Internet Facing Governance Gridlock?
We Trace Two Years of Win/Lose Power Plays
NTIA Rule Making Procedure Reinforces Lobbyist's Zero Sum Mentality Endangering Magaziner's Efforts to Find Consensus Positions Taken on "Public Trust" Aspects of DNS Not Helpful

The reality is that the tried and true Internet consensus building mechanisms have been broken by the zero-sum game folk. As long as zero-sum folk are playing the zero-sum strategy, non-zero-sum players are neutralized. What I want to see is a genuine confederation of the interested parties from the ground up. Of course, we know that the Govt. has difficulty seeing the little guys behind an immense lobbying screen that has formed around Washington. But, in any case, it will certainly default to control by the big guys unless the Internet develops a broad Rough Consensus and Running Code solution by cooperating. Continued fighting is what will tilt the whole game into the hands or the big guys, if it has not already done so. It seems to me that as long as the U.S. Government (or any government) holds out the possibility that intense lobbying might tilt the game to one or another of the contenders, it is pretty much impossible to get a significant fraction of the Internet Community to cooperate. It would be very helpful if the USGovt simply said 'We are in a holding pattern until the Internet Community demonsrates its vaunted Rough Consensus and Running Code solution methods in organizing for the proper coordination, administration, and operation of the DNS and other IANA functions!'" - **Einar Stefferud, 3/3/98**

"We are engaged in a down and dirty political end game here. What Internet old timers think isn't relevant except to the extent that we can convince people with political power in DC to adopt our ideas." **- a D.C. player, 3/2/98**

Introduction to Chaos

We believe that we finally understand what is happening during the Green Paper process. It is not a pretty picture. We will describe our understanding in this article with the hope that the rest of the players involved in the Internet, seeing the downward spiraling consequences of the fragmentation, may rediscover the value of cooperation. At the moment, inside the beltway, two

"elephants" are squared off against each other. On the one hand NSI, backed by SAIC and the resources of Wilmer, Cutler & Pickering. Lloyd Cutler himself, the biggest legal six shooter in DC, is defending NSI in the suit by Bode and Beckman. The second "elephant" is a barely visible AT&T IBM alliance. At times it has been facilitated by Brian Kahin at OSTP and Becky Burr at NTIA.

It seems that this alliance would like to break into the Internet registry game. While it is difficult to tell the current stength and exact direction of the alliance, we feel, at the very least, that it should not

Ira Magaziner Discusses Plans for Next Stage of IANA Transition in COOK Report Interview
Discussion Offers Detailed View of His Approach
He Expects Community to React to Green Paper

Editor's Note: We interviewed Ira Magaziner by telephone on February 23rd. We commend Ira for patient, no-holds-barred, approach that he took in this discussion. He doesn't have all the answers and is not afraid of admitting that. The conversation below shows the current state of his thinking in a detail not elsewhere available. In it he describes with candor the methodology of his approach. Those who don't take the time to look at and try to understand what he reveals here about his decision making process and the direction in which he intends to push events should

not complain if, having opted out of the process, they are later unhappy with the outcome.

COOK Report: You clearly have a very difficult task ahead of you. One that is filed with minefields. The opportunity for things to be misunderstood and taken out of context on significant mail lists like the IETF list is great - especially when the Green Paper uses words that have the new IANA Corporation going outside the boundaries of the old IANA's function.

be allowed, through access to the government rule making process, to derive special advantages. In short IBM and AT&T should be told that the only way that they will get into the registry business is to join in cooperating with all the other players who have been seeking the same end. We would not deny them the right to join the parade, but we see no reason to grant them any special privileges that would in essence constitute "a taking away" from others who have spent a longer time waiting in the queue.

What's Happening

Here is what is going on. "Dot" gov has already been turned over to the US government (GSA) by Network Solutions, and the Green Paper proposes that NSI will "shift operation of .edu to a not-for-profit entity", which we now know will be Educom. Therefore we have to assume that .com will be put into play by those who, for what they undoubtedly feel are the best of reasons, are advocating that U.S. government act in the "public interest" by declaring all of Internet name space as something that should be run on a non profit basis.

We know that IBM and AT&T have been quietly talking to Brian Kahin and Becky Burr, the day-to-day leaders of the rule making process, since last September about becoming involved in the DNS registry business. First, we are told, as an effort to provide POC and CORE with a database. Most recently we are told that IBM and AT&T are now being lobbied to step in and run .com on a non profit basis -allegedly motivated by their concern for the public interest of the Internet community. Multiple problems exist with the advocacy of this approach. We are not so naive as to believe that these two huge companies would do this without getting something back in return - namely control of the .com database which would be of immense value to them as they expand their business efforts in the Internet. As we point out later in this article there are also huge privacy issues involved in the way in which that database is handled.

The second major problem is the issue of blurring the distinction between public interest and public trust. This is an absolutely critical distinction. As we point out later in this article, the ITU is an international treaty organization to which the United States belongs. Telecommunications related issues defined as matters of public trust automatically fall under the purview of the ITU. Define Internet name space as a matter of

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the "public trust" and you give the ITU control on name space. You also give it the lever that Bangeman and the EC now want for it to become the international governing body for the Internet.

DNS has turned into not only a battle for Internet governance but for control, via the ITU, of a phenomenon that to many appears uncontrollable. The TCP/IP protocol, left to the free market that the Clinton Administration says it supports, is likely in the next five to ten years to become defacto protocol for almost all forms of telecommunications. Left unchecked it has the power to obsolete trillions of dollars of embedded infrastructure worldwide. Companies like the European PTTs and AT&T and IBM have ample reason to want to be able to grab control of the technology of the Internet and ration its arrival into the market place. Remember the promise of ISDN and what your LEC did to that? The same issue is at stake here.

ISOC and Public Trust

Watch very carefully what ISOC does on this score. You can bet that, when ISOC files its Green Paper comments, it will call for non profit registries to be operated in the public trust - perhaps under its aegis. We called ISOC on March 5th to find out whether anything was on record. We were told that the ISOC response to the Green Paper wasn't finished. But on March 6, Don Heath confirmed that the ISOC response would call for operation of name space as a "public trust."

Now perhaps Burr and Kahin are motivated by the "public interest" and not just by hatred for "greedy" NSI? We are willing to give them the benefit of that doubt. But we think they may be pushing for the adoption of terribly naive policies. It is now clear that the last minute addition of the user mem-

ber seats on the IANA Council Board were the result of the same non profit, "edu," push that would like to see IBM and AT&T take over and operate .com on a non profit basis.

Such a move would presumably divest NSI of its back office as well as its front office operation. For the reasons we have mentioned, we fail to see how transitioning .com to a not-for-profit is in the public interest, or how it would ensure stability of service .com for nearly two million .com registrants. We would hope that Magaziner uses the leverage that the US government has via its cooperative agreement to work with NSI to open up .com, which is exactly what the Green Paper has proposed.

Unless one were to 'nationalize" the infrastructure that NSI has already paid for, a non profit .com would likely have to invest $30 million dollars to replace what NSI has right now in its back office registry operation. What would make anyone think that IBM or AT&T would invest that for purely altruistic reasons? Do we really think a non-profit could provide a better quality of service for $35? How long would it take for such to come on line? What would the funding organizations be given in return? What would be done with the interest of the current .com holders in the meantime? Note that if we define name space as public space or something that deserves public interest protection, and if we manage, by not using the word trust to keep it out of the hands of the ITU, we have still created a new monopoly over TLD space and have voided Magaziner's announced intent to introduce competition.

Two Contrasting Views

Here are two contrasting views: Mike Roberts suggested to us that "large stakeholders in a given TLD community should come forward voluntarily and offer to absorb the costs of the registry the TLD registry while operating it under general rules and policies that will be established by the new IANA corporation. And at the same time, having the same arms length relationship with competitive providers of registrar services that other TLD registries will have. This suggestion applies to any/all TLD's including .com."

We asked another observer: "could IBM and AT&T get gov't blessing to take over .com on a public INTEREST non profit basis?" His response: "probably not." "Should they?" His response: "No." "Could it be done in such

a way that public interest isn't blurred by the bureaucrats and the rulemakers into use of the word public trust?" Response: "Yes. Call it a collective private trust."

He concluded: "It's not clear that IBM and AT&T care about this anymore under the new arrangements - although there are persistent rumors about IBM. I suspect that other providers would scream if IBM or AT&T took this over because of the potential anti-competitive implications. It's one of the wise dimensions of Ira's approach - leave everyone answerable to the courts for anti-competitive abuses. It's also the reason why the last thing one wants is a cartel body in Switzerland running all this. Switzerland consists predominantly of cartels. It not only has no anti-competitive law - it actually has the converse - cartel supportive law! Some of the IAHC players though they were pulling a fast one - not only no government oversight, but a private organization subject to no law that normally keeps such organizations in check."

We have been puzzled and alarmed for six months by the reported pro POC/CORE leaning of Kahin and Burr and by their behind the scenes involvement of IBM and AT&T. We now think that we understand what was going on. Namely that there is bloc within the Inter Agency Working Group and rule making process that is convinced that a private sector solution is not appropriate. Perhaps this group was awarded the user member seats on the IANA Board as a means of placating it? As we have pointed out in this introduction and will explain in more detail in what follows, we believe that this group is misguided at best in what their intentions would mean for the Internet. We believe that Ira Magaziner will not support it. We focus on it at length in order to bring out into the open so that others will know what some of the solutions are that are being advocated in closed beltway circles.

Like it or not, this *IS* now a political process and the only way to influence the results is for every affected person and organization to register a reasoned and thoughtful statement of their concerns with Magaziner and the Department of Commerce.

Origins of the Current Mess

In September 1995, the NSF faced with responsibility for paying NSI for the costs of administering the exploding .com database authorized NSI to charge

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$50 per year per domain name. Outrage among users who never understood the necessity for the charges mixed with the entrepreneurial juices of those who ran the numbers on the rocketing growth of the Internet and decided competing with NSI could give a money making machine of vast proportions. NSI immediately became the company the Internet loved to vilify and only made matters worse for itself by the most inept responses to the attacks it suffered.

Three NSF sponsored forums between the fall of 1995 and the summer of 1996 found no agreement on what the parties should do. In June of 1996 the new ISOC Exec Director, Don Heath met with Robert Shaw of the ITU and with representatives from WIPO and INTA. Out of that meeting came the proposal for IAHC that was sold to Jon Postel during the summer of 1996. Jon picked its original seven members and set in motion its deliberations during the fall of 1996. Sources claim that Jon hoped the IAHC results would bring him and IAHC under the ISOC legal umbrella and get him indemnified from suit. As the IAHC worked toward the announcement of its proposed Internet community's solution to the problems caused by so called "greedy" NSI, the Internet had grown to the point where it no longer could be considered a single community anymore.

When early last year IAHC announced its proposals and claimed in them to be speaking for the entire Internet, it delivered to the world a set of proposals worked out on a private mail list (which had a public component). On February 4 1997 it announced a process calling for the creation of infrastructure to handle the creation of Domain Names for the world. It said that it, in effect, was the sole authority to do this and set itself up in immediate conflict with NSI by suggesting that it should be the entity to handle .com after the cooperative agreement with NSF expired on April 1 1998. It marked its very aggressive stance by choosing .web and .art as two of its seven new domains with the full knowledge that two other entrepren-

eurs who believed they had Postel's approval had invested time and money in establishing their own registry operations. The pattern of zero sum, we win, you loose, was effectively set.

IAHC - an Assessment

Not surprisingly NSI as a rather large loser under the zero sum scenario became hostile to the IAHC group. But, at the same time, a wide cross section of interests took a skeptical look at this self-appointed group that was proposing to let the fate of all Internet business addresses (DNS) be solved by an organization chartered in Geneva and enmeshed with WIPO, INTA and the ITU - interests that were hostile to the young Internet's technology and its ability to obsolete the paper based publishing standards WIPO depended on.

Many came to view this move as the Internet old guard teaming up with representatives of the publishers and trademark old guard and determined to keep the net international by taking Shaw up on his proposal to ask the ITU to hold the Memorandum of Understanding (MoU) by which the IAHC process was established. Traditional conservative ITU oriented telcos like France Telecom are happy with the results and have endorsed the process.

Tony Rutkowski offers a constructive summary: Of course it's more than just the ITU "holding" the MoU. If it were just that, they wouldn't have bothered. The MoU itself adopts a key strategically important new ITU instrument first created the previous year for the equally strategic mobile radio community, it establishes ITU jurisdiction in the Internet arena for the first time, and it calls for such further roles as may be needed. Lastly, by declaring domain names to be a "public resource" the equivalent of radio spectrum, it assures ITU involvement forever, since their treaty charter assigns them a permanent role where such resources are involved.

Since then the ITU's Secretary General as we have seen, has become quite openly adamant that he considers the ITU the only appropriate forum for deciding issues of Internet governance. However, in addition to Rutkowski's and NSI's ire, the IAHC MOU drew the anger of a wide range of players who saw legal control of DNS being moved outside the US. The CIX opposed it and behind the scenes major corporations began to weigh in with doubts. The Private Sector Working Group comprised of: America On-line, Inc., Ameritech Corp., AT&T Corp., Bell

Atlantic Corporation, BellSouth Corporation, British Telcommunications plc., The Dun & Bradstreet Corporation, Information Technology Association of America, Nabisco, Inc., Microsoft, Prince plc., SBC Communications, Inc., U S WEST, Inc., Warner-Lambert Company was one such. Zero sum behavior spreading from the IAHC's game would mean losses for many others. These others began lobbying very hard in January and February 97 and by March 1 had forced the creation of a US Government Inter Agency Working Group on DNS (IAWG).

