usenet system and are therefore only of limited use as ways of fighting net abuse. Mass third-party cancel messages put excessive demands upon the cancel mechanism which is either oriented toward the article's original author or the site of its origin and result in a potential cumulation of legitimation and control deficits at the newsfeed's relaying stations, where the cancel messages are issued.

On Usenet, third-party cancel messages are increasingly less seen as an efficient method against net abuse, but a kind of failure to establish order typical for the network. [124] Their part in Usenet traffic is estimated at a third; cancel messages themselves are no small burden upon the network. A more economic system which presents fewer legitimation problems and rules out forgeries to a large extent would therefore be welcome. Such a system, which is recommended both as a "solution" to the spam and the spam cancel problem, is NoCeM (pronounced "No See 'Em).[125]

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[123] A news site's traces can be covered by varying the header entries that refer to the originating system of an article. Cf. "How to recover from a UDP" (http://www.jetcafe.org/~dave/uenet/nntp.html).

[124] A failure of order, within which forms of conflict solving or prevention are structurally overtaxed or practically remain ineffective, such as partly occurred in the case of the spam cancels, can be called "informational entropy" (Hoffmann 1997b, 223).

[125] The NoCeM FAQ. V0.3 (http://www.cm.org/faq.html).

This system introduces a new category of evaluative articles to Usenet. A NoCeM message includes a list of Usenet articles, which are in a certain format and evaluate other articles using a random principle that must be decided upon. NoCeM messages (NoCeMs)are not directed at human users but address programmes which react to the message's arrival with a locally preadjusted operation, whether they show the articles contained within to the reader at once as being worth reading, and exclude or delete unwanted ones. NoCeM, which has recently become the centre of attention as an alternative to spam cancels on Usenet, is still an incomplete technology and its further development is subjected to the ongoing conflict between both prevailing movements on Usenet as to the "proper" usage of the network.[126] The debates on NoCeM therefore exemplify the contingency of current technology development on Usenet. During the debate on NoCeM, old controversies on the localisation of the ability to act on Usenet are repeated and renewed.

These controversies reveal themselves as in a burning glass when the creation of the news.admin.nocem newsgroup is proposed during the beginning of December 1997.[127] Two rivalling views of what NoCeM "is" become apparent. One would like NoCeM to be developed and used as a supplementation for newsreader programmes as was originally envisioned by Cancelmoose. Here, NoCeM has the character of a "3rd party kill file", to which only the individual users have any access. NoCeM messages are regarded as "end to end" communication, which only pertain to the reading and posting software and not the intermediary distribution instances. NoCeM implementations at server software level with which news administrators can filter the newsfeed behind the users' backs (NoCeM on spool) is seen as abuse.

> Subject: Re: Is nanau under attack by HipCrime?
> From: fluffy@meow.org (Fluffy)
> Date: 1998/07/14
> Newsgroups: news.admin.net-abuse.usenet
>
> (...)
> But NoCeM _isn't_ designed to eliminate messages, only to mark them read at the newsreader level. NoceM-on-spool is as much a misuse of the NoCeM message format as a perl-based header filter is a misuse of that header. (...)

From the other point of view, NoCeM on spool in the hand of news administrators is not only regarded as desirable but also - at least currently - as the only practicable use.

> From: rosalind@xs4all.nl (Rosalind Hengeveld)
> Newsgroups: news.groups
> Subject: Re: RFD: news.admin.nocem.policy

[126] NoCeM itself is not a programme, but rather a protocol which specifies the format of NoCeM messages. In order to use them, according NoCeM implementations must be developed. In this sense, NoCeM not only presents itself as an unfinished, but also as a principally open technology. As well as NoCeM clients for Usenet, work on a NoCeM implementation for email is in progress.

[127] Around 240 articles in news.groups followed the Request for Discussion (RfD) in December 1997. After a second RfD in the beginning of January, voting took place on February 26th 1998, which ended in a yes vote in favour of group creation.

