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HOW ANARCHY WORKS

On location with the masters of the metaverse, the Internet Engineering Task Force.

The Internet, perhaps the greatest instantiation of self-organization the planet has ever seen, evolves in its fractious decentralized way through the Internet Engineering Task Force, the IETF. Which means, in the cyber '90s, that the True Masters of the Universe are not freemasons, mergers-and-acquisitions specialists, or venture capitalists but the members of a voluntary association of tech wizards that create and oversee the technological future of the Internet. It is the IETF's work on tough technical problems that will make possible the whiz-bang Net applications of the future.

Maintaining a low profile and peaceably going about its business as collections of True Masters always do, the IETF has always consisted of anyone (that's right, anyone - an IETFer could be your mom, a former Soviet commissar of culture, or even a director of marketing) who wants to be part of the technical working groups charged with creating the standards and pathways that will move the Net into the next century. All you have to do is pay a token registration fee and sign up. No questions asked, no meritocratic credentials checked.

In the IETF, there's a kind of direct, populist democracy that most of us have never experienced: Not in democratically elected government, where too many layers of pols and polls and image and handling intervene. Not in radical politics, where too often, the same old alpha-male/top-dog politics prevail despite the countercultural objectives pursued. And not in the feminist collective world, where so much time is spent establishing total consensus and dealing with the concerns of process queens that little gets done. The IETF provides a counter-example of true grass-roots political process that few of us have ever had the privilege to participate in, outside of the backstories about member planets of the Star Trek Federation. IETF group process succeeds

because of a profound connection with, and understanding of, the real world of networking.

Unlike most technical-standards bodies, the IETF has pioneered a culture of pragmatism (quit jawing, throw it out on the Net and see if it works). It maintains a high debate-to-politicking ratio: there may be 104 opinions in a room of 100 IETFers, but the work still gets done. Which is not to say IETFers have the finesse and indirection of 19th-century French diplomats: one IETFer, trying to avoid pissing matches over an issue, was heard saying, "I don't think urinary contests will solve anything"; and another, regarding the organization's expectations, "If you don't write well, there are lots of standards groups in Europe that would love to have you."

MIT professor Dave Clark, one of the grand old men of the Internet, may have unintentionally written the IETF anthem in his A Cloudy Crystal Ball/Apocalypse Now presentation at the 24th annual July 1992 IETF conference. Today, it's immortalized on T-shirts: "We reject: kings, presidents, and voting. We believe in: rough consensus and running code." Which might translate to, "In the IETF, we don't allow caucusing, lobbying, and charismatic leaders to chart our path, but when something out on the Net really seems to work and makes sense to most of us, that's the path we'll adopt."

Part of what has made the Net successful is precisely that: it works, and because it works, Net standards and protocols have dominated the marketplace, where others have tried and failed. In fact, the IETF style of technology creation is being adopted by other standards-making bodies such as the ATM forum. (Asynchronous Transfer Mode is a technology to support very-high-speed networks.) The IETF's political culture is hardy enough so that the Net mechanisms and structures it has fostered may very well enable the Net to survive in good enough shape through the next millennium. Never mind that Net hardware and software infrastructures struggle with a now-huge embedded base that makes technological innovation difficult. Never mind that Net culture hasn't sorted out what to do with the shock of commercialization. Never mind that the IETF has evolved from a small group of élite geeks to a massive group of more average folks, a change on many axes that necessitates incremental growth.

What it is

The Internet, and its ancestor, the Arpanet, has always had its standards-creation bodies. But back in the early days, the Net was a research project known to fewer than a hundred guys - and pretty much everyone who used the network was also involved in creating it, experimenting with it, and evolving it. In effect, the IETF, the anarchic assembly of the Net designers and standards bearers, and its Arpanet precursor Network Working Group, more or less were the Net.

But today, the Net has evolved to include millions, and attendance at IETF meetings has surpassed 1,000 - though some longtime IETFers would insist that, for the most part, it's a small core of about 100 people, predominantly old-timers, who are still getting the work done.