"Adult" Supervision from U.S. Government

This put DNS into the hands of presumably well meaning federal bureaucrats most of whom had no idea of what it was or how it functioned. Ira Magaziner was the real power behind the group but unfortunately he was finishing his electronic commerce study which was finally released on July 1, 1997. It added a whole new level of complexity to the fissures appearing in the foundation of the Internet. It increased opportunities for federal agencies to play win/lose games with each other. It also mean that it would be another six months before the players figured out that Internet governance and institutionalization of the IANA administrative functions were what the debate was really about - something one of our sources had been pointing out since the summer of 1996.

As the IWAG got up and running a year ago the level of chaos and complexity increased substantially. For now you had 20 Federal agencies which, invited to act ostensibly for the good of the Internet, could either do so or use the opportunity to put their own agenda on the unfolding chaos. OMB, rather than Bruce McConnel, unaccountably delegated Glen Schlarman to the lead the process in the early weeks. Schlarman's knowledge of the consequences of the power he weilded was minimal. At the same time Brian Kahin was invited to take Mike Nelson's old OSTP position and to take a leadership role in IWAG along side Becky Burr, who as a lawyer from the FTC, was brought to the Commerce Department to head up the NTIA Department of Commerce effort under Larry Irving. Kahin's arrival was greeted by unanimous gasps of dismay from everyone with a clue on the Internet side of things. His critics complained across the board that Kahin, as an intellectual property attorney couldn't see the Internet from a perspective any broader than his immediate legal background. Burr, we were told, came to the task at

In any case how ironic that the feds, who were called in because POC/CORE seemed likely to lose, put in charge two individuals who seem to have decided that NSI is so bad that since POC/CORE was the only other game in town the POC and CORE should win. (Dear Readers do you see now what we mean by CHAOS?)

hand with a considerable amount of arrogance and very poor listening skills.

The whole crew decided that they were running a policy game independent of technology constraints. The plans to launch an independent American Registry for Internet Numbers (ARIN) were quickly held hostage to technological naiveté. One of the players informed us in April that approval for ARIN was being denied because the administration favored competion, and IP number portability should be executed to ensure that. It seemed that the white house politico had never heard of CIDR! For three months thanks largely to Burr's combination of arrogance and technology ignorance ARIN lost and Becky won. Finally the disputes were elevated to the level of Magaziner who listened carefully, understood the concerns, and ordered ARIN formed. Ira would have to come in again during the fall to clean up after Brian and Becky a second time. Becky mean while showed her ability to learn by telling a Board member of ARIN in January 1998 that she was still not reconciled to its existence.

Meanwhile IHAC turned into the IPOC and the POC sprouting the PAB and CORE along the way. These folk brought zero sum to a new level as they set about requiring signing their MoU in order to be able to deal with them. It was like a church. You had to sign the declaration of faith to belong and by the winter of 97-98 internal POC memos were warning the wayward that dissidence from the direction of the program was cause for expulsion.

Because of Vint Cerf's support for the POC and because of its sponsorship by ISOC, the story got started that the problem was not CORE or POC, it was just those darned Internet old timers who aren't willing to see the net grow up. But in reality as Stef recently said: "The Internet Old Timers are by no means a solid block. That is a

myth pushed by the news media. We are by no means agreed as a block about what should happen next."

The IANA

Jon Postel meanwhile continued through the increasing chaos of 1997 unphased. Declaring his continued support of the IPOC and then the POC he assumed that the zero sum earth quakes happening around him would not affect him. He was as one close friend said, utterly convinced of his own ability to always make the right decision. When in the summer of 1997 the registries begged him to try to extricate himself from the DNS wars and help them with IP numbering policy and with building a framework that could withstand legal second guessing of his appeal process, his actions suggested that he gave the complaints short shrift. When by the end of the summer he wanted to repoint the root and found the NSF at the order of the IAWG blocking him, speculation arrose that he would move to Europe where he might be more warmly received.

By the fall of 1997, with Magaziner having pointed out that the handwriting was on the wall, Jon started to think about a transition process to a more broadly based IANA structure. The structure however was geared to the POC and the ISOC and the MoU. Jon couldn't seem to bring himself to admit that the basic Internet user constituency had changed in nature. He was for the most part loath to surround himself with any one but close friends and supporters. The same pattern was shown by Jon in the ITAG group that he selected last month. Don Heath's pursuit of POC victory via the Internet Society rendered ISOC anathema to many. Zero sum games were further fracturing the nets ability to reach consensus. When at the December IETF the POC arranged an allegedly technical briefing with the IAWG, Dave Crocker tried to show the IAWG that the POC technology would work just so long as the seven new TLDs were in the root by the following Monday. Jon had been told by the feds that the insertion would not happen. It did not.

After Green Paper Rejects POC Does IAB Support It?

The POC versus the rest of the Internet continued to spread fissures in the nets foundation. According to Tony Rutkowski, "the IAB once had a kind of IETF oversight role in the late 80s, but

What else is in the data base? The expert's response was stunning: "The contact info (name, phone address and email) on (up to) three people for each name. (Technical, admin and billing). That alone would give you the name of almost every sysadmin in the US (or maybe the world if you combined it with other DNS databases from CORE for example) as well as the "owner" of every Internet associated business.   .   .   That's why the POC/CORE idea of aggregating it with all, other TLD data in one central database is so frightening. . . . Not to mention that the revenue value of being able to e-spam or telephone solicit that community is enormous. Finally if all such databases worldwide were agreggatable, or were just one huge database as CORE proposes, you'd have the potential in some extreme future situation for concerted simultaneous police action against the Internet world wide.   There they are. Start bringing them in. Unlikely? We certainly hope. But why create the opportunity?"

this was terminated in 1992 by the IETF because of the IAB's inappropriate conduct [in choosing a draft for IPv7 based on CLNP], and the IAB was subsequently adopted by the Internet Society . . . Stef: " The IAB took on a sort of fatherly advisory role to the IETF, with its members selected by an IETF Nominating Committee, and endorsed by the ISOC Board of Trustees. None have ever been rejected". Tony: "Because of its status, the IAB [might be seen to be] tightly bound to the Society's position as a highly interested party with strong views including it's publicly declared position that the Society itself as a small technical professional organization is somehow responsible for DNS matters - as well as its involvement with and promotion of other interested parties it has crafted such as the CORE organization."

An argument between Stef and IAB Chair Brian Carpenter flared late last year over whether the IAB was sending representatives to the POC or just lending them some technical expertise. When called by Stef, Carpenter said not representatives, just folk lending technical advice. But on February 23 Carpenter in a note to the IETF said: The IAB was happy to nominate technical representatives to the IAHC, and to the gTLD-MOU POC, and within reason would do the same for any IANA-approved gTLD registry requesting technical advice.

Stef then wrote to Carpenter: The last time we publicly discussed (in the poisson mailing list) the IAB "nomination of technical representatives to the POC", you adamantly pointed out that those were not IAB representatives, but only IAB identified experts who were referred to the POC to help them with technical issues, but not to represent the IAB. In short, their names were purportedly given to the IAHC as IAB qualified experts, and when appointed to their POC posts by the POC, they were to be on their own to represent only themselves as technical advisors. You pointed out then that I had misunderstood about them being "representatives" of the IAB. I now find it very interesting to see from your current comments that they were IAB representatives after all.

Stef was asking Brian if he supported the POC politically by virtue of sending representatives. And by implication if the IAB would send representatives (ie give polictical support to) only IANA supported registries. On March second Brian responded: saying you are "paying far too much attention to very minor wording choices. We're not lawyers; our documents should be read accordingly." [Editor's note: this is the same man asking that no special attention be paid to his use of the word "representative" who raised hell against Magaziner because of Ira's misuse of a single word (assignment rather than development) as discussed at the beginning of this article.] Asked if response was his personal view or that of the IAB, Carpenter responded: "thus far I believe [it is] the IAB's view." This was yet one more unfortunate fissure in the Internet's foundation resulting from the POC process of forcing folk into win lose positions.

RFC 2282, found at http://ds.internic.net/rfc/rfc2282.txt, notes that (1. As part of the nominating process, "The Internet Society Board of Trustees reveiws the IAB candidates, consenting to some, all or none" "If some or none of the candidates are confirmed, the nominating committee must reconvene to select alternate candidates for the rejected candidates." (2. "The ISOC President appoints the non-voting chair [of the nominating committee]. (3. "Anyone may request the recall of any sitting IAB or IESG member, ... upon written request with justification to the ISOC President".

The control that the ISOC has over the nominating process for the IAB; the ISOC's support of POC and CORE, and the IAB's willingness to help out such IANA approved registries as CORE certainly do bring into question the neutrality of the IAB in these disputes. The IAB is not, as the green paper states,"an international membership board that represents the technical community of the Internet". Rather we would argue that the IAB represents what ISOC is content to see it present and as such represents only a fraction of the technical community. The seeds of further trouble may be burried in this issue.

International Fall Out: POC Lost and Therefore Europe Lost - Consequently Europe Must Now Win by Making US Lose

The Green Paper side stepped the CORE/POC debacle by omitting mention of it. European politicians recoiled in anger at seeing themselves deprived by the US government govermnent of the recognition handed them via the internationalist ITU approach of the CORE/POC program. Of course the US government was called into the sway precisely because of the take no prisoners approach strategy of POCand CORE. Thus the sad downward spiral. IAHC seeks win lose. But rather than lose IAHC's oppenents call in US government, which hands them a victory and IAHC/POC/CORE is now the loser. Rather than accept their loss POC/CORE calls on the EU to fight the US.

On Feb 26 Jeremy Scott-Joynt, wrote in Total Telecom: "The European Commission has told the United States government that its plans on how to govern the Internet amount to a de facto U.S. takeover of the international network.

In a draft reply Wednesday to the U.S. government "green paper" . . . the European Commission said the paper ignored the need for an international dimension to Internet governance. The document, . . ., "seems to seek exclusive U.S. jurisdiction over the Internet," said the European Commission response paper published by Martin Bangemann, the European commissioner in charge of communications policy. Bangemann said he hoped all

15 European Union member states would adopt his document as pan-European policy. . . .

The U.S. approach smacked too much of an attempt to retain control of a system which -- though it may have originated in the U.S. -- has taken on global dimensions, according to Bangemann. "We want to have a global discussion," he said.

It is a sad commentary that, while Bangeman is crafting a European based political position on the Internet, Ira magaziner is trying to craft an internationalist, what-is-best-for-the-Internet position that, in this contentious environment, is seen by the Europeans as nothing but self-serving. If this spirals down further into the United States Congress, the Europeans will really then see what self serving is all about.

The Kahin Burr IBM ATT Database Manuevers

So much for the chaos that is by and large on the public record. For the past six months we have been tracking a shadow story still going on. The other "elephant" mentioned above is IBM and ATT (led by their Washington lobbyists Roger Cochetti and Marilyn Cade).

We confess that we are stumped by one thing. The only reason that we can come up for the behavior of Brian Kahin and Becky Burr is an abiding hatred of NSI. We were amazed to hear a statement from an ally of a major figure in the CORE/POC camp saying that they were in the CORE because the spooks have control of DNS and must be pried lose at any cost - a CORE victory it was said was the only way to do this. The reference to spooks is to SAIC's work for CIA and NSA subsequent SAIC purchase of NSI. It is mind boggling that this absurd rumor can still motivate mischief making!

In any case how ironic that the feds, who were called in because POC/CORE seemed likely to lose, put in charge two individuals who seem to have decided that NSI is so bad that since POC/CORE was the only other game in town the POC and CORE should win. (Dear Readers do you see now what we mean by CHAOS?)

By September Marilyn Cade had attended a meeting of the CORE database planners in the US. And Kahin and Burr had, according to well placed informants, begun a series of private meetings with IBM, ATT and Oracle to discuss an arrangement where these companies would help CORE build its database. We trust that they did a clever job of not creating any paper trail that could be defined as a federal record because a FOIA battle, waged this fall and described in previous issues, came up empty. We are totally confident however of our assertion that such private meetings took place because we have identified no less that six different people working for six different organizations who have told us parts of the same general train of events

When Emergent, using Oracle software, got the CORE contract in late October, Oracle dropped out of the discussions and DEC was recruited. From what we can tell the goal has evolved into ways to share .com and beef up the root servers. Earlier this year, even the ITU's Robert Shaw, in response to prodding from us, stated that CORE received technical help in its database design from AT&T and IBM.

Kahin and Burr met with Ira Magaziner last October 15th saying they had a policy solution all wrapped up and ready for him to announce. Fortunately he knew that he didn't know enough to endorse their solution. He sent them back to the drawing boards. Realizing once again that he would have to begin to do the serious work himself, he immersed himself in the process totally beginning in November.

On March 2, we received a communication from a significant player in the non profit community whom we have known for a very long time. The communication spoke of the desire to convince AT&T, IBM and some of their politically high powered friends to team up in order to run .com on non-profit basis - the back office registry, not the day to day retail registrar operation. It expressed the belief that such action would go far toward defusing the current crisis. For if all registries for TLDs were non-profit, the behavior pattern would improve immediately. The communication concluded that instead of would be millionaires trying to force the creation of arbitrarily chosen new TLD's, those involved might be able to reach an equilibrium where representatives of communities of interests could come forward to request new divisions of existing TLD's on behalf of their legitimate constituencies.

We have to wonder why this person seems to think that IBM and ATT would some how be more altruistic that SAI or NSI! Perhaps the non profits and "edu"s are thinking of supporting IBM and ATT, if it takes care of their DNS needs on a non profit basis? In return for a public private partnership, would IBM and AT&T get access to infrastructure that they could use to open their own registry to compete with SAIC to share .com? The Green Paper, afterall, says NSI must give the government its data base. If IBM and AT&T can get their hands on the data base, they can take a slice of NSI's pie more easily

The NSI Database Issue

We asked Tony Rutkowski if he had any notion why these two huge companies would find competing with NSI in the DNS registry business so interesting that they might go to such lengths during this rule making process. For the negotiators thought the matter of the possession of the NSI database had been settled in NSI's favor on the eve of the publication of the Green Paper. To see it not so came as a bit of a shock.