Date: Thu, 11 Dec 1997 09:48:30 GMT

At this point in time, NoCeM-compliant newsreaders hardly exist, and it remains to be seen whether the big newsreader makers (Netscape, Microsoft) will be interested in implementing NoCeM any time soon; also, whether such newsreaders will have adequate performance in processing thousands of NoCeM messages from news.lists.filters.

At this point in time, when we're talking application of NoCeM, we're talking NoCeM on spool. While still experimental in ways, that is at least up and running at some sites (including mine). (...)

This marks out the positions between which the discussion on the semantics of cancels is raging: Is a NoCeM message the same as a cancel message or something completely different? It is about the usage of resources by NoCeM clients in regard to functionally equivalent solutions such as retromoderation, about intended effects vs. those that actually occur, and time and again about the actors to whom NoCeM presents new challenges. For news administrators, issuers are the critical mass:

Subject: Re: Is nanau under attack by HipCrime?
From: Rebecca Ore <rebecca.ore@op.net>
Date: 1998/07/15
Newsgroups: news.admin.net-abuse.usenet

Dave Hayes <dave@jetcafe.org> writes:

> Given that the on-spool software exists, and is maintained, it is reasonable
> to presume that it is in use. (In fact, I remember people admitting its use
> in this very group.)
>
> If it is in use at -one- site, then all NoCeM messages are effectively cancel
> messages.

Uh, Dave, you don't know how this works. NoCeMs are not across the board automatically applied. To apply them on the spool at one site, the sys admin has to put the various issuers' PGP signatures in his accepted issuers file (on his keyring). Until cancels, this is a volitional act. The sysadmin has to decide which NoCeMs, whose NoCeMs and what kinds of NoCeMs from each issuer he'll accept. (...)

On the users' side, even bigger hurdles have to be overcome before a wide-ranged use can be considered.

From: rosalind@xs4all.nl (Rosalind Hengeveld)
Newsgroups: news.groups
Subject: Re: RFD: news.admin.nocem.policy
Date: Tue, 09 Dec 1997 11:28:03 GMT

> Henrietta Thomas <hkt@wwa.com> had written:
>
> > > Who is going to teach everyone about PGP?
>
> Russ Allbery <rra@stanford.edu> in <m31zznrwpf.fsf@windlord.Stanford.EDU>:
>
> > They can figure it out for themselves if they want to issue NoCeMs. If
> > they can't, they shouldn't be issuing NoCeMs in the first place.
>
> I think Henrietta may have been speaking of the use of PGP on the receiving side, especially on the end user side. After all, one must (or at least: should) use PGP to authenticate a NoCeM notice before applying it. So, end users must put together a PGP public keyring, and also a NoCeM permission file (or its equivalent on the end user side). (...) How we are going to 'teach' utter newbies to have their newsreader act as a third-party killfile by way of NoCeM is indeed a far from trivial problem.

Whether or not NoCeMs will make their mark upon Usenet and in which form is for the most part dependent upon which concept of use can find the better allies. NoCeM on spool and NoCeM for newsreaders attempt at creating a network consisting of users, administrators, issuers (of NoCeM messages) and clients. The easiest way to deal with them at present still remains to ignore them, as one of the participants in the discussion remarked.

6 "Default Policy" – frameworks and scope for action

When dealing with net abuse and namespace management, which we have discussed in the previous two parts, are areas of action which have developed into institutional fields within Usenet. The concept of institutional fields describes a pattern of ordering which is crucial to the constitutively decentral social world of Usenet. Order in the sense of a translocal coordination is generated by connecting first and second-level forms of control and integrating them into more or less complex chains of action.