Most IETF work is done over e-mail between meetings, using Net dist-list servers. But its pioneers, ever smart and sensible, knew that people must occasionally meet face to face, that the bandwidth of real-time conversation can make issues-resolution a hell of a lot more efficient, and that sometimes the most important work that humans do happens in that most fertile, inadvertent, and self-organizing fashion: over dinner, in the hallways, late at night over drinks. In fact, attending a bar BOF can be the best part of an IETF meeting. BOF stands for Birds of Feather - a temporary, informal, charterless group - and bar BOF is a joke term for night meetings that continue in the bar of the hotel after the official night meetings end. IETF sessions officially run from 8 a.m. until 10 p.m., and the night sessions, which run from 7:30 to 10 p.m., frequently never end - they merely transfer to the bar. Alas, for the hoteliers, this is not a crowd of heavy drinkers: Pepsi, Coke, and beer are the norm. Bar BOFs are no less technical than scheduled technical sessions - and may be more so, since they are often made up of a selected crew who talk in a shorthand that would stall out the full membership of a working group.

So, the IETF meets face to face three times a year, twice in the US, in deference to the Net's historic roots and to the preponderance of network researchers located there; once outside the US, in deference to the Net's global nature.

True identity of the IETF

The best of the IETFers are folks you'd want to have with you after the nuclear holocaust the Net was originally funded to survive: well-intentioned, clear-headed, results-oriented, communicative (these are communications geeks, after all) - and community-minded. And in a case of life imitating art, playing Nuclear War, a card game invented by a Mensan, is an honored late-night IETF tradition. With great silliness and little evidence of testosterone poisoning, players try to wipe out their opponents' populations.

IETFers are something like a dominant strain of descendants of those kindly, NASA-Mission-Control guys of the 1960s with some recessive streaks of '90s cypherpunks thrown in. Most are comfy, slightly dumpy white guys in the 35-to-50-plus demographic, with nary a great haircut in sight. The women (and there are women, both at the executive and rank-and-file levels, in roughly the same proportion as on the Net: 10 percent) run to the mode of pleasant post-graduate: jeans, blazers, blunt-cut long hair.

But even if meetings of IETFers look like a conference of municipal-sanitation planners - minus the suits that would amuse members - the IETF nonetheless constitutes a radical social phenomenon. Not the least of which is that while the IETF is peopled by folks rightfully sure of their opinions on networking, IETF mechanisms prevent any great men and women of history from taking over the process through personal magnetism. With that many techno-smarty-pants in a group, everyone is paranoid about cabals and back-room deals. So, while IETFers become known for their eccentricity or obnoxiousness or offbeat brilliance or plodding attention to detail, a cult of personality - where personal allure can drive policy - doesn't fiourish. In fact, most of the IETFers don't particularly want to be singled out as spokespeople - not because any harm would come to them for going public with opinions, but because they simply resist the notion of IETF representatives to begin with.

A little over a third of the attendees at each IETF meeting are new; about a third of those go on to become regular attendees. In typical IETF communitarian spirit, first-timers are treated to a voluntary 45-minute orientation, told who to seek out for help and how to govern themselves so the process works - and then are subjected to benign neglect. No outward stigma is attached to being a newbie.

And it doesn't necessarily take long for old-school IETFers to see newcomers as respected colleagues - if the newcomers can establish their authority in the short initial grace period that longtime IETFers extend off the bat, or if, over the course of an IETF meeting's five days, newbie arguments start making sense. And this can lead to one of the best parts of attending an IETF meeting: getting on first-name terms with Net luminaries.