Rutkowski responded: They'd probably love to have access for business purposes. It's the mother lode of all Internet strategic databases. We asked an expert: is Rutkowski right? The expert responded: yep. Then we said: besides transactional data of all sorts about two million owners of domain names, what else is in the data base?

The expert's response was stunning: "The contact info (name, phone address and email) on (up to) three people for each name. (Technical, admin and billing). That alone would give you the name of almost every sysadmin in the US (or maybe the world if you combined it with other DNS databases from CORE for example) as well as the "owner" of every Internet associated business. You'd also be able to see (for instance) who is moonlighting by doing a "whois" search by name. Any other business with domain names that your sys admin employee might have would pop right out. That's why the POC/CORE idea of aggregating it with all, other TLD data in one central database is so frightening. (Personal notes from the FBI on key escrow to that set of people or the IRS on audits is REAL leverage. Not to mention that the revenue value of being able to e-spam or telephone solicit that community is enormous. Finally if all such databases worldwide were aggreggatable, or were

just one huge database as CORE proposes, you'd have the potential in some extreme future situation for concerted simultaneous police action against the Internet world wide. There they are. Start bringing them in. Unlikely? We certainly hope. But why create the opportunity?"

These implications to privacy and marketing are horrendous. We can imagine however that such tactics suit the law enforcement agencies just fine.

The Non Profit User Member Part Of The Puzzle Falls Into Place

On March 3 we discovered the Educom response to the Green paper. It was fascinating. Two relevant portions follow. Here is the first.

"(3) The Green Paper is unbalanced in its treatment of private sector and public sector development and use of the Internet. As noted above, research and education, to cite only one public sector constituency, have a significant interest in the successful technical evolution and economic growth of the Internet. The Clinton Administration has initiated and is supporting Internet projects in many Cabinet agencies (such as TIIAP and ATP in your own department), to promote its use for education, research and to achieve many social and economic benefits beyond electronic commerce. The incorporation documents of the new non-profit organization and the composition of the Board of Trustees and of its various advisory groups must reflect the importance of public sector access to and use of Internet services and technology."

This combined with several points from our interview with Ira Magaziner makes it clear why what we believe to be risks are being taken with the new IANA corporation by shoving user members onto a technical policy board. As Ira said, faced with heavy lobbying by the non profit and educational library community the "unworkable" [our word] group of seven user members balancing seven technical members was added. In our interview with Ira that follows this article we have enu-merated at length the reasons why making this top technical Internet council a general policy making body is a bad idea. We note also that the user group board members may have been pushed by NTIA to keep ATT and IBM happy on trade mark issues

Here is the second point from the Educom response - one which is even more interesting than the first.

"(4) Along with many others in the Internet community, Educom believes that the proposed registry(ies) function for Domain Names should be operated on a non-profit basis on behalf of the holders of the names in the respective top level domains. The pairing of a non-profit registry function with a private sector registrar function for the TLD's will best achieve the principles set forth in the Green Paper."

In view of the earlier wish expressed by a long time acquaintance that IBM and AT&T and a few friends would put their weight behind the idea of a non profit registry, this assertion is quite startling. If IBM and AT&T could get possession of the NSI data base what they would make from the marketing potential in it would more than pay their costs in running a back room operation.

We can not imagine that NSI could be forced to give full access to their back office operations. However if IBM and AT&T, thanks to the inside track given them by Brian and Becky, have been designing the right kind of database software, we can imagine that they would be in a good position to connect, in real time, their back office to NSI's back office operation and have both run in a distributed fashion.

Forcing Lose/Lose on Every One

Rutkowski gave us a final reminder. You've left out entirely the federal judicial system - which from what I know behind the scenes is what the agency staff are most "scared" of. The PGMedia and Bode suits could land all of this in the hands of a federal judge like Judge Green and the Consent Decree.

So what then do we have? Not just elephants, but entire circus rings full. The American elephants, NSI, IBM, AT&T in one ring. In another the US Congress, in a third the Europeans, in a fouth Asia, and in the fifth the US Judiciary.

The IANA Transition Advisory Group (ITAG) is in a sixth ring. This group (Randy Bush, Geoff Huston, Brian Carpenter, John Klensin, Steve Wolff and Dave Farber) is composed primarily of long time close associates of Jon Postel. ITAG is appears to be set up to perform the detailed design of the new IANA corporation. Drafting the articles of Incorporation and the By-Laws is something that has to be well underway right now for there to be a chance for Magaziner's time-

Educom's Position Would Define Name Space as a Public Trust

In response to questions about the Educom response to the Green Paper, Educom Vice President Mike Roberts told us: I want to outline the logic in our position on the registry function, which is where we differ with the GP. This is an elaboration of the four points in Dr. Heterick's letter.

First, we regard the TLD space as public space. This is intangible (ie virtual) public property, since it is defined and delimited by the applicable RFC's. For instance, names can only be so long, characters must fall within a specific set, etc. Misuse of this space potentially affects all Internet users, etc. Hence the letter says use of the space should be regarded as a license to use, not private property suitable for private gain, etc. Similar to spectrum licenses, although the parallel should not be pushed too hard.

Second, we accept and support the USG's proposal to vest control and stewardship of the root domain in the hands of the Trustees of a new non-profit (called 'IANA corp' below) to be administered as a public trust on behalf of all Internet users worldwide.

Third, we support the idea of delegating the policy administration and operational oversight of whatever number of TLD's the IANA corp concludes should exist to decentralized registries, which themselves are accountable to the holders of the names in their TLD community, and - consistent with the public trust aspect flowing from the top - operated themselves as non-profit or not-for-profit entities.

Fourth, we support the idea that as a general practice the registry entities would make suitable arrangements, using commercial practices, for the day to day registrar functions. This might not apply to all TLD's since some of them are entirely government or public sector, e.g. .gov. (Although it is interesting that GSA has in fact outsourced the operation of .gov.)

Now, a couple of your comments suggest you worry about a large multinational corp or group of corps taking on the registry function for .com (or new TLD's in the .com group), even if it were done on a non-profit basis. Certainly there is the potential for abuse in the activities of large corporations, although I suspect they might point to equal abuses by small corporations. In any event, I would make two comments. One, the chief hazard is in the notion that a TLD space is private property which the owner has a right to exploit to the limit of the law(s) covering use of private property. Second, one could make the argument that economies of scale mean that the worldwide Internet TLD registry function should all be handled by the new IANA corp directly. I've learned over the years that most so-called economies of scale arguments don't pan out in practice and further, this is not the Internet style. Jon already operates a very decentralized name space administration and, because of continuing growth and complexitiy, the direction should be more decentralization, not less. Hence, we argue that each TLD, however many there are, should be managed by a non-profit entity that holds itself accountable to its second level name holders, who are the closest thing to constituents that we're going to get.

I don't necessarily expect you to agree with all of the above, but I did want to make sure you followed the thread of logic in our recommendations to Commerce.

line to work. Unfortunately, the pattern being followed is very similar to Jon's appointment of IAHC. ITAG is a closed, top down, appointed group working to revamp the most critical aspects of the Internet. We have seen no sign that, apart from getting initial clearance through Magaziner, the ITAG will do other than present its redesign to the world as a fait accompli. IAHC was the previous such win/lose solution concocted by Jon as IANA.

It is becoming clear that the new IANA will have broader powers than the old. ITAG may be the most important "working group" in the history of the net. It is a damned shame to see that it has not adopted the IETF tradition of openness and is working instead behind closed doors. What will be done to ascertain if the result has any consensus behind it? When ITAG is finished, will it present its draft anywhere before sending it to Magaziner? Now that rule making is underway contacts with government must be done in the open. ITAG as a

private sector group falls outside these constraints. Any corporation wishing to affect the outcome at this moment has to be thinking about whether an approach to ITAG could be fruitful. This approach is hardly fair to the Open Root Server Confederation, one group that is working in the open to develop broad consensus for a solution to the DNS problem. We recommend a look at <www.open-rsc.org>.

Ira Magaziner - as Ring master - tries to honest broker what is best for the Internet and takes an internationalist stance that ironically the European's miss as being US centric. Events push Ira out on a limb. But because he is not a formal part of the rule making process, if he ventures too far out on a limb and it breaks - politically - he's out of there. Can Magaziner be sacrificed? If need be sure. When it blows apart blame Ira not Becky or the department of Commerce. The Internet community - no longer cohesive - is heavily fragmented. Fighting amongst itself, it risks surrendering the field to new players which will remake the Internet top

down while deftly handing out higher prices, less innovation and less freedom for end users.

And this is what we likely have in store according to an authority who knows these processes better than we do. "To give you an idea of what is likely to come next:

1. The NTIA will assemble and review the comments and a draft Report and Order will be prepared. 2. This draft will be coordinated through the interagency committee with all other agencies. 3. It will then go to Irving to officially approve. 4. There could possibly be another loop in the process - such as a Further Notice of Proposed Policy/Rule Making. 5. Upon publication, it will have the force of law, will be reviewable by the Federal Courts, and will form the basis of U.S. positions to other governments and in intergovernmental organizations."

The elephants are mating. What will be left for the rest of us when they are done?

Importance of Words

For example, Brian Carpenter, the Chair of the Internet Architecture Board (IAB), today (2/23/98) posted the IAB's reply to the Green Paper to the IETF mail list. Here is one part of his reply to you that has already drawn an angry response.

"3. The IAB is a committee of the IETF, the open international voluntary standards organization for basic Internet protocols. We are therefore concerned that the proposed responsibility of the new corporation to "coordinate the development of other technical protocol parameters as needed to maintain universal connectivity on the Internet..." might be misread in such a way as to undermine the autonomy of the IETF. We propose that the word "development" should be replaced by the word "assignment". [**End of statement by Brian Carpenter**.]

COOK Report: Do you wish it to say "assignment" rather than "development?"

Magaziner: Yes. I think that would be a better word to convey what we meant. Our intention was certainly not to have this new organization interfere in any way with the responsibilities of the IETF.

COOK Report: Glad to hear that. But the process of distrust tends to develop a life of its own. For example consider this exchange:

Billy Biggs -: And again, I think that

Ira et al. know exactly what's at stake when they try to hand over protocol assignment responsibilities to this new organization. [**Editor**: Note that Biggs is careless in *his* choice of words saying protocol assignment when he should be saying either protocol development or port number assignment.]

Carpenter in response to Biggs: We (the IETF/IESG/IAB) have two choices (1) leave the assignment of protocol numbers with the IANAng, get to choose some board members, and have significant influence; or (2) do the assignment of protocol numbers ourselves, not get to choose any board members of IANAng, and have no influence. Pick one. Ira doesn't care which; he told me that personally a couple of weeks ago.

COOK Report: This is already being used on the IETF list by those who don't like what you are doing to say that Magaziner hasn't learned anything and that he is just like the Bourbon kings who thought that the people could be trifled with as they choose. Even Noel Chiappa, who is normally level headed, said if Ira is going to treat us in the fashion that Brian implied (either play ball and have influence, or do our own thing and have none), then we might as well pack it up and move to Switzerland. Some on the IETF list are portraying it as an attempt by you and the US government to usurp the entire authority of the IETF.

Magaziner: Let me make clear then what is going on. I think that the word "development" was not a correct word to represent the function we were trying to indicate and that has been pointed out to us by a number of people. So that is a good criticism. There are mistakes in this

draft report as there would be in any report and when they are pointed out, we acknowledge them and say we will fix them. I think the process of assigning port numbers is what we are trying to convey. Secondly I think it is accurate to say that we would respond to the sense of the broader community about whether that function which has been performed by Postel historically should be performed by this new organization or whether it should be performed by the IETF itself. I think whatever the community wanted to do on that would be OKAY with us. What we did in our report was to propose this to continue as a IANA function, but if the IETF wished to, it could assume the authority. But let me again make it very clear we don't intend the word development. It was an honest mistake which we will correct.

COOK Report: Another minefield is the question of Jon's authority . Only yesterday (2/22) Dave Farber, an ITAG member, put out on his IP list the following: "Background to announcement of ITAG" that, Farber explained, was "drafted by the ITAG". "The initial task of the ITAG is to assist Jon in drawing up draft statutes for the new, not-for-profit, IANA organization, with particular attention to its open, international governance. This is why the ITAG members have disqualified themselves from membership of the initial Board of the new organization. They will also advise Dr Postel on any other critical issues concerning the transition to the new organization. The ITAG members were invited on a personal basis by Jon, and do not officially represent anyone

except themselves." It looks to us like the ITAG and Jon are making the assumption that Jon has the authority to execute the redesign of the IANA on his own.

Magaziner: No I don't think that is true. We are in touch with Jon regularly and he is not taking any steps without consulting us.

Public Disclosure Process During the Comment Period

COOK Report: Sounds good. Let's try a couple of process questions. While the process of making comments public at this point is apparently a normal part of the rule making procedure, what seems perplexing and likely to create a probability for misunderstandings and further instability brought about by bruised egos and flared tempers, rather than coherent focusing of parties on a solution is the fact that we have just a month more of open comment and that, during that time, everyone is likely to be in the dark as to how your thinking is evolving.

Now that we are in a period of public comment and feedback has anyone ever suggested to you the possibility of trying to create some means where current thinking could be put up on some sort of read only mail list?

Magaziner: Sorry we simply can't. What is new about what we are doing here is that we are posting everything on the Internet. That is, for example, we are requiring transcripts of meetings that we have and we are imaging them up onto the Internet.

COOK Report: Where is that happening?

Magaziner: It is on the NTIA web site where the Green Paper is.. Everything is being posted within a matter of days - no matter whether we receive it by print or electronic means. Today I did an open meeting with some people in Washington. There is a transcript being taken of that and it will be posted on the site soon. I did the same thing when I went to the Apricot meeting in Manila so that I could have an Asian consultation. I met with some hundred plus people for six or seven hours and notes were taken and will be put up on the web as soon as possible. So this is the process we are using.