The development of an institutional field is accompanied by temporary specialisation concerning models of action (for example the "Usenet Volunteer Votetakers" for the "Big 8" hierarchies, the "Spam Cancelers" or the "hierarchy czars" in Usenet II), the establishment of collaborative structures (such as "group advice" in the "Big 8" or the UK Usenet Committee) and by an automatisation of procedures. Especially the latter is an effective form of institutionalisation, as the news administrators have the possibility to delegate tasks that can hardly, or at least with difficulty, be carried out manually. This is depicted clearly in the following episode, using the administration of "Big 8" namespace as an example. The subject is "tale", who routinely sends out group-related control messages

as "control", and the consolidation of his role of action by way of establishment in a newer vesion of the news software (INN).

> From: josephb@tezcat.com (Joe Bernstein)
> Newsgroups: news.admin.hierarchies
> Subject: Bogus groups in the Big (was Re: mod.*)
> Date: 29 Jul 1998 08:42:41 -0500
>
> In article <p4w1zr4eqrs.fsf@panix2.panix.com>,
> Jim Kingdon <kingdon@panix2.panix.com> wrote:
>
> > the Big 8 has gone down the "formalize it" path (as has net.* and us.*
> > and various other national hierarchies although the formalities are
> > rather different in each case). Now, there are limits to this (for
> > example, I suspect that people's adherence is to the Rules more so
> > than to tale as a person, well except that the Rules give tale power
> > intentionally or not).
>
> Um, this is not what has changed things. The distribution of INN with
> tale defaulted in as the control for the Big 8 is the main thing that
> has changed things. (...)
>
> As newsgroups have proliferated, those admins who are selective at *all*
> (other than by simple namespace masks, e.g. alt.binaries.*) are obviously
> increasingly pressed for time. I'm not looking forward to the control
> messages that'll start landing in *my* mailbox in a few hours, and I'm only
> taking a few hierarchies. So it's not just that the defaults make an easy
> way out for admins, but that they make a *possible* way out for someone who
> is not being paid to spend 60 hours a week reading control messages. (...)

In net communication, delegating tasks to technology plays a more meaningful role in coordinating procedures than differentiated organisational structures and formal rulesets. The range of the delegation principle on Usenet is however limited to the hierarchy level. In self-governing areas such as these to whom certain forms of delegation are unknown, users themselves must lend a hand with technology. Whereas for administrators, the news server configuration files form a coordinating point, for users, the same function is carried out by the newsreader. The following example, which deals with the creation of an alt. group, exemplifies that the default settings of some newsreaders must be changed.

> From: katew@enteract.delete-me.com (Kate the Short -- Spamblocked)
> Newsgroups: news.groups
> Subject: Re: Control Codes for alt newsgroup creation?
> Date: Fri, 14 Aug 1998 22:02:35 GMT
>
> In article <35d6af5d.75166083@news.supernews.com>,
> mokane@gate.net sat on the sofa and said:

>Can someone tell me what they are or where to find them? The FAQ says
>they are needed for alt. newsgroup creation but doesn't say what they are.

Well, um, if you go to alt.config, they'll help you out with alllll the
info. Some newsreaders can't put the codes in, though. Agent *can*,
but you need to alter your agent .ini file with all the settings. I
think it's ShowAllHeaders = 1 or something like that. (Originally it's
0 but making it 1 gives you access to Control: and Approved: header lines.

As for the rest, I'd suggest discussing it in alt.config first, as they're
likely to send out a rmgroup message if you don't go there with the proposal.

The case in point here is one in which the reader's "built-in" action roles obviously do not provide for users being able to send control messages. As can the server's configuration file, the reader's "operative text" can be edited by the user in such a way that the reader programme's settings are rendered obsolete. In addition to the institutionalised rules and procedures which are valid within individual hierarchies in certain areas of action, the - malleable - news software specifications that lay out the framework of action for Usenet participants. Behind them lies the third level, protocol specifications. As far as standard IETF categories are concerned, the status of news protocols is traditionally only an informal one. The interaction between servers when exchanging news between sites and the interaction between servers and news clients when receiving newsgroups and posting articles (RFC 977) as well as the article format (RFC 1036bis) is regulated on the protocol level. Protocol specifications themselves contain prerequisites concerning the developers of server and reader software according to the smallest possible demands on interoperability.