IETF culture

When people collaborate on a daily basis, they generally use first names. IETFers see each other only a few times a year, yet the group, which started as a small community of know-it-alls who all knew each other, retains its insular village intimacy: it still sorta feels like everyone is working together at close quarters. It's just assumed when you hear talk of Lixia (Zhang, of Xerox Parc) or Joyce (Reynolds, of the University of Southern California) or Van (Jacobson, of the University of California, Berkeley) or Dan (Lynch, of Interop + CyberCash), you know who's being referred to.

More important, there's the assumption that we're all in this cozy, if contentious, intentional community (or is it a graduate seminar?) together, so anything other than first names (especially honorifics such as "Dr." or "Ms.") would be pretentious and out of line. If you've acquitted yourself in an IETF working group with useful or at least witty contributions ("I'm terribly sorry, but I don't know what reality you walked in from"), you too can become known by your first name, alongside Stev (Knowles, of FTP Software) or Lyman (Chapin, of Bolt Beranek and Newman).

And one of the collateral benefits of attending an IETF meeting consists of hanging out with super-sharp, good-natured, friendly geeks whose affectionate term of false mockery and true praise is name-calling someone "Engineer!" If you're lucky, you might end up involved in a dinner confab with the likes of Noel Chiappa. Chiappa, a colleague of Dave Clark and the inventor of the multiprotocol router, is part of a mailing list of about 30 people who routinely bark at each other about the meaning of life, the events of the day, and esoterica such as the roots of the Peloponnesian War.

What's so IETF-like about this mailing-list/debating society is the number of Net GSGs (Genuinely Smart Guys/Gals) who subscribe to it. And even though formal education (some have PhDs, some dropped out of college), religion (some are fundamentalist Christian, some have lived in monasteries in Japan and India), geography (some live all over North America, some in other hemispheres), and politics (some consider themselves far to the right of Newt, some consider themselves tree-huggers of the first order) vary wildly, good manners prevail while arguments rage. Typical of the mailing list's fierce-but-friendly style is the ongoing debate between its creationists and its Darwinians, a bit like a match of the World Wrestling Federation - much shouting and posturing, much goodwill. And no one gets hurt.

How it works

The IETF is divided into nine functional areas that change as needed. Each has at least one area director (a volunteer like everyone else in the IETF); and these directors comprise the Internet Engineering Steering Group, responsible for Internet standards processes ("A weekend is when you get up, put on comfortable clothes, and go into work to do your Steering Group work"). About a dozen working groups in each area operate under charters to achieve specific goals - such as creating a protocol to retrieve a file - and when those goals are achieved, the working group dissolves. The teams create informational documents, protocol standards, or resolutions to Internet problems.

That there are pretty much no permanent working groups is one of the many clever embedded IETF safeguards that encourage action and currency, and discourage bureaucracy and the March-of-Dimes syndrome of a permanent shadow government. (What does an organization do, once its goal - elimination of polio - is achieved? To ensure its survival, it gets into something else - like birth defects!)

Similarly, the creation of new working groups and areas is generally avoided: since all IETF work is carried on by volunteers with other day jobs, there is relatively little incentive toward turf-building and make-work exercises. Few IETFers have the time or interest to devote themselves to technical tasks someone is carrying on elsewhere in the IETF - although dissenters may form

alternative working groups if they feel a bad solution was picked, or if progress isn't being made fast enough.

In practice, this means that the working groups take on such noble efforts as helping the Net survive its catastrophically high growth rates; coaxing it to work with new multimedia, video, and multicast technologies like the MBone and CU-SeeMe; and getting it to connect more effectively with IBM mainframe-legacy networks. In the midst of confusion and greed over intellectual property, the IETF, an institution that has been predicated on making its intellectual property freely available, is also grappling with marketplace realities. Working groups even seek to foster civility on the Net: the charter of the working group abbreviated RUN (Responsible Use of the Network) is to codify and update a useful Netiquette RFC.