[**Editor's Note**: On February 11 Ira wrote to us: "It is fine with me to open

Magaziner: We are interested in getting this privatization done as quickly as possible. People tend to work to deadlines even if they don't always meet them. We want to try to electrify people into moving quickly to go to work on setting up this private sector organization. On the other hand, by saying we have this goal of September 30, we must realize that we don't all turn into pumpkins on October 1 if the organization isn't yet fully consummated.

these communications to anyone. Starting with the publication of the green paper in the federal register this week, these conversations will be publicly available in any event. . . .The process we are going through now will be a completely open one which means that all comments I receive or the commerce web site receives or that we receive through the mails or by phone or that come from meetings we have will be part of the public record. Even at meetings or in phone calls, there will be notetakers and those notes will be in the public record."

On February 13th he added: I have checked and we will be scanning all paper responses and written notes so that we can post those along with electronic communications on the NTIA website. Therefore, all discussion we receive relative to the green paper will be available on the net. " In the interview on February 23 he was very expansive about all these documents going on the NTIA web site.

When on March 2 we complained that nothing other that direct email to the NTIA web site was posted, Ira added: "I will correct this. I have checked and gather that the process is backed up. Perhaps what I should say so as not to be creating false expectations is that transcripts are being prepared and will be posted as soon as possible but definitely within the comment period." Ira asked us to tone down the phrasing of how quick documents would go up in the final interview text. We complied with his request. As of March 5th a few of the promised documents are on the web site and, according to a source within NTIA, efforts are being made to index the site such that it becomes more usable.]

Magaziner: However, we don't want to make intermediate revisions in our decisions. Where we have made a mistake

in wording that has conveyed a misimpression, I will try to correct it. But, with respect to changes in our position we don't want to give undue weight to comments that appeared early rather than late during the comment period. If I were to take comments that we have so far that might represent 10 or 20 per cent of those we eventually get and were to say: OK we have revised our position based on these, that's not fair to the other 80%.

COOK Report: We were thinking that it would be a continuous process of revision that would change from day to day.

Magaziner: I think the next draft process will be based on what we get during the whole comment period. As you know, we have extended the comment period. We were originally thinking of a month and now it will be just one week shy of two months.

The Tight Time Line

COOK Report: Glad you brought up the time line. The Green Paper has that deadline of September 30th out there looming very large. There are many many things that must be accomplished by then and extending the comment period just shortens the time line. A body to guide the Internet in the creation of key technology policy issues and implementation of legal issues is supposed to be created from nothing, set up and become operational. One might ask how on earth this can be done in eight months? It seems that either you arbitrarily act to force something in there by the time deadline or you keep up a more methodical pace and risk breaching the September 30 deadline or even the two year deadline. Some people have suggested that even the two years shouldn't be looked at as an inflexible deadline.

Magaziner: We are interested in getting this privatization done as quickly as possible. People tend to work to deadlines even if they don't always meet them. We want to try to electrify people into moving quickly to go to work on setting up this private sector organization. On the other hand, by saying we have this goal of September 30, we must realize that we don't all turn into pumpkins on October 1 if the organization isn't yet fully consummated. We will still be around and could keep some oversight. Our hope is that, as soon after that as possible, the new organization

will be up and running and we can exit. So it is more a question of trying to light a fire under the process than forcing the September 30, 1998 date no matter what.

COOK Report: So there is no arbitrary expectation of having it both launched and in any degree of state of maturity in its operations?

Magaziner: No. But one can set goals even if they are aggressive. Doing this tends to get people moving faster than they would in the absence of such goals. We are trying to move this as fast as possible. Now the two year date is arbitrary to be frank. What we tried to do is address concerns of groups with conflicting worries. There is one group of people who are afraid that the involvement will last forever. There is another group of people who say that you can't walk away without something solid in place. So we tried to say: let's set a date certain so that people don't think we are going to drag it on forever. Frankly it was in part driven by the fact that we would like to complete this by the end of the President's term. If it extended longer than that this administration would be gone and we could not guarantee the government's exit.

COOK Report: Well, if in the summer of 2000, things were still going very poorly, it seems unlikely that a revisioning of the game plan might not happen?

Magaziner: If things were going poorly, I think the revision would have happened before then. But the goal now with the two year deadline is to try to reassure those people who think we are trying to hold on forever. Our goal is to get it done in this administration because once it is done and once the new non profit is up and excercising its authority, a future administration will not be able to grab it back. True, it is an arbitrary date, but it also seemed like a reasonable date.

Funding the IANA Council

COOK Report: Can we turn to issues of how the IANA Council is to be funded? It seems likely that the court decision on the infrastructure fund will be appealed and with any luck that this money might become available to help the new organization get operational.

Magaziner: We had left open the possibility and I think would have favora-

What we are looking for as a legal structure is that of a private standards setting body. The reason for this - even though it would be different in some respects - is because there is a successful body of law that defends such organizations against anti-trust challenges.

bly entertained the idea that some piece of the Infrastructure fund, if it were able to be used, should be allocated for the purpose of starting up this organization until it can get its own revenue stream going. We were also favorably disposed toward using some of the fund to help beef up the root server system - its security and redundancy and so on.

If those funds are somehow not available then I think we need to arrange for that funding another way and we would do so.

COOK Report: Is it safe to assume that someone is looking at alternative funding as a contingency plan?

Magaziner: Yes. Exactly what it would be we don't know yet, but I think we would regard it as part of our responsibility in executing this privatization to see that this new organization has the where-with-all to get up and start to operate.

COOK Report: Do you think that by June we will have a good idea about the nature of the board and where its funding was going to come from?

Magaziner: In the paper we had talked about having some sense about this by this summer. This is still the goal - some time during the summer.

COOK Report: The question of an executive director is still an interesting one. Hopefully you have some sense how many people Don Heath in his role as Executive Director of ISOC has angered? Can you indicate some sense of how you'd go about it?

Magaziner: I think it would be up to the Board to pick an individual but I think we would try to make clear that we think it should be someone with a broad management background and that there should be a serious executive search undertaken because the person would have to have not only the technical capability but also, even more important, the managerial capability - because this will be a very important

management task.

COOK Report: If you are going to have a significant search, you would be doing very well to get it done by September? Do you agree?

Magaziner: I have seen searches that can happen in a couple of months. If the board constitutes by the summer and it takes a couple of months to do a good search, then perhaps by October they can have an Executive Director in place. But again no one is holding a stop watch that says the world ends on October 1. Hopefully we are setting something in motion here that is going to serve the Internet well for decades and, if it takes a few months longer, to launch it successfully, those months are worth the investment.

Certainly there needs to be a search. Also in our view the person chosen should have a strong managerial background. However the board of the organization should manage the search process. I think one of the indicators of the success of the organization will be the board's ability to effectively organize those kinds of searches. We also suggest that there should be an executive vice president with a legal background because it's a virtual certainty that there will be some legal challenges up front.

If the by laws are drafted carefully enough, those legal challenges will fail and then that will create the stability that we would like to see.

Legal Structure of New Organization

COOK Report: When can the drafting of the by laws begin? Not until the original board is in place?

Magaziner: No. That can begin before. Some of the organizations involved could begin (for example the IANA, and/or the US government) researching some ideas for by-laws. I think some of the thinking on that could get done sooner rather than later.

What we are looking for as a legal structure is that of a private standards setting body. The reason for this - even though it would be different in some respects - is because there is a successful body of law that defends such organizations against anti-trust challenges.

COOK Report: What would be an ex-

ample of an existing organization that would fit this pattern?

Magaziner: There are organizations right now, some of which are international, but incorporate under US law which set standards for different industries or for different technical issues. Those organizations follow a similar pattern under the law because of the way their by-laws work. ANSI (American National Standards Insititute) is an example of such an organization.

COOK Report: You do realize that the words "standards setting body" for IANA policy council could be negatively interpreted by the IETF?

Magaziner: To be clear this is not saying what the new body will do but rather only what its corporate form will be.

COOK Report: Can we further try to clarify this? The IETF after all has even refused to incorporate. Are we looking at the IANA policy Council as an organization not that does standards setting but an organization that provides policy guidance for the parameters under which the standards are set?

Magaziner: I understand and appreciate your pointing out the way in which my words can be misinterpreted so let me try to be clear about this. The functions that this organization would perform in terms of the Internet address system, the name system, and so on are spelled out in the green paper. The question that I am addressing now is how is this non profit corporation organized legally - not what it does. One of the key things that is absolutely essential to making this work is that it be able to function effectively without getting bogged down in a thousand law suits that try to find its actions illegal. So what we have looked for is a legal non profit corporate form that has withstood the test of such challenges in the past and that could be the basis for the by laws that are written by this new organization. My use of the term private standards setting body is only in that sense - namely the form but not the substance.

COOK Report: So when looking at the policy setting that this IANA Council will be responsible for, it is the RFC editor and port number assignments for protocols, the handling of IPv4 number assignments and presumably policy issues in transition to IPv6, and finally the policy issues involved in new domain name service. As far as

policy issues involved in creating new protocols goes, it is understood that this is not part of the purview of the new organization. Correct?

Magaziner: Correct. In addition to the name, number and protocol assignment functions you mentioned, the new organization will have policy oversight of and management responsibility for the root-server system. In no way is it intended to deal with policy with respect to the creation of protocols.

The User Group Members

COOK Report: Can we get then into a discussion of the user group members of the IANA policy council board? It is very hard to understand why a non technical member or members of a board that sets what is generally highly technical policy are necessary. One wonders what a corporate lawyer can contribute to the general understanding of the technical issues involving IP number distribution?

Help us to understand why the technical community should not be alarmed at this other beast and especially so if you are talking about seven user members and seven technical members rather than just one or two user members out of a board that cannot be larger than seven members to begin with?

Magaziner: That's a good question and I can tell you what our reasoning was. To see where we go from here we will have to look at what kind of comments we get. When we have a board that is operating in a public trust like this we think it is a good idea to have users as well as those who technically run a system be part of that board. It's not to say that they must be lawyers versus technical people but rather people who are ultimate users of the system.

COOK Report: Well the Internet is so incredibly diverse how are you every going to come up with "representative" users? Or even with criteria for selection of such?? Some of the most senior people in the network with whom we talk simply don't understand the rationale. They would like to know, for example, why the users couldn't be appointed to an independent panel that would be free to comment on and support or object to what the technical board did? Why is it necessary to put them in a position where they can derail new technical policies?

Magaziner: Why is there the assumption that these users would stone wall or

keep policy from being made? Is the image here of a bunch of obfuscating lawyers?

COOK Report: We don't know. It seems to be an honest inability to see why this would not be the outcome. Certainly last June when we worked for a short while with a Texas ISP to try to help it better understand the rational for the distribution of number space we saw it intent on using its attorney to derive what it considered the economic advantage of portable address space in a zero sum game where it would win and everyone else would lose. In such a case that lawyer on the policy council would have driven the process to a screeching halt. Lawyers are about economic advantage not about the technology decisions that have to be made to keep the Internet afloat.

Perhaps you should make some real serious effort to express in public how you would flesh out this particular point of the green paper and let people react to that. You may be in for a real shock.

Magaziner: That's fair enough. In the consultations I did, a number of users, including a number of the non profit institutions such as libraries, universities, and school users, as well as some of the corporate users - both the computer companies, but also all the companies involved in publishing, and the new consumer oriented companies who were using the Internet - were saying: Well there has been this technical old boy network which built the Internet and, although they still have an important role to play, they have to recognize that there are a lot of other interests out there who have in some cases bet their companies or committed their universities to the Internet and need some kind of voice in the way in which things operate. They were not saying this in a critical way of the technical community. Rather they were just saying: we are here now. Take some account of us.

We felt that there was legitimacy to that set of concerns and then the question became one of how to shape the concerns into something useful? You are correct that we do not have a specific plan that makes us certain that we were doing it in the right way. We have suggested the general notion of user participationm to balance the new corporation in this way.

I see a number of possibilities. As

IETF does, you could convene meetings of commercial or non commercial users in different regions of the world and have them nominate someone to get started. Or, in the beginning you could call to specific organizations that currently exist and have them get the ball rolling by nominating incorporators to the board for a short period and then have the board develop a process to ensure long term user representation.

COOK Report: But what you put out there was a board to discuss narrow and rather arcane technical policy with five then seven, then nine members. Suddenly in the last few days before the green paper release burgeoned to 14, and suddenly, non technical end users were equal in numbers to the technical policy setters. Some of the technical people whose cooperation you need in order for your efforts to be successful feel, and I believe justifiably so, that if seven general users are elevated to this board to discuss highly complex critical technical decisions, you are setting the process up to fail.

Now if you look at the non profit community, universities, schools and libraries and so on. Their concerns are very justifiably going to be focused on issue of cost of access to the network and reasonable interconnection to the network by commercial backbone providers. In this sense, what these people are concerned about has nothing to do with port assignments, the RFC publication series, or IP number assignments to the global registries. Their interests do not also have a lot to do with DNS. Corporate trademark attorneys perhaps yes, but the rest of the group - no. The issues I have just listed are economic not technical issues. It doesn't fit. It doesn't match. Do you see what I am saying?

Should Names and Numbers be Lumped Together?

Magaziner: I think you are right in terms of the numbers, but I am not sure this is the case in terms of names. I wonder whether the question that is really bothering you is the lumping together of names and numbers. Now if the council were dealing purely with the number issues and the protocol issues, then it is a purely technical body. It would be a simpler and cleaner organization and then the name problem could be dealt with somewhere else. But then two organizations have to be formed which creates additional head-

aches. We want to see what kind of comments we get. If you are going to combine both number and name functions, it becomes more than just another set of technical issues because the naming functions do have a value to the commercial side and even to the non profit side. I think this is where the problem comes in.

The initial path that I was heading down with this was a small board that would be primarily technical in nature and might have one or two user members. But as I made a set of calls around in the last week to ten days before we issued the paper, I was getting some very strong feedback that was very wide spread supporting a broader user interest.

COOK Report: From what you are saying it sounds like the pushback was focused almost entirely in the domain name area?