In the summer of 1996, a revision of Usenet's entire protocol world was begun. On the one hand, this work is aimed at refining RfC 977 and towards an extension to NNTP, adding a mechanism for attaching standard extensions and integrating extensions in common use. On the other hand, an effort is directed at the reworking of the Usenet article format. The subject is the "operative text" which itself is attached to the Usenet article, thereby (re-)determining the control messages' type and the conditions under which they are executed. During the course of this - hitherto unfinished - plan it has become apparent that, similar to the reordering of the creation of new "Big 8" groups, previous practices meet with approval and continuity, radical innovations have no chance - the "grandson of 1036" is true to type.

The authentication question has shown itself as not agreeable upon: is it advantageous for the authenticity of Usenet articles to be documented and how could this be best realised? This question not only leads to animated discussions on the proper method of encryption, but is connected to the problems surrounding cancel messages as a method of maintaining order from the start, itself a hot potato. For example, the chairman of the Usefor working group opens the discussion on the mailing list with the suggestion:[128]

For a start I would suggest:

[128] The Usefor mailing list archive, which received around 5000 postings between April 1997 and July 1998 can be found at http://www.landfield.com/usefor.

* Authenticated articles (perhaps a generalization of PGPcontrol)
* 3rd party cancels. (Lyall, usefor, 10.4.1997)

Notwithstanding an abundance of pressing problems, which is a result of the dual load put upon Usenet by spam and spam cancels (cf. part III, Section 5.4), there is still no solution to the problem in sight, even after more than a year after the working group's creation.

>My personal opinion is that unless the standard produced by this group
>contains at least an implementable proposal for how unauthenticated
>cancels of all forms will be done away with, it will have been a failure.

I agree. Without strong authentication, USEFOR may as well go home now.
(Franz, usefor, 28.6.1998)

The centre of the controversy is centred around the question as to whether a method of authentification system using a "public key" or a "private key" system is preferable. "Private key" advocates present the vision of a "clean" Usenet, within which all trustworthy participants will in future be more than glad to sign their articles, thus doing away with the worst evils ("spam, forgery and forged cancel") once and for all. Opponents of this proposal invariably mention (among other things) the practically unsolved problem of the distribution of public keys on a network the size of Usenet. It remains doubtful as to whether a network-wide delegation of trust in authorised places of certification and registratures inextricably connected to such a system are compatible with the medium's structures. In comparison, a system with "private keys", in which the user marks her articles with a code only known to her, seems to be less difficult.[129]

H(H(secret+public) [private key cancel lock] is exceedingly easy to implement
for 1st party cancels, requires no additional outside effort for the user besides defining a secret, and does not require anyone to trust anyone but themselves.
(Cook, usefor, 10.7.1998)

Trust - as the debates on the Usenet article format show most clearly - is a rare resource on Usenet. Nevertheless, it is written in the beginning of the draft of the "grandson of 1036": "USENET is (...) an environment in which trust forms the basis of all agreements. It works."[130] This contradiction can partly be resolved if one recalls that trust - as well as agency - can be distributed. And communication protocols are a very important area in which their localisation is decided upon, sometimes in advance. And this turns the "technical centre" as defined in the protocol specifications into a "geography of responsibilities" (Akrich 1992). All around the Usenet article, the protrocol creates and defines a world of actors and delegates certain corresponding roles and responsibilities to human and non-human actors. The world of actors runs the gamut from "posters", "posting agents", "injecting agents", "relaying agents", "serving agents" to "readers" and "reading

[129] In the beginning of August 1998 a draft for the authentification of Usenet articles according to such a system was published: "Cancel locks in Usenet Articles" (draft-ietf-usefor-cancel-lock-00.txt). Practically speaking, this means that two lines ("cancel-lock:" and "cancel key:") are added to the header of an article.
[130] This and the following quotations are taken from "News Article Format" (draft-ietf-usefor-article-01).

agents". These actors are equipped with a certain inscription: a narrative programme of action with prescriptions and permissions.