RFC stands for "Request For Comments," a term that extends back to the 1970s Arpanet Network Working Group. An RFC represents collated proposals sufficiently polished to be worthy of eliciting formal responses and technical experimentation from the Net community. Some RFCs are serious technical documents, some are jokes, and some are in between. In October 1993, for example, Gary Malkin authored the helpful RFC 1539 titled "The Tao of the IETF: A Guide for New Attendees of the Internet Engineering Task Force," in which he jokes, "It's unwise to get between a hungry IETFer (and there is no other kind) and coffee-break brownies and cookies, no matter how interesting a hallway conversation is."

Institutional affiliations

The institution that serves as the IETF's personal assistant is the CNRI - Corporation for National Research Initiatives - a permanent body that takes care of the details. Located in Reston, Virginia, CNRI was founded in part by the man People magazine called one of 25 most intriguing individuals of 1994 - Vinton Cerf - the Net celeb and father of TCP/IP (Transmission Control Protocol/Internet Protocol). Its charter is "Research and Development for the National Information Infrastructure," and it's largely funded by federal grants.

Make no mistake: the IETF is big government with a human face. Probably only half of the expenses of bare-bones IETF attendance (breakfast snacks to gnaw

on, refreshments between sessions, hotel meeting-room rentals, signage, CNRI staff time, copies of IETF proceedings) are covered by the registration fee - US$130 at the 31st IETF. Someone, mainly the government in the guise of the National Science Foundation, is its invisible benefactor. IETF meetings are explicitly not trade shows, but in addition to government funding, local sponsors, whether universities or corporations, do provide additional support at each meeting.

IETFers speak, half with amusement and half in horror, about the time a bunch of suits infiltrated an IETF meeting. Speculation goes that the suits, fired up by the odor of money and power being given off by information superhighway hype, thought to get insider information - and what they got instead, of course, was progress on a bunch of esoteric technical standards (like the minutiae of routing tables) and philosophical debates (the technical merits of different kinds of pricing schemes) that would in no way help anyone productize anything.

More sinisterly, veteran IETFers think the onetime infestation by suits may have been an attempt to pack working groups with members from the suits' own companies. This way, the suits' specific corporate interests might have been best (over)represented. Of course, the whole scheme would have been an exercise in futility since the IETF doesn't operate by vote. This meeting-packing stunt is a time-honored tactic for all standards organizations; but alas, it can't work at the IETF, where people have keen bullshit detectors, long institutional memories for what has and hasn't worked in both the procedural and technological past, and a stubborn insistence on trying to choose the best technological solution, as determined by real-world data, not by corporate realpolitik.

Here there's no voting, no chance that a proposal with a weak mandate of 51-for/49-against will be called the best solution. Even at what seems like an impossible stalemate, IETFers will look to graceful principles to arrive at a resolution; diversity of opinion might be resolved by an agreement to make some decisions, for instance, in the belief that "agreement about parts may lead to agreement about wholes," says IETFer Dave Crocker.

Exception reports

The political culture of rough consensus and running code is imperfect, of course, as any human endeavor has to be, and it's being stressed in the IETF as the Net grows beyond what its creators could ever have imagined. Area directors gripe that too much time in working group sessions is spent educating rubes who show up unprepared, having failed to read the documents readily available online and having neglected to educate themselves about technical decisions made in the past. Some area directors complain that certain working groups have gotten so large they make the IETF process untenable. And the working group process has always had problems with Net geniuses (who may have solutions so far-reaching and oblique no one knows what to make of them) and Net morons (who can be obstructionist at best, failing to operate at the level of abstraction of their colleagues).

As human artifact, the IETF can't make everyone perfectly happy all of the time. In 1992, a palace putsch was ignited by a committee meeting at the International Internet User's convention in Kobe, Japan, which spread to the IETF meeting the next month in Boston. Longtime IETF leaders were thrown or rotated out within the year, guilty of appearing to be too mandarin, too out-of-touch, too long in power - and possibly guilty of using the IETF to pursue private research goals instead of the common good.