Magaziner: That is fair to say. As opposed to the number or protocol area.

COOK Report: That's not surprising. A

number either conflicts or it doesn't.

Magaziner: That's correct and that push back was strong enough and widespread enough that we decided to go in the direction of saying let's try to balance the technical representatives with user representatives. Now one could do one of three things with that. One could say let's develop some reasonable way to get these user members selected so that they do not become a destabilizing force. Or one could say let's reduce the number, it's just too many. Or one could say: split the Board - either into two separate Boards or two separate organizations, one for names one for numbers. **[Editor's Note**: see side bar on this page where an "observer" suggests some additional valuable approaches for addressing the DNS issue in the context of Magaziner's effort.]

COOK Report: Or following Stef's suggestion, couldn't one say to the DNS folk if you can come together in

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An Observer: Additional Ways to Address DNS

What's missing here is that there are two different levels of questions related to DNS/Domain Names. The first, which should be determined by "technical folks" (By the way, this is primarily commercial network operators rather than academics and researchers), relate to operational stability of the Internet. These are questions like: What is the maximum number of TLDs can the Internet System add without significant operational degredation? Is there any operational difference caused by an increase in TLDs vs 2LDs? What is the topologically optimal distribution of root servers? Is new BIND software likely needed (in the next 3-5 years*)to facilitate such a distribution (given the current limit of 13)?

* Three to five years because that's the maximum probable life expectancy of DNS due to scalability isues which are practical and "operational" in the sense that the "value" of a domain name comes from its misapplication as a directory entry and a directory that encompasses the world may no longer be useful.

In each case above, there is an objectively discernible answer which allows derivative decisions to be made. Frankly, most of the "DNS community " has no clue on the above issues (and it goes without saying that "users" don't either). Assuming we'd rather not kill the Internet "golden

goose", the above decisions should be made by the "technical community", that is "by the network operators who have to keep the Internet functioning".

The second level is what I'd consider the DNS Policy level. It's questions like: Assuming that the Internet System can handle _ TLDs without significant performance degradation, is this number high enough such that no rationing or allocation system is necessary? If not, how and when should the limited TLDs be allocated? Is competition best injected at the TLD level or elsewhere?

Frankly, as long as they stay within the technical limitations set by the higher level group, it doesn't make a damned bit of difference who sets these. It could be Registrar', registrees, users, politicians or anyone else. I'd even say that this (DNS Policy) group could make recommendations to the IANA council about the importance of specific considerations when making "technical" policy but I'd not let the DNS Policy group [**Editor**: which probably should be a body separate from the top level IANA policy council] "drive" the technology.

It should also be noted that "universal addressing", while it may be philosophically desirable, is also a myth. We're much more likely to see VPNs (we each belong to several) which may maintain their own naming or other conventions and use the "global" system ONLY when venturing outside their affinity groups

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your own confederation, you can do DNS and nominate two delegates to a small top level IANA policy council? We won't force the choices on you because we believe in self organizing bottom up government if you show us that you can bring it off. Do it this way keep it a lot cleaner and give the DNS people a chance to be self organizing. You get the benefit of not putting the most critical element of the Internet, the maintenance of IP numbers in technical jeopardy by insisting that non technical people, whose primary interest is DNS, oversee their policy.

Magaziner: Well, that is a possibility. The notion of having some consumer representation on the board you could buy? But your belief is that it is weighted to heavily and therefore could destabilize the technical expertise.

COOK Report: Absolutely.

Magaziner: My experience on boards is that when it comes to a technical question those people who don't have the technical expertise tend to defer to those that do.

An Observer: Ira 's never been to a DNS meeting where everyone is an expert (based on what they personally want) and doesn't give a damn what the technology will support.

Finding Cooperating Board Members Could be Difficult

COOK Report: Think about this possibility. If you get too many people on a board, especially when some of what the board does is peripheral to some member's interests, you have a situation where the executive director can run the board by working with a minority who do give matters their full attention.   In such a situation where have we gotten in trying to protect the DNS interests of the user members?

You should also be aware that this is the Internet where everyone has a microphone and no one is shy about expressing himself or herself. It is also the Internet where, after two years of warfare over this issue, the trust of the players in each other is at an all time low. Finding board members who can work cooperatively with each other will be somewhat difficult. These attitudes will be compounded by a justifi-

able feeling of pride in accomplishment which will cause most candidates for the board to take an attitude that these "politicians" better not dare to burden them with a bunch of non technical people who understand neither their culture nor their achievements.

While you are doing this for benign public interest reasons, you also need to understand that it is unlikely to be perceived that way within the IETF. There's enough opposition to what you are doing in that community to make it imperative to make the changes you are trying to get them to adopt as attractive as possible, because if you wind up having to spend extra time selling it to them, the result will be that the rest of your already difficult schedule becomes even more so.

Magaziner: You may have a good point. I guess we need to see what kind of reactions we draw during this comment period. If we get a lot of the reactions of the sort you are talking about, then it is easier to go back to those who were arguing for a broader user representation and say well look here is a very strong response saying that what you asked for just doesn't fly and then we will have to see where we go from there.

COOK Report: After all you could have a very broad user representation in a top level organization devoted just to DNS. The idea that DNS would be able to out vote either IP numbers or RFC and port assignments will just cause no end of problems.

Magaziner: OK. I see your point. Before we put out the paper an equal three way division is where we were. Let's see what we get by way of responses but I do think you have raised some legitimate concerns.

COOK Report: Well what then are the plans for selecting the board members? The technical members could, one hopes, be chosen expeditiously.   But user members would stretch out over extended time lines even further. At least four and perhaps eight extra weeks?

Selection Process

Magaziner: I think that is right. One suggestion that has been raised to deal with that is that you can possibly identify some organizations that could nominate the first user board members who would serve only as incorporators for a limited period of time. This would be

done so that you could get the organization up and going. They would be replaced as a more bottoms up process went forward.   Technical members might be appointed for multi-year terms and then you would have user members who might be asked to agree to only six month or one year terms until a more democratic process could be formed to elect the users.

COOK Report: Let's look at the user issue in an even broader context. Tony Rutkowski says that now every Fortune 500 company realizes that it will be seriously affected by the Internet and that they all are wondering what they can do in the current context of things to turn things more to their advantage. Now in this situation you have Becky Burr at the Department of Commerce (only a year ago she was a lawyer at the Federal Trade Commission). She has moved into the process that you are running in a major way. In doing so she has stepped on quite a few toes and gotten a bunch of folk rather upset which, we suppose, comes with the territory given the very important and thankless task which you are engaged in.

What would you tell us to say to those who are alarmed at what they see as especially heavy handed actions from the Commerce Department - actions that they believe are not good for the net and actions that they see as implementing a policy independent from your own? They claim to see her as pressing for this user agenda and user representation on the board. Is that accurate?

Magaziner: No I don't think that is accurate.   I take responsibility for what's in the paper. I am coordinating a group which has a lot of people in it. What I have done is to honestly express to you what the thinking was. Now that thinking may be flawed and the comments we get in from people, may be very persuasive in saying that's just not the way to go. If that is the case we will be very receptive to changing the paper.

This issue is too broad and to complex not to make mistakes. That is why we put out a discussion draft.   We do make mistakes.   Now whether this turns out to be one of them or not, I don't know. I want to hear what people will say. I guess all I would ask for from you and your readers is for help in correcting those weaknesses and mistakes without seeing all kinds of dark motives which in reality aren't

there.

COOK Report: OK. But when you look at your ideas about user representation would you say that part of what you have in mind is the corporate legal community, the publishers, the trademark legal community and so on and is it reasonably safe to conclude that they would use meetings with the commerce department as a channel to express their influence than elsewhere. But on the other hand do schools and libraries have their own channel for input?

Magaziner: Yes I think that is fair to say and I think it is also fair to say that people are not shy about expressing their views directly to the White House.

COOK Report: So you are saying not to assume that anyone person working on the project has any undue influence over it?

Magaziner: Yes. Ultimately we are all collectively responsible for the output and, as the one who has been coordinating it, the buck stops with me. So where there are mistakes in the paper like the word "develop," I take responsibility for them.

User Member's Concerns

COOK Report: This process that you are coordinating encompasses some concerns like settlements, and the cost of peering and how you do interconnection and a whole lot of other things that, under a different time and age, would have been regulatory issues. Now, for various and sundry reasons, most of us feel that trying to regulate this beast is probably not a good idea. But could we posit that while there is end user concern about DNS, there may be even broader end user concern about these broader "regulatory" - for lack of a better word - issues. Now if you accept this line of reasoning, do you think that there might be some possibility of a mechanism, being established in lieu of the traditional FCC type of regulatory mechanism? If so, the question becomes one of whether it would be appropriate for an end user policy group to be formed around these issue of concerns? Would you like to hear comments and ideas along those lines?

Magaziner: Our view is that certainly the Internet should not be regulated and that instead we think that private, non profit, cooperative bodies should come together to help solve specific problems in areas where there needs to be coordi-

nation. So we are favoring industry self-regulation and codes of conduct with respect to privacy with respect to development of filtering tools. We don't think it is a good idea to have one big over-arching body that comes together to run the Internet. The Internet is inherently a decentralized medium and we are much better off having special bodies that do special functions and that are focused on performing those functions well. These bodies should be stakeholder based and not government run. So, to that extent, there will be certain areas where users have a particular interest. We think that there should be private bodies that reflect those user interests that gather around those specific issues.

COOK Report: There will be multiple bodies in other words.

Magaziner: Yes. I think there probably will be. I think that the body that comes together to address the issues of how you empower people to filter out content. . .

COOK Report: Will be a very different body from the one that negotiates for changes in the economic model of interconnection or the cost of public access. So it sounds like you are saying that, as far as this next generation IANA policy council is concerned, your idea about user input into it is that it should be restricted to DNS maters and not other things?

Magaziner: Well you are trying to get me to go some place where I won't go now. I think you are doing a very good job of persuading me and leading me down a path here but we have come out with the paper and it says what it says and, at this point, we will defend our ideas and await the comments from all quarters. I think it is correct to say that concerns raised by users about their participation in this related to the name side and not to the rest of IANA affairs.

We are trying to legitimately have a free comment period here and then in a rapid fashion after that we intend to see where the comments lead us. I have to say that so far at least we are feeling reasonably good about the reactions that we are getting. Naturally there are people who want to change various parts of the paper. That is why we have a comment period. But so far we are getting good responses and the process itself is something that people seem to be getting more comfortable with.

COOK Report: It seems that just about every one except perhaps for the POC and CORE are willing to assume that you are a reasonable person and can be negotiated with. Maybe even the POC and CORE will come around to that point of view.

Magaziner: I think a number of them, at least in meetings I have been in have begun to work with the process and I am optimistic that we can reach consensus. This is the Internet. One can never reach a unanimous view. But I think we can build sufficient consensus and that most POC/CORE members and supporters will be part of that consensus.

COOK Report: And certainly, if they become willing to work with the process, it has to help everyone of us.

Magaziner: I think so and we are seeing good signs of that.

Final Questions on DNS

COOK Report: Stef asked me to try these two questions out on you.

Einar Stefferud: How do you feel about setting a slow start rate of new TLD insertions in place of the GP concept of setting some fixed number of new TLDs to be added. The problem with setting a fixed number is that all the contending parties then focus on "getting the largest possible share" of that number, which continues to force the community to deal with a "zero-sum game" situation where anything someone else gets must come out of someone else's share. This puts a big obstacle in front of efforts to form any consensus.

Magaziner: So if we said this is just for the transition period you could wind up with five but you wouldn't say we are limiting it to five, but you would just say you were going to dole them out one at a time?

COOK Report: I think he wants to establish some criteria for inserting a new domain, letting it be used, observing the fall out and if after a few weeks or months things seemed stable insert a second name and follow the same process. He said that he thought eventually it might be possible to insert almost one a month ultimately.

Magaziner: Well, we can look at this certainly. The only thing that this belies is the feelings of significant groups that they would prefer not to have any

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new names added. Or maybe just one or two. This would imply that you might get 10 or 20 added in the next year to year and a half and this is more than a lot of people want.

COOK Report: Wouldn't it be interesting if you could develop some criteria were if it looked like the mareket was becoming glutted, you could slow down the gating of new names considerably?

Magaziner: I suggest that he write up his ideas and send them in as a formal comment.

COOK Report: Here is his final question.

Stef: I would also like to know more about how the US Government views the "Public Trust" issues involved with the DNS Namespace and the DNS ROOT Zone Service. It appears that there is a big difference between the Namespace itself (i.e., what is the list of permitted TLD names) versus "How is the ROOT Zone Service operated?"

So, there are two major policy dimensions: (1) Who controls the choices of new TLD names and (2) how the Root Servers assure that all legitimate TLD names are reliably resolved for all users of the Internet. Should both of these be a matter of Intergovernmental Institutional Regulation, or should they be a matter of Internet Industry Cooperative Confederation?

Magaziner: We have said that they both should be part of this non profit stakeholder cooperation as opposed to government controlled.

COOK Report: So if through response to the comment process they can come up with reasonable criteria to get together a group of people to make a convincing case that under thus and such circumstances new names could be gated, the rootservers could be operated, you'd be the first to bless that?

Magaziner: That is not what we proposed but, if most stakeholders support that approach in the comment period, we could consider it. As to the second question of whether this should be intergovernmental, I don't think it should. I think what we are looking for is for this new non profit corporation to set policy both for the operation of the root system and policy for the adding of new names. Now before we transfer the root system to the new organization, we do want to get it beefed up in terms of redundancy, security, and its ability to continue to scale.

As a final word, I would like to encouarge your readers to send in comments and to read and react to the comments of others. I would also like to ask for tolerance. None of us know for sure what all the right answers are on these issues. Nobody will be fully happy with the proposal we implement. Hopefully people will accept that we are trying to do the right thing and will work with us to make a successful transition.