For example, it is defined which actors are legitimately authorised to run a certain programme ("Cancel messages MAY be issued by posters, posting agents, moderators, injecting agents on 'proto-articles' [other entities MUST NOT use this method to remove articles]"). The software is required to limitate actors' ability to act in such a way that only legitimate actors are given the possibility to use it ("Posting Agents meant for use by ordinary posters SHOULD reject any attempt to post an article which Cancels Supersedes or Replaces another article if the target article is not by the poster"). The final responsibility for an article's correct state is not held by the poster but the "injecting agent" ("An injecting agent is responsible for taking a proto-article from a posting agent and either forwarding it to a moderator or injecting it into the relaying system for access by readers. As such an Injecting Agent is considered responsible for ensuring that any article it injects conforms with the policies and rules of this document and any newsgroups that an article is posted to.")

The ongoing debates on the Usefor mailing list make it apparent that the regulative principle of the duty book is the actors' trustworthiness. Even more: some actors owe their mere existens to this principle.

> The whole point of distinguishing between injecting agents and others is that posting agents (of which there are many millions worldwide) are in general not to be trusted. They include all sorts of spammers (amateurish or professional) who may try to hide the true source of the article. We are placing a duty on injecting agents to be able to vouch for the correctness of the From (or Sender or whichever) line, and we are proposing to provide them with an Originator-Info header in which they can testify to what they are vouching for. So if something comes in that is suspicious (...) then it is the injecting agent that is supposed to work out what, if anything has gone wrong (since it is the last point where all the relevant information is available). (Lindsey, usefor, 11.2.1998)

The programmes of action as defined in the communication protocols can be adhered to in daily network practice or not. Even if their interpretation is controversial, they are still acknowledged and used as a reference for moral guidelines of communicative behaviour on Usenet.

> In article <3349924B.399D@idt.net>, boursy@idt.net plaintively meowed:
>
> > J.D. Baldwin wrote:
> >>
> >> There is no "integrity" to the "From:" line.
> >
> >That's simply untrue. In fact the cancel mechanism built in was
> > specifically designed for posters to be able to cancel their own
> > messages--someone else forging their email identity is clearly system

> abuse and morally >indefensible.

That is simply untrue. In Fact the Cancel Mechanism built in was specifically designed for Posters *and their site administrators* to be able to cancel Messages. What you call «forged» Cancels are explicitly allowed by RFC 1036 and in RFC 850 before it. Posters have /never/ been granted an implicit or explicit assurance of absolute Control over their Articles.

While we're at it, what do you think RFC stands for?

Request Fluffy's Consent.

Meow
Fluffy

205 Closing connection - good bye!

During the course of its use, Usenet has - contrary to its intention - changed from a primarily local information medium into a global communication service.[131] Time and again, the network has gone beyond the horizon of past futures ("Imminent Death of the Net Predicted!"). Not only does its growth reflect expansion, but also upward transformation. According to the concept suggested by Kubicek (1997) of the "developmental space" of a medium with the coordinates degree of diffusion and types of institutionalisation, looking at the network-wide distribution of Usenet, by now it can be said that it is universally accessible.

The Usenet article has given rise to a separate new media genre, to which a complex knowledge of rules and procedures on Usenet that are passed on in many ways belongs. The resources of the creation of order and ordering patterns which are a consequence thereof take on a new and unusual shape which differs from old media. This text has already described some characteristics of the news medium as artefact and its organisation as a service in detail. Seen from this perspective, Usenet presents itself as well-structured in its own way, even if differentiated organisational structures in the traditional sense of the word have not yet become apparent.[132] As a testimony to its original culture, Usenet still stubbornly seems to prefer software technical solutions ("first-level forms of control") to organizational ones. But also the "social hack" has its tradition on Usenet. Its constitutively decentral world is divided patchwork-like into a plethora of self-governed areas with their own rules and forms of collaborative management.