A self-selecting, self-perpetuating old-Net-boys group was replaced by a more democratic nominating committee, but with a classic IETF twist: members of the nominating committee are selected at random from eligible members who are willing to serve. Again, there's the IETF populist assumption that all citizens are equally able to make important decisions - personnel ones in this case - and the process has worked quite well.

Meanwhile, typical of the spirit of comity that defines the organization, the ousted Net prophets didn't lose their honor in their own country, and now, three years later, a post-Kobe backlash may be in the offing, with more and more IETFers recognizing that the organization needs continuity and historical perspective. A couple years later, a number of IETF's gray heads have resurfaced in positions of semiformal stewardship.

A grand melodrama also surrounds the future of IP (Internet Protocol), the communications technology that undergirds the Net and is becoming too old and creaky to support all that is being demanded of it (see "Addressing the Future of the Net," *Wired* 3.05). Even though certain IETF political wounds are still being licked vis-à-vis the 1994 decisions that were made about the next generation of IP, the reality is, as always with the IETF, that if some rebel fighters were to come up with a demonstrably better solution, chances are it would have a hearing and be tested.

Some say the problems with IP can be fixed only when they are free of the homogenizing effects of the IETF; because of its size, the argument goes, only the lowest common denominator of network thinking takes place at the IETF. These dissenters may end up ignoring the mainstream IETF work on the next generation of IP - and strategize a better IP in skunkworks alternative working groups. But in the elastic, anarchic structure of the IETF, there's room for such alternatives, dissent, and working-around.

All told, in spite of these breaches within the community, the IETF, for the most part, is still doing just fine. It's what's going on in the world outside that causes alarm among IETFers.

The price of celebrity

IETFers are realists, perhaps from their experience of dealing with the true nature of networking: IRL problems in electronic plumbing and fiow control, injected with an ornery degree of chaos. IETFers know they have to worry about new users, dumb users, and commercial users, since what has an impact on one part of the Net inevitably has consequences on another. (Consider it another example of the butterfiy-over-China effect.) And IETFers know the Net is caught in the middle of a fatal embrace between the Godzilla of Microsoft and the smog monster of the Regional Bell Operating Companies - with the Terminator of local and national government intervention hovering nearby. Commercial enterprises, government forces, and telecommunications providers are concerning themselves with the Net as they never have before - and in doing so, may screw up one of the most beautifully self-regulating, self-healing, adaptive, democratic, neural networks of people and technology the world has ever seen.

As one IETFer put it, "A government interested in using us is a government interested in how we work." In other words, once governments realize what a treasure there is in the Net, they want to mess with it, regulate it, and censor it. The Exon bill may be coming to a country near you!

Some of the best thinkers in the IETF believe the greatest hope for the relative freedom and independence of the Net lies in a kind of self-canceling effect that may result from the interplay of these new outside threats. Could be. And wouldn't it be pretty to think so?

But the IETF is not into denial. Savvy IETFers have intuited since the mid-1980s that their treasure was too wondrous a thing not to have commercial potential, and keynote speakers have addressed various commercial aspects of the Net over the last several years. At the 31st IETF, for instance, Nathaniel Borenstein - one of the brains behind Carnegie Mellon University's pioneering Andrew electronic-mail network, the Internet MIME standard for multimedia e-mail, and First Virtual Holdings, a force for Net commercial transactions - focused on the technical aspects of the start-up's offering. That an agent of merchandising was addressing an IETF plenary meeting was as much a signal of change as the first New Yorker cartoon about the Internet. Markets and money are coming to matter to the IETF and the Internet as much as protocol suites and internetworking schemas.

The IETF, in the mid-1990s, struggles with the intersection of technology and culture. And the organization necessarily works less well, because culture and policy and economics are far less amenable to the logic of running code. Nonetheless, echoing what Winston Churchill said about democracy - "It is the worst form of Government except for all those other forms that have been tried from time to time" - the political economy of the IETF is so precious, for what it has done and for what it continues to try to do, that we must all hope it lasts and lasts.