Comments on our Win/ Lose Cover Article

"I believe you have some of your facts wrong. However, the zero sum mentality is a useful analogy to explain some of the extremal behaviour of various parties. "For me to win, you must lose" - a poor match to the burgeoning value of the Internet and its potential for growing opportunities for many parties." -- **Vint Cerf** 3/4/98

"Given that the internet era is only about 30 years old, approximately where books were in 1685, the telephone in 1920, or the computer in 1976 (pre-pc), it is not too surprising that we do not have the answer to the meta question : What is our collective vision for the internet in 2020? For that matter, what is our vision for the society that comes after the industrial era? Absent these visions, the current DNS debate can only be informed by today's dominant value set of Dickensonian capitalism. Without a goal mapped out by a mutually agreed upon vision, it is hard to see how we can escape from the current zero sum arguments concerning internet governance. Only when we know where we want to go will we be be able to evaluate our process and, hopefully, invent a better one. A process guided only by a simplistic and one dimensional concern for profit is impoverished and probably does not yield useful fruit. After all, does any one really believe that the meaning of the internet is to be found only in profit and loss statements? So what is the vision for the internet in 2020?" -- **Jock Gill**, Director of special projects, Office of media affairs, the-White House 1993 - 1995 3/4/95

Comments on Magaziner Interview

Ira Magaziner is doing a stellar job in a very difficult environment where industry, users, and the real world are colliding with a kind of "old time Internet religion" based on a lot of self-generated myth and self-interested machinations.

For example, the IAB today is literally a committee of the Internet Society that largely serves as its public relations arm. It once had a kind of IETF oversight role in the late 80s, but this was terminated in 1992 by the IETF because of the IAB's inappropriate conduct, and the IAB was subsequently adopted by the Internet Society as a kind of generic advisory committee.

In the interest of full transparency, in any public policy making proceeding, this relationship should have been disclosed at the outset. Because of its status, the IAB is likely to be tightly bound to the Society's position as a highly interested party with strong views including it's publicly declared position that the Society itself as a small technical professional organization is somehow responsible for DNS matters - as well as its involvement with and promotion of other interested parties it has crafted such as the CORE organization.

There are a great many diverse interested parties today - indeed entire constellations of diverse "Internet communities." The matters that will arise before this IANA Council will be complex competitive, public policy, legal, and technical issues. It will also function in quasi-legislative, executive, and judicial modes. This diversity of constituents, complexity of issues, and multiplicity of functions must be meaningfully factored into the Council organization and balance.

It may not be possible to get a fully representative process for selecting Board members operational at the initial creation of the Council due to time constraints. However, the basic requirements and processes for such diversity can be instantiated, coupled with the selection of an initial board of totally disinterested, trusted individuals who serve one-time terms of six months. Totally disinterested means no one with strong ties to any particular "Internet community."

Analysis & Critique of Magaziner Direction
Laudable Framework and Stated Goals Conflict with Self Interest of Large Players & Leave Little Policy Flexibility

Ira Magaziner is walking a tight rope and hoping not to fall. We commend his efforts so far. He understands very well that the crux of the current problems are not just DNS but the entire range of IANA authority. Given the early record of the Inter-agency Working Group on DNS, that understanding is no minor achievement. However - apart from troubling continuing indications that Ms. J Beckwith Burr is meddling in the process beyond the scope of her authority -we are also worried that what Ira is doing faces several contradictions.

He is working with an arbitrary but significant deadline of September 30 because at that time two things happen. First the final six month ramp down of the NSF NSI Cooperative Agreement ends and with it the US government's authority over NSI's operation. Second federal funds to pay for the IANA function end and with that ending the government's claim of authority over the IANA, if not ended, is sharply diminished.

In this context he wants to make sure that NSI shares registrations into the .com database and he wants to have a new IANA authority in place with an international buy-in to a privatized policy board that will establish policies over the issuance of new top level domains and establish a new internationally agreed upon means of operating a single set of beefed up root-servers. A tall order in eight months under any circumstances - one that is made even more difficult first by two years of internal rancor within the Internet community and more recently by resentment between many in that community and in many foreign governments over the U.S. government's involvement in the dispute. All of this operates in a context where, in the year since the U.S. government's involvement began, the importance of the Internet to the entire range of telecommunications has been growing and where many large corporations - motivated by a newfound awareness of the impact of the Internet on their future viability - are now quite eager to meddle in the process to protect their own self interest.

As a result, Magaziner is on the tightrope because he is burdened by having little time to get a group of powerful forces with conflicting interests to act on behalf of a mutually agreed upon common good. We are concerned that his need to find consensus among such a diverse range of interests will mean that he either runs out of time or agrees to a structure that will be unworkable - or even both!

Between the Rock and the Hard Place

For example, he says in our interview that he intends for the IANA Board to choose its executive director by means of the use of an executive search firm. He has outlined an overall process that seems acceptable but the lack of detail on how things will come together is bound to make running any of them on the kind of parallel tracks necessary to make the time deadline exceedingly difficult. One could argue that efforts to line up an executive director should begin now. The reason is that knowledge of who is willing to serve would likely impact the willingness of others to take seats on the Board.

However, only seven months before the September 30 deadline the very nature of the IANA board is still not clear and will likely remain unclear for another month. We can imagine that, given the rifts among the Internet technical community, just getting the technical folks to cooperate will be difficult. Yet thanks to a rather brazen, "we-know-best," attitude from the Department of Commerce, we are working with a proposal that the Board have an equal number of user representatives. This may seem politically correct but, in reality, it will add another level of potential dissension and policy gridlock.

Indeed we regard the issue of forcing a large number of user group members onto the general policy board as so serious in its potential for disruption that, if it stays after the comment period, end we have serious doubts about whether we shall be able to continue to support the process. The energy of the board must be focused, as Ira points out, on working with each other in coming to mutual agreement on the selection of an executive director. Saddling the board with the added burden of meeting the time deadline and selecting seven user representatives when it itself will not have had time to coalesce is a recipe for failure. We can not afford to see several disparate pieces of the solution brought together in September for the first time, only to watch them implode!

In looking for IANA Policy Council Board Members, it would seem wise to us to use the analogy of the ideas for GAR (Global Association of IP Registries) that were being discussed in December. Here the three IP registries (US - ARIN, Europe - Ripe, and Asia - APNIC) would each choose a single representative to the IANA Council. The IAB which, it seems, represents the CORE/POC/MoU point of view more strongly than we realized, is choosing two. At the same time, an open rootserver coalition in the DNS area is coming together. It should choose two members of the IANA Council. If each regional IP number registry represents the interests of its member ISPs, then there is no reason why each registry should not push that bottom up ISP interest one level higher by having a seat on the new IANA Board. If the ISPs can work a bottom up approach on IP number policy, then there should also be no reason why DNS registries coming together through their Confederation should not be able to use the Confederation to send two board members to the IANA Council. While it might be argued that the IESG would more directly represent the interests of the IETF than the generally pro MoU stance of the IAB, allowing the IAB to nominate two people for IANA Policy Council seats would give the IANA Policy council both adequate MoU and international representation.

Unfortunately the fact that this reform is being taken as a top down process tilts the outcome towards meddling with complex issues in an arbitrary fashion to satisfy the perceived shortness of time. Magaziner might be well advised to establish some very minimal criteria that the government insists on in the eventual outcome and then stand back and get out of the way while the parties wield their own solution. What is unknown is whether this is even possible at this point. Consider the points made in three sets of recent postings to the net by Einar Stefferud (Stef), NMA, a knowledgeable authority who requested anonymity, Nick Lordi, Bellcore (but speaking for himself), and Tony Rutkowski, NGI.

Disagreement Over Whether a Central Authority Could Subvert the Internet

Stef: Of course no central authority is possible, with an edge controlled Internet environment so those people are going to be and remain frustrated until they come to understand the realities of the Internet Environment. In the meantime, there is no central control of what protocols may be run over the Internet, and the IETF certainly has no monopoly on creating new protocols to run over the Internet. So, the ITU and anyone else is welcome to develop and standardize new protocols, whether they are openly developed and openly released, or not. And, new protocols from ITU will just have to slug it out in the free and open market for protocols used on the Internet.

Anonymous: [Editor: Anonymous has been building the net for over a decade]: What frightens me is that I disagree. I believe that with enough money and/or force a "standardized network" could be imposed. It would be like killing the goose to get the golden eggs but I doubt that would stop (telephony or other) large vested interests who see their momentary economic advantage disappearing. You know what publishers tried to do to "fair use" in the context on the Internet (a charge for each access). Do you believe that telcos wouldn't impose ATM (and/or some other quasi circuit switched standard) IF they could get away with it? I don't. Would the result be the "Internet"? NO. Would it's potential for near-universal ubiquity be as great? NO. Would most people know the difference? NO. Or care? NO.

Stef: In the view that I see, the ITU and others have a choice of figuring out how to do good Internet protocols, or they can continue to try to use their old network protocol experience to build new protocols. I predict that they will fail to get much market share, in spite of having Governments and Monopolies behind them and funding them. But it does not mater too much in the long term, since things that work will become widely used, and things that don't won't.

Anonymous: Governments, working with industrial and telecommunications giants could impose a "hard standards" solution that would destroy innovation and would probably get away with it. If "government", the UN, the

Anonymous: Like it or not, the ITU's constituents are and will continue to create a multiplicity of Internet related groups across the scores of diverse ITU forums.

Rutkowski: It's already occurring so fast that even in Geneva, one group doesn't know what the other group is doing. This is a problem exacerbated by the ITU's federated structure and historical fiefdoms. There is a real need for a "ITU Watch" and a related means of informing and coordinating the affected parties.

ITU, the WTO, whoever, decide that there will be only one way to do things, they can win for long enough that we all lose. 56Kbps is a "standard" that can be imposed under the banner of standard service and "Universal Access" (Telephony, of course, not data networking. It couldn't happen here.)

Consider the following proposition. I doubt that there's anything I do today that I couldn't do more expensively and less conveniently on a circuit-switched network than on the Internet, BUT, I'm fairly sure that in a more expensive and less convenient environment I'd do less. Is that my minor personal opportunity which is lost? Or have we then accepted a major setback for broad -based distribution of art, music and other intellectual properties in ways that maximize the exposure of and benefit to their creators rather than to producers and publishers.

Stef: It is easy to lament that this kind of "inefficiency" will consume and waste resources, but my take is that it is unavoidable, and is one the prices we pay for our general freedoms, and in the longer terms, it is actually more efficient than to be centrally controlled and not have an Internet, as we would not if ITU had controlled development of the Internet from its early days.

Anonymous: But freedom needs fertilizer and our society is more and more adverse to paying for anything. I agree with you that inefficiency is one of the "costs" of freedom. Personally, I've always felt that inequality is another and that they're both costs well worth paying. Even though you're absolutely right both philosophically and technically, I fear that it won't preclude those of an authoritarian bent or vested interests (cloaked in a variety of garbs and professed public interests) from trying to stifle the technologically dynamic "inefficiencies" of

internetworking in the name of global "stability".

In my humble opinion we can risk "instability" in the DNS (as long as IP number management is stable) because it's peripheral to the essential operation of the Internet but fear of "instability" in the DNS is being used to justify the creation of the "top down" model we both feel is antithetical to future growth.

Stef: So, I am lobbying to avoid creation of any thing that resembles a new ITU kind of top down structure that is intended or expected to assert central control over our edge controlled Internet. First of all, I fail to see how any central controller can control the net by getting control of all the edge based control points. (Eg. all those "NameServer" defaults in our Internet Access software.)

Anonymous: That's heartening in principle but where the rubber meets the road, the folks who own the physical plant, the fiber, the switches, the routers will do what they perceive to be in their best interest or what they're told (because their assets can be lost or confiscated and they have families to feed). It's true that ideas are more powerful that guns. Unfortunately, they also take longer to load and to train folks to use.

Does Failure Mean ITU Control?

Anonymous: Like it or not, the ITU's constituents are and will continue to create a multiplicity of Internet related groups across the scores   of diverse ITU forums.

Rutkowski: It's already occurring so fast that even in Geneva, one group doesn't know what the other group is doing. This is a problem exacerbated by the ITU's federated structure and historical fiefdoms. There is a real need for a "ITU Watch" and a related means of informing and coordinating the affected parties.

Anonymous: If a carrier took a serious look at the ITU, I think it would decide the ITU wasn't a good option either.

Rutkowski: Organizations are usually as much a home for certain kinds of constituencies as they are functional bodies. There are some carriers - particularly outside the U.S., that find the ITU a great club. In addition, the staff who hang out in Geneva, will increas-

ingly be driving the organization to be Internet-relevant. Shaw was just a visible forerunner because he was in the MIS dept and peppered U.S. based folks with lots of messages.

Anonymous: You also need to contend with the fact that 2/3 rds of the ITU is devoted to radio spectrum stuff (including broadcasting)- and it still serves as the monopoly global forum for dealing with these matters - and that as radio-based/wireless technologies increasingly merge into the Internet "soup," there will be unavoidable ITU activities.

Rutkowski: I'm personally convinced that radio-based "tetherless technologies" will become the "last 1 to 100" mile solution of choice and will be the real ground for competition and value-added services over the next 20 years or so. A model that provides licensing and divides up the spectrum (as the telcos and governments are now doing) will leave less capability available for competition in the local loop and mobile arena via such developing technologies as spread spectrum and wireless.

Anonymous: This can be looked at in two ways. That the real problem is that the breath of activities and technologies is so broad, and the forums relatively remote, that almost no one in the United States or existing Internet communities has any comprehension of this stuff.

But it could also be argued that the Internet is going to become so pervasive that the ways in which people can get handles on it will increase and like the proverbial blind men with the elephant, attempting to draw conclusions and/or develop policies based on a thorough command of information limited to any one part of the whole is likely to lead to serious flaws in the worldview and resulting system. Thus, the best option is that which preserves the greatest possible number of future options.