[131] One of the developers: "The original ANews had a number of design choices that made it unsuitable for a large net. (We estimated a maximum size of 100 sites, and 1-2 articles a day, net-wide ...)." http://communication.ucsd.edu/bjones/Usenet.Hist/Nethist/0011.html

[132] Take the "Organization" line in article headers. To a certain part, it refers to the poster's ISP. It also partly contains messages referring to Usenet-specific communities ("Usenet Volunteer Votetakers", for example). In the majority of cases, it consists of made-up headers ("Ruler of all Usenet", "Cabal Network Security"), used by participants to give the restricted character-based world of Usenet their own personal scent.

Usenet is an unfinished project. It does not present itself as a finished object, but rather as a delicate and confusable operation. Order fails especially when dealing with abusive usage practices such as "spam" as of late. The excess consumption of network resources goes hand in hand with internal regulation conflicts and leads to "informal entropy" situations. Collaborative filters (NoCeM) are a first possible way of coordinating translocal action, but their future is at present still undecided.[133] Though Usenet is in many respects a fast medium, yet institutional change is slow to come about.

In many ways, Usenet presents itself as a noisy medium. (1) This is reflected by its atmosphere, which has been described as a "mixture of noticeboard, newspaper and pub" (Bruchhaus 1994, 1), "ongoing commentary from everybody on everything" (Grassmuck 1995, 52), "stream of topical chatter" (Baym 1995a, 138), "narrative greenhouse" (Herz 1995, 80) or "a fair, a cocktail party, a town meeting, the notes of a secret cabal, the chatter in the hallway at a conference, the sounds of a Friday night fish fry, post-coital gossip, the conversations overheard in an airplane waiting lounge that launched a company, and a bunch of other things"[134] (2). On Usenet, the metaphor of "signal-to-noise ratio" has become the measure for the amount by which communication is impaired by unwanted or unqualified articles. (3) Noise includes the manifestation of the medium as medium, present in its use (Ellrich 1997, 208). On Usenet, users see themselves forced to deal with the medium's function and its materiality when communicating. If Usenet is judged by the fact that the better a medium is, the less it is noticed during the process of sending or distributing a message, then Usenet must be seen as not being particularly successful. However, as is pointed out in the present study, this form of noise is not only omnipresent on Usenet, but possibly a permanent side-effect of telematic interactivity in general.

[133] The future role that will be played by software agents on Usenet is as yet still undecided upon. We predicted that they would have great potential as a filtering technology for news; they (still?) remain practically unused. For more on the subject of agents, not mentioned in this report, cf. Helmers & Hoffmann 1996; Helmers, Hoffmann & Stamos-Kaschke 1997, Hoffmann & Stamos-Kaschke 1998.

[134] Edward Vielmetti, What is Usenet? A second opinion (news.announce.newusers).

"Last Chance for Common Sense": a comprehensive view of the Internet

Three areas of investigation, three questions and three main chapters. What have they got in common? Where do our observations intersect? Last chance for common sense …

Whichever way we look at the Internet, whether from the perspective of the network nodes, the transmission processes or the communication services, we see similar principles of organisation. The decentralised and open structure of the Internet is the determining factor at all levels of Net technology. The flow of data is basically controlled on the periphery or, more precisely, by the applications. The applications themselves also have a decentralised organisation. The host servers and the network's transmission technology are as inaccessible to any form of central control as the communication services. A principle of self-administration reigns – with the result that the applications of the technology are gradually becoming more heterogeneous.

The common denominator in the evolution of Usenet, in the Unix "family trees" and in the further development of IP can be expressed in one maxim: support the free flow of data. The aim of the global connectivity project is the integration of all potential users and applications. This is evidenced by the renunciation of proprietary technologies in the area of standards development and by the enormous significance of "running code", the proof of functional efficiency and interoperability. The principle of open standards leaves it up to the users to decide how and to what purpose they apply these standards. Any comprehensive regulation of the transformation the Internet is undergoing in the area of services and data transmission is thus out of the question in reality.

Patterns of transformation

The consequences of the Internet's open organisation for its continued existence became the central question in all three areas of investigation, and the answers to this question were constantly changing impressionistic pictures of the situation. Problems of scaling, the inability to regulate and the loss of meaning of once uncontested rules of behaviour made the exponential growth of the Internet appear at times to signify expulsion from the Garden of Eden and at other times the imminent collapse of everything. This tendency to use the rhetoric of crisis and catastrophe is also echoed in our reports about the Internet. The so frequently predicted collapse has, however, occurred neither at the level of the transmission technology, nor in the area of Netiquette, nor on Usenet. On the contrary, the Internet has stood up remarkably well to the huge demands on its resources. However, the transformation from temple of science to mass medium has had its price, of which the deconstruction of Usenet into individual areas of administration characterised by various forms of control or order is one example: the growth and decentralisation of this communication service mean that common rules for the entire network are no longer possible. The increasing tendency to deactivate individual Unix functions such as "finger" and "remote login" is another example. Free access to Net resources – characteristic for the research network – is being eroded by the sharper distinction between public and private

space: the open data network is being divided up into separate little territories. Restrictions to access in the form of firewalls are intended to protect sites from abuse, but at the same time they undermine the tradition of sharing and the collective exchange of information. The rearrangement of ownership relations in the area of addressing is another element of the changes taking place on the Internet. The administration of once public property, such as Net addresses, is passing into the hands of the Internet Service Providers – a force in the regulation of the Internet which is gaining increasing influence over the expansion of the cable network and the establishment of new services and transmission technologies. The distribution of power achieved by the transmission technologies is now being countered by a process of power concentration in favour of the providers.

But these transformations do not necessarily mean that the losses outweigh the gains in any of the areas under investigation. While prophesies of doom can be heard in reaction to the developments, the fact is that the possibilities for communication via the Internet are expanding rather than contracting. This is not only true of the number of people, organisations and data banks that can be reached, but also of the services that can be used for communication. A recent example of these new possibilities is Internet telephony.

If we compare the changes the Net has undergone in the individual areas studied during the period of observation, we perceive a pattern that can be described by the term "change through integration". The mutual interpenetration of WWW and Usenet is a good example of the principle of "incorporation", which could also serve as a model for the future establishment of new services or transmission technologies. It is above all by means of interoperability or mutual support, and not by direct substitution, that new applications or transmission procedures gain acceptance on the Net. IPv6 itself will only be able to gain a foothold on the Internet if it really is downwardly compatible and if it supports the current standard, IPv4. The installation basis of Internet technologies has become so large that any innovations at the level of host, transmission or service can only reckon with success if they are able to coexist with current procedures. Thus, even ever so purist Unix has acquired a graphical interface.

This tendency to integrate rather than replace is, incidentally, also found in the emergency measures that have been implemented on the Internet. An example is the reform of the address architecture being pursued since 1984. The new procedure for allocating Internet addresses (CIDR) can only be implemented as a modification of existing practices, i.e. it cannot radically change the previous allocation policy. The same pattern of development is visible in the emergence of the "alt" hierarchies on Usenet. The attempt to create an independent channel of distribution on Usenet only led to the coexistence of different hierarchies that obey different types of administration.

For the time being it is unlikely that this process of absorption between old and new will lead to a slower pace of development, but the conventions that hold the Net together are certainly likely to become more heterogeneous.