Importance of Stability of Funding and Staff for the Policy Council

Nick Lordi: The new organization needs stability, which would help to lend confidence in it from those of us in the industry. Stability in the form of stable funding and prominent, knowledgeable staff is required. While I agree with many of the principles, there are several issues which seriously concern me.

First, trust and lack of detail. Borrowing from a reply Peter Mott made to a com-

But it could also be argued that the Internet is going to become so pervasive that the ways in which people can get handles on it will increase and like the proverbial blind men with the elephant, attempting to draw conclusions and/or develop policies based on a thorough command of information limited to any one part of the whole is likely to lead to serious flaws in the worldview and resulting system. Thus, the best option is that which preserves the greatest possible number of future options.

ment on the domain-policy discussion list: "Ira is bright, personable and sincere. These are helpful qualities for a sales effort. They do not, however, fix the utter lack of detail in the GP or the very profound deficiencies to the details that are present. In other words, folks might be trusting but that doesn't make the plan work."

Mott's reply:

It is this sort of rationale that has severely limited support for the gTLD MoU organization. Business and investment decisions are in the ultimate sense made on the basis of trust. If you have the numbers, whether you know what you are doing technically or not, you win the game. There is a chance to sort out the technical stuff later, but without the crowds of people with warm fuzzies you have nothing.

Lordi: So what does this mean ? To me, as a business person, how can I put trust into a nameless organization, without a CEO or staff, and without a business plan setting forth the organization's mission and budget ?

The Green paper states: "The new corporation will be funded by domain name registries and regional IP registries". If one looks at the regional IP registries, they themselves don't have the budget to support this new organization. As far as domain name registries, are we going to ask those registries running country code domains to ante up ? Why should they. This leaves NSI as the only viable source of funds, and that doesn't lead to stability.

We're bickering on the details of how to staff the board of directors, when we don't even have the foundation of this new organization in place. Therefore the new organization needs stability, which would help to lend confidence in it from

those of us in the industry. Stability in the form of stable funding and prominent, knowledgeable staff is required.

What are some possible options ? One option would be that the US government ante up several staff person(s) on a 12 month TEMPORARY basis to help fill this leadership void. The US government could also ask other industry partners or governments to do the same. It would be this *temporary* group of people that could hash out the details, and get the non-profit organizations business plan, financial plan, and key officer positions filled (such as the CEO/exec director).

This is similar to what the IAHC tried to do as a temporary organization which got the ball rolling, the difference is that the majority of people who staffed the IAHC went right on to the CORE, and did not open up the process.

Another possible option is the US government, in conjunction with funding from other international stakeholders, could hire an independent executive search firm to initiate the process to staff the CEO/executive director position. I would think compensation would be a difficult question to answer, so the US government and/or international stakeholders may have to guarantee this person's salary for a reasonable period of three years.

We want to hire the best, and given the lack of stable funding for this new organization, a new CEO would have to be independently wealthy or have his salary subsidized by a third party or interest group. Would you want to sign on as a CEO for this new organization not knowing where your next pay check is coming from? With additional seed funding from the US government, and/or international stakeholders, one may even use this independent executive search firm to staff the board on a temporary 12 month basis.

Also, being on the board of a non-profit organization, I have noticed that board members have a lot of latitude in their actions, and, at times, may tend to reflect their personal views rather the views of those whom they represent, which is why the concept of using an independent third party, a professional executive search firm, to staff the board and/or CEO position is an option. But, keep in mind, before we decide on the members of a board, we need to establish stability (in leadership and funding) for this new organization.

Quality of Service Described by Ferguson

Not Just a "Knob" to Be Installed - QoS Is Complex Mesh of Engineering Decisions - Tag Switching's Role - Network Engineers to Acquire Toolset to Tailor Performance

Editor's Note: Paul Ferguson is Consulting Engineer with Cisco Systems. As a member of the Internet architecture subgroup, he spends his time working within the company on issues of technology development and knowledge transfer to technical folks in the field. He plays a cross pollinating role between Cisco and its customers where he identifies marketplace problems and delivers Cisco based solutions to the problems as rapidly as possible. But he also describes himself as a technology person and not a Cisco product person. We interviewed him in London on January 28, 1998 on the occasion of the publication of his and Geoff Huston's new book - *Quality of Service: Delivering QoS on the Internet and in Corporate Networks*, Wiley, 1998. $34.95.

COOK Report: How did you come to write this book?

Ferguson: Geoff Huston and I took it on as something of an independent project. Although, it was done with the encouragement of Cisco, I must note that it does not reflect Cisco opinions. It is really our own effort to sort through the QoS muck.

Removing the Hype from QoS

The problem that we are addressing is to show readers what "Quality of Service," that is so recklessly used to describe so many different things, can and can't do. We take an objective view of all the things that people attach QoS associations to and say "OK these are the pro's and con's of what this technology does for QoS from an Internet perspective or from an IP perspective."

COOK Report: Are there guidelines for looking sanely at what can and what cannot be done with QoS?

Ferguson: What it boils down to is a matter of opinion. There is a lot of entrenched emotional feeling about the subject. We try to take a rational approach by defining what QoS is.

We then go on to examine all the ways of doing it and finally we look at improvements that are on the horizon - like MPLS and QoS routing and IPv6. We conclude with a summary that suggests: how the network engineer, who has surveyed the field, can focus his or her priorities.

COOK Report: So how do you define QoS?

Ferguson: By drawing the distinction between service quality and quality of service. When most people talk about QoS, what they are really talking about is just plain good old service quality. Reliability, stability, responsiveness. Those kind of things.

COOK Report: And QoS is things like differentiated services with precedence bits?

Ferguson: This is more what people talk about when they want to start delivering new services from a business perspective as an Internet Service Provider. Someone once said that ISPs will reach a point where just selling connectivity is no longer good enough. They will have to start offering additional services to bring additional revenue in the door. Talking about a differentiation of traffic means that, if I pay you more money, you treat my bits better than his bits. This is where most of the discussion on QoS within the IETF is going right now. What it all breaks down to is who gets better transport of their bits from one side of the network to the other.

COOK Report: And if, as an ISP, I can get these capabilities in my routers I have some new things to offer in the marketplace?

Ferguson: Absolutely. Once you have the technology available, its use becomes an exercise in packaging it and selling it as a service. We define Quality of Service more broadly however. For it also needs to take into account some market forces that are non technical in nature. Like, for example the availability of bandwidth in certain parts of the world.

But first let's examine several of the oth-

er factors driving the push for QoS which are not service related. If I am a marketing person at an ISP trying to figure how to raise revenue, that would be one reason to consider traffic differentiation. There may be other reasons, however, why you would want to differentiate traffic. Say, for example, I have a T3 almost at saturation and have more traffic coming onto a link that I know I will be unable to upgrade for six months. What do I do to give my best customers the most efficient use of available bandwidth for that period without making my entire network melt down so that I loose all of my customers?

COOK Report: So what can be done?

Ferguson: There is actually a laundry list of things. For years there has been an argument between two different camps. Where some want all the intelligence to reside in the network, others say all the intelligence should reside in the end systems. What we actually find is that there should be a shared responsibility in that the end systems need to do things better while the network also needs to do things better. An entirely stupid network would be incapable of differentiating traffic.

But there are also a lot of things that can be done to increase service quality without doing differentiation of traffic. For example, if you put better TCP stacks in the end systems that do SACK (selective acknowledgment), deploy http 1.1 with pipeline connections, and do a few other things, you may find that the need for formal QoS has greatly diminished because you will now be using your available bandwidth much more efficiently. What you do here is push your envelop outward. Instead of hitting the wall at 60 miles per hour, you may push it out to where you will not hit it at all or at least not for some period of time. Our point is that running a network and running it well is really a lot more than just plugging cables and routers and switches together. If you speak to any of the larger ISPs with several years experience, you will

find that one of the things that keeps them busiest is doing capacity planning and traffic engineering.

COOK Report: Traffic engineering?

Ferguson: Let's assume that you have three trunks between New York and Chicago and you have two running at 20% capacity and the third at 80%. You would want to be able to move as much traffic off the third and onto the first two as you were able to. Regardless of whose routers you are using, what this means is that the architect and engineers of the network don't just get together twice a year to tweak things and forecast traffic. Their job is an ongoing exercise where, every week, they are making traffic adjustments according to the demands that the real world is placing on their network. If you don't follow the changing patterns of your network traffic on at least a weekly basis, then you can never achieve reasonable service quality.

COOK Report: Had you better be looking at tools to help you do this?

Ferguson: Absolutely. That is why I am very supportive of CAIDA. The tools they produce are sorely needed. Without being able to keep your finger on the changing pulse of your network's traffic, achieving good service quality becomes extremely unlikely. The traffic differentiation part of QoS is not a magic bullet that you can turn on somewhere and make the inadequacies of a sloppily designed network go away. If people are looking at QoS to compensate for the shortcomings a poorly designed network, they are looking at the wrong solution.

Now granted some QoS knobs may ameliorate the damage from a network melt down, but they still won't keep the inevitable crash from occurring.

COOK Report: Is part of the problem that we are pushing the development of the network beyond what anyone imagined possible five or six years ago and that we are having to develop a whole new methodology for how to run these nets with stability and decent performance while the apparent dictate of the market place is, first and foremost, to expand their size and ask questions about performance later? Those who need to learn how to do better engineering simply either can't find or aren't given the necessary time to do so.

Ferguson: That is exactly right. The gene pool of good engineering is not

growing at a rate that matches industry demand. Part of the problem is that there seems to be a lot of snake oil, quick fix things that crop up. We hear things like such-and-such technology has robust QoS capabilities. The first thing to do is ask just what such a claim means?

It also doesn't mean that the technology or package might not also do some good things. What it does mean is that there is no single magic bullet answer which, at the same time, can help both the people and the network technologists and their political allies. Class based queuing, for example, is a great tool. But adopting it on its own does NOT solve the problem of a poorly engineered network. It is just one tool from a suite of tools that need to be intelligently applied. We don't have all the tools we need yet. But we have quite a few and, if we use them appropriately, we have more than halfway won the battle.

COOK Report: So have you written a handbook that identifies the tools necessary for good network engineering and management, describes their uses and tells network engineers how to apply them to improve the service quality of their networks?

Ferguson: Absolutely. The target audience for this book is the ordinary ISP and those who have to make decisions about managing corporate networks. It is aimed at those who are considering choosing one technology over another and it explains the strengths and weaknesses of these technologies in a way that we hope will encourage wiser choices in their use.

Differentiated Services

COOK Report: The agreement seems to be that if you want to do real Quality of Service (QoS), you have to be ready to embrace differentiated services. Therefore, would you summarize the current state of differentiated services and describe the state to which they can be implemented in routing technologies that are out there now? What can we look forward to in the next year?

Ferguson: I am encouraged. There is a lot of good dialogue going on between some very good people. Dave Clark, John Wroclawski, Fred Baker for example. There is starting to be a convergence on a differentiated services model within the integrated services working group of the IETF. It is possible that the differentiated services discussion may spin off into its own working group.

[**Editor**: it has now done this.]

COOK Report: For new standards work to take place does such a spin off have to occur?

Ferguson: No. It does not have to occur. But, if people decide a phased approach and a time line of 12 to 24 months is needed, then a new working group is more likely. Over the next one to two years it is going to be largely up to the individual ISPs to determine what their quality of service tools are.

COOK Report: Random Early Discard (RED) is one tool. How should this and other tools in this area be handled ?

Ferguson: Here is the model that is being examined. As packets come into the network, you have a classification engine where they are assigned a priority. You can have a template where each downstream user has a profile that describes such things as kilobit per second transmission rates that it expects. You then decide whether something is in or out of profile meaning that, if he has contracted for 30% of the available capacity for this particular user, everything that falls within that profile gets marked with one level of precedence and everything that is out of profile level gets marked with the other precedence. This is done in relative terms. It does not necessarily mean the assigning of a precedence value.

COOK Report: These profiles sound like RSVP with boundaries on them.

Ferguson: Using RSVP has actually been under discussion. The profiles are negotiated between the end users and the operators of the network. If I were Smith's ISP, I would negotiate several profile levels for my users.

COOK Report: And you have tools that are good enough for them to understand just what they will actually get with the different profile levels. Once you get into profile levels, you have a feedback loop operating within that level where, although patterns of usage may change and go outside the profile, the usage will get feedback that such particular traffic isn't very happy and will not, as a result, get very good service.

Ferguson: What you have described gets into a discussion of measuring QoS and this becomes an issue of yet to be determined research. Why? Because, if you go outside the profile,

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feedback depends on something predictable happening and, right now, what happens is not really determined. Because, what if you go outside the profile, but there is no congestion in the network that would cause you to be dropped? Should you be dropped anyway?

This can get you into a long tangled philosophical argument that, if bandwidth were infinite, then you wouldn't have to worry about selling more than you can deliver and the whole problem of differentiated services goes away. All of this can be seen as variables involved in the formation of business models from a single ISP perspective.

The much more difficult part is getting people to agree on the semantics of what things mean to them as it passes from the administrative network to another. For example when I set certain bits in the IP packet in such a way that they are meaningful for me, when they reach you, do they carry the same meaning?

COOK Report: That sounds like what you need standards for.

Ferguson: This is what we are working on in IETF right now. We are trying to come up with a framework so that people who are out there actually building the networks can say here is what we are adhering to as far as what the semantics are. The mechanics of how this is done - whether it is traffic shaping on the edges or dropping traffic in the middle - is, in my opinion, a little less important than how you interpret the value of your traffic as it crosses domain boundaries. I can use whatever bit settings I want to right now if traffic never leaves my domain.

Now if you take two ISPs, getting agreement on how to treat cross network traffic is reasonably easy. But, if you take several dozen or several hundred, the matter becomes much more difficult. Here you need the uniformity offered by standards. What we are talking about is standardized language for defining service differentiation. In the very last chapter we look at some of the economic factors involved in driving the architecture for and against QoS in the traffic differentiation sense.

COOK Report: So in a VPN like the Automotive Network Exchange could the Overseer impose on the network members a standard language for defining the terms of their service differentiation?

Ferguson: Sure. The smaller the network the easier it is to pull this off. When you are in control of connectivity from end to end, you can do without stan-

dards because you can define your own common language and impose it on the participants. If you have someone who can define cross network settlements and impose rules for allocation of bandwidth, they could even use RSVP.

The angle we take in the book is that these choices are more governed by your business model than by anything else. We suggest that one the reasons we haven't seen the differentiated services form of QoS deployed as a commercial service yet is because this has been one of the hardest things for people to decide how to implement, package and market. Our book is more of an examination and explanation of what's available than it is a how to book.

COOK Report: One of the tools is listed as MPLS. What is that all about?

Multi-Protocol Label Switching (MPLS)

Ferguson: Multi-Protocol Label Switching (MPLS) is a standardized tag switching if you will. It is Cisco's particular implementation of the technology. The internal mechanism is pretty complicated and the concepts are almost as complicated because it fundamentally changes the existing mechanism of the way your packets are forwarded. Right now traffic is forwarded based on destination. MPLS would allow sending traffic over different paths based on extraneous criteria. You could then give some traffic a higher bandwidth lower delay path. When you really grasp the overall picture of what it is being developed to do, it becomes pretty compelling.

The QoS implications of this are pretty important. It is another tool. the more tools available the more flexibility we have in meeting customer needs and doing differentiation of services. Once we get all the tools we need, the entertaining exercise is going to be in communicating to the rest of the world how to use them. You can be the best routing configuration person in the world, but doing good QoS means a lot more than just plugging in routers and configuring routers.

COOK Report: But if you are constantly in a fire fighting mode trying to keep your network ahead of the demand curve, you won't have the time to sit down and learn good network engineering?

Ferguson: That is true. Most people

are occupied with building out existing capacity to meet their existing and future subscriber demand. When you couple the required on going efforts to keep what you have built running and provision increased capacity with the on-going skills shortage, you have the same amount of people having to do more work. This is not a good environment for also finding the time in which to improve network engineering.

Still, not only must we look out for meeting tomorrow's problems, we must try to find a way of investing in our infrastructure and human capital five years or more into the future. This is why many companies make significant investments in IETF Working Groups. The necessary stepping back and integration must take place within the IETF and the operational forums like NANOG, APRICOT and RIPE. You really need to separate the functional development of the protocols in the IETF and the implementation of these technologies within the operational forums.

Iakhov Rekhter Decsribes Tag Switching

Dr. Yakov Rekhter is a Cisco Fellow. He joined Cisco in June of 1995, after working for 11 years at T.J. Watson Research Center, IBM Corp. He is one of the leading designers of Border Gateway Protocol (BGP). He is also one of the leading architects, as well as a major software developer of the NSFNET Backbone Phase II. He's been actively involved with the development and deployment of Classless Inter-Domain Routing (CIDR). We interviewed him on January 29, 1998.

COOK Report: Tag Switching looks likely to become an important tool in the network engineer's tool chest. Please define what some of the problems are that Tag Switching is designed to solve.

Rekhter: In a nutshell, Tag Switching is intended to become an essential building block of the next generation routing system. At the same time we need to make it clear that Tag Switching is not the routing system in and of itself, but just one of its essential building blocks.

By using Tag Switching, we should be able to add new functionality into the routing system. One example of this

new functionality is what is known as "traffic engineering". ISPs need to avoid situations where some links are under utilized and some over utilized. The primary mechanism that ISPs use to solve this problem today is by deploying ATM and using ATM virtual circuits to evenly distribute traffic among links. Tag Switching is expected to provide traffic engineering capabilities comparable to what ATM provides today, but without requiring ATM. So, you may say that Tag Switching brings to the IP routing system some of the ATM functionality that ISPs found useful, but without requiring ATM.

COOK Report: If you work for a Service Provider that may have heavily invested in ATM switches, you can use Tag Switching to simplify the integration of those ATM switches into your IP network?

Rekhter: Yes. Tag Switching simplifies the integration of ATM switches and IP routers. This is accomplished by using IP routing protocols and IP addressing in the ATM control plane. Use of Tag Switching with ATM switches turns an ATM switch into a router, with some "funny" encoding of data, where the data on the wire is sent as a sequence of cells.

COOK Report: How do you see the relationship between Tag Switching and the MPLS effort within the IETF. When do you expect the emergence of the MPLS standards ?

You asked about the IETF. It is well known that Cisco started MLPS Working group within the IETF with the goal to evolve Tag Switching into an IETF standard. George Swallow, also from Cisco, is a co-chair of that Working Group. How long will it take the MPLS Working Group to develop standards? For this I don't have a definitive answer. Any standards making body probably moves a bit slower than you would like.

COOK Report: What type of market does tag switching within the Cisco realm have now? Who is doing things with it? Is it something that, until you do have a completely interoperable standard, can go through everyone's routers will have a minimal impact?

Rekhter: Having multivendor interoperable IETF standards would increase the value of Tag Switching. That is why Cisco is one of the major contributors to the MPLS Working Group within the IETF. At the same time, we don't think it is reasonable to require our customers who need to solve practical problems now to wait for the MPLS standards. In fact Cisco made it very clear that we will provide

our customers with Tag Switching now, and as the MPLS standards develop and mature, we will transition our customers to the MPLS standards.

COOK Report: Is there any similar situation that Cisco has been involved in that might be useful as a precedent in judging what may happen?

Rekhter: Yes. Just remember the Border Gateway Protocol (BGP). Cisco implemented BGP in the late 1980's well before it became an IETF Proposed Standard. Look at the development of the latest version of BGP - version 4. Cisco implemented it, and ISPs deployed it in the Internet before it became an IETF Proposed Standard.

COOK Report: Can you begin to explain at a high level how Tag Switching works, and what makes it so different from the "traditional" IP routing ?

Rekhter: What makes Tag Switching different from "traditional" IP routing is that forwarding of a packet is based not on the information carried in the IP header, but on the tag carried by the packet.

On all media, except for the Frame Relay and ATM, a tag is carried as a "shim" inserted between the MAC header and the IP header. On Frame Relay a tag could be carried in the DLCI field, and on ATM a tag could be carried in either VCI or VPI field.

When a router receives a packet, the router uses the tag carried by the packet as an index in its forwarding table. The entry (in the table) indexed by the tag contains the information about the next hop, as well as a tag. The router replaces the tag carried by the packet with the tag from the found entry and sends the packet to the next hop, as specified in the found entry.

Since, with Tag Switching, forwarding decision isn't determined by the IP header, that gives you more flexibility in how you forward packets. The path taken by the packet can now be very different from the path that the packet would take were you only to look at the IP header. For example, Tag Switching can support a very flexible type of explicit routing.

COOK Report: Say a bit more about how you might use explicit routing capability of Tag Switching for the purpose of traffic engineering ?

Rekhter: Using procedures similar to the ones ISPs use today to construct a set of ATM Virtual Circuits based on the traffic matrix, one could also construct a set of Tag Switched Paths (TSPs). Each such TSP would be expressed as an "explicit route" - a sequence of routers within a

network that forms the TSP. Once a TSP is constructed, the next task is to set up forwarding tables on the routers along the TSP. For the purpose of explicit routing with Tag Switching we propose to use RSVP as a mechanism to set up the forwarding tables. In order to accomplish this, RSVP is augmented with two new objects, the Explicit Route Object, and the Label Object. The Explicit Route Object carries the information about the explicit route. This object is carried in the RSVP Path message, and forces the Path message to flow along the explicit route. The Label Object is carried in the RSVP Resv message, and creates forwarding entries in routers along the explicit route.

COOK Report: How does your use of RSVP for traffic engineering with Tag Switching differ from the usage of RSVP as it was originally envisioned by its designers ?

Rekhter: The first difference is that, for the purpose of traffic engineering with Tag Switching, RSVP installs state that applies to a collection of flows that share a common path and a common pool of reserved resources, rather than just to a single flow. The second difference is that RSVP is used to install not just resource reservation state, but forwarding state as well. Third, the path along which RSVP installs the state is no longer constrained by the destination-based routing. Finally, an RSVP session is not constrained to hosts, but also can be used between pairs of routers.

COOK Report: But what about scalability of RSVP ?

Rekhter: This is one of the most frequently raised objection to the use of RSVP for the purpose of traffic engineering with Tag Switching. Those who raise this objection suggest that some other mechanism (e.g., adding explicit route capabilities to the Label Distribution Protocol) would result in a more scalable alternative. However, one needs to understand that the scalability is determined by the amount of state that routers would have to maintain. And the amount of state maintained by a router is dominated by the number of explicit routes that go through that router, and not by the mechanism used to establish such explicit routes. Thus, replacing RSVP with some other mechanism isn't going to significantly alter the amount of state that routers would need to maintain.

COOK Report: How close is this to being used in the commercial ISP world at this point?

Rekhter: It will be available for use this year.

Internet Research Institute Pursues Innovative Program to Nurture growth of Japan's Internet

Hiroshi Fujiwara Explains NTT's Approach and Japanese Interest in IPv6

On December 22, 1997 we interviewed Dr. Hiroshi Fujiwara, President and CEO of the Internet Research Institute at his offices in the Shinjuku section of Tokyo.

Fujiwara: As you know we are very much behind the US in the Internet field, but very advanced in the digital video area. I was one of the founding members of MPEG (Moving Pictures Expert Group) protocol in 1987. We thought then that video or multimedia would be the next generation key technology for the next century. However, it turns ou t that Internet is much more important than the digitalization of video and audio. So the country changed its strategy. For example NTT abandoned the concept of broadband ISDN in 1995. It would have been a n attempt to integrate voice, video, and data via ATM. But NTT decided to divide a number of ATM services. Voice services would continue with the use of ISDN compatible switching system. Of course while the Internet can encompass all these systems, for the near future, telephone and data networks will continue to coexist.

In the mean time we developed high definition television while the US decided to compete against us with something called ATV (advanced television). However in 1990 the US changed its strategy from analog ue to digital when General Instruments developed the first completely digital HDTV process. During this time Japan continued its analogue strategy. So even now in the video world Japan is behind the US. As a result, by the end of 1997, my interest in digital and video really came to an end.

My new interest is now to accelerate the development of the Internet in Japan. The WIDE project directed by Prof.Jun Murai, the man who developed the academic Internet in Japan, led to establishment of the first Japanese commercial TCP/IP based ISP, IIJ (Internet Initiative Japan) in 1993.

NTT Grabs Major Market Share in First Six Months of ISP service

Now NTT has launched OCN (Open Computer Network) as its first Interne t service. I have been a member of the multimedia advisory committee of OCN for the past three years. This is an outside, technical, telecommunications advisory committee sponsored by NTT.

I think things here are very much different from the US situation. I have just made a chart of the growth domain names in Japan in 1997. This the growth of OCN from its start in April until right now at the end of December. All the way from 50 to 5,500. In June it hit 200. In July 500. By August 1,500. By September 2,250. By October 3,000. By November 5,000 and in Early December more than 5,500. The meantime IIJ may have grown from about 2,200 to 2,750 and Tokyo Net from 1,500 to 2,750. This chart shows only domain names and not actual market share. But the growth of NTT compaired to seven other Japanese ISPs is quite dramatic.

COOK Report: What is the reason for NTT's extraordinary Internet growth?

Fijiwara: Well you know that Internet is already heavily dependent on infrastructure. Any powerful ISP better have a strong backbone, strong technical team, strong management and also much money. NTT has all this.

COOK Report: For how long had they prepared the launch?

Fujiwara: Almost three years in preparation. Some advanced engineer within NTT proposed three years ago to start OCN which is now backed by the very top management of NTT which has decided to concentrate on the Internet side of things rather than telephony. NTT in this country is like AT&T was in the United States 30 years ago. Our deregulation effort, NCC (New Common Carrier) has started. NTT competitors exist. For example DDI, Teleway, and Japan Telecom.

COOK Report: The difference in size between NTT and everyone else is huge is it not? Something like 6 trillion yen revenues for NTT and in the 300 billion yen per year range for its largest competitors?

Fujiwara: Yes. New Common Carrier services are just a copy of NTT. Their price is regulated by the Ministry of Posts and Telecoms (MPT) and they are entirely independent from NTT. They are infrastructure companies with rights of way. One is Japan Railways and the other the electric power company. So top management of the new would be telecommunications carriers comes from the railway, power and automotive industries. However, in the absence of good IP engineering talent, they cannot really compete with NTT.

COOK Report: Does NTT pay its people well enough so that it is difficult for a competitor hire them?

Fujiwara: Yes. The only difference is the tariffs which are completely regulated by the Ministry. So the tariff for the new common carriers are set to be slightly lower than that of NTT. When people look for those who can offer Internet services, they will not find too many such people within NTT. Furthermore people do not changes jobs lightly in Japan. Still NTT does have infrastructure. The MPT last year divided NTT up into various holding companies. The NTT long distance company. NTT Mobile Communications and so on.

COOK Report: Will this divsion make much difference?

Fujiwara: I don't think so.

COOK Report: It sounds as though if good American Internet engineers wanted to come to work in Japan, there would be plenty of opportunity? Would these new NTT competitors hire them?

A Need to Build Japanese Internet Expertise

Fujiwara: Yes. I think so. Right now we are at a turning point in the development of the Internet in Japan. We have therefore decided to establish a new organization called the Internet Research Insitute, Inc. (IRII). The purpose of the Intsitute is technology transfer.

COOK Report: You are the head?

Fujiwara: Yes, the President and

CEO. The Chairman of the IRII Board is Professor Haruhisa Iashida. He is Chairman of the Internet Asssociation of Japan and honorable professor at the University of Tokyo. The capitalization so far is $500,000 but we will soon increase this. Established in November 1996, IRII employs 25 people. We are acting as an independent engineering company for the Internet in Japan.

We are doing the design of both a Network Operations Center, and an Internet exchange point. We run an interoperability