Forms of governance

Loosely connected or even just coexisting material and behavioural contexts are clearly fulfilling their purpose on the Internet, even if the scope of their validity is uncertain and they seem chaotic and dysfunctional in comparison to traditional, hierarchically organised systems. The combination of short-term, makeshift architectural solutions and remedies devised on the periphery at the level of individual sites is proving not only to be successful but also reproducible. Different varieties of this cooperative anarchy can be found at all levels of the Net. This, in our opinion, is a characteristic feature of governance on the Internet.

Because central forms of control are largely ruled out on the Net, innovations cannot be prescribed, but can only be arrived at through the active agreement of each individual site. This, if you will, is the virtual equivalent of "voting with one's feet", where the expression of individual preferences amounts to a collective decision. The rapid spread of the World Wide Web illustrates how effective this form of decentralised coordination, based on nothing but free will, can be. The WWW established itself within a matter of months as a new Internet communication service without any formal agreements between developers and users ever being required. The development of the hypertext language and transmission protocol, of browsers, search engines and software agents, and of links to other Internet services are all occurring independently. Only the interoperability of new Net objects is subject to a general norm. In this sense the transformation of the Net cannot be attributed either to individuals or to institutions. Governance on the Internet is based instead on "distributed" forms of coordination, which manage to get by without hierarchies and with a minimum of centralised functions and rules.

The development of the host software Linux, of the Internet protocol IPv6 and of the administration of Usenet is something which happens in public, mainly or even exclusively on the Internet itself. Administrative and legal norms, as are characteristic of public- or private-sector standardisation bodies, are to a large extent incompatible with this system. The continuing development and administration of the Net is in fact subject to the same conditions as its use: everybody is free to participate actively and to try to influence matters according to their own interests. This governance by a kind of grassroots democracy does not, however, mean that there are not also mechanisms of exclusion of an informal kind in operation. A high level of technical competence and a knowledge of the context are the basic conditions for participation on Usenet, in the IETF and in the Unix community. The only voices likely to gain a hearing in discussions concerning the regulation of the Net are those of people who know how to relate to its cultural and technical traditions.

Processes of normalisation

The particular characteristics and forms of expression of these traditions constitute what we have termed an autonomous social space and what we have examined as the "cultural space of the Internet". We proceeded from the hypothesis that forms of interaction on the Net are quite distinct from forms of interaction in other media. The more the use of Internet

services becomes a matter of course, and the more people there are who can be reached on the Net, the less it will appear to be a special or even separate place. While being "on the Net" may still have had something of a sensational aura about it in the mid-1990s, it is rapidly becoming such an everyday thing that the boundary which once separated the virtual world from the real world is disappearing. The new possibilities of action and experience – resulting from the combination of immateriality, global space-time equivalence and expanded possibilities for the representation of people and objects – have been integrated in society to such an extent that they are now perceived as an almost natural and self-evident part of the public domain. The Internet is in the process of becoming normal. A further indication of this development is the huge effort the state and business are putting into domesticating the Internet, into making cyberspace a definable place and the flow of information subject to state law. It is hoped that more technical security and the exercise of sovereign authority will open the Internet to further forms of use and thus promote its career as a global infrastructure available everywhere.

Can we expect, then, that in the short or long term the Net will lose its status as a self-organising space for communication? Are the sceptics right when they predict that this interactive, symmetrically organised communication device will eventually meet the same fate as the radio? One answer to such pessimistic forecasts is the observation that the decentralised architecture of the Internet has so far withstood all attempts at regulation and standardisation. It may be true that interaction is increasingly losing ground to "one-way" information services and that the Internet is thus becoming more like the traditional broadcast media; however, it is also to be expected that different forms of communication will coexist rather than replace each other.

In relation to the principles of transformation and governance that we found in the three areas investigated, we might add that attempts to control and normalise the Internet ultimately depend on the agreement of the users. Without their acceptance, technologies of encryption, authentication and control will have no effect. Whether the Internet will move towards traditional forms of social organisation and allow itself to be governed in the traditional sense is something which is still beyond the power of state authorities to decide, and thus remains to be seen.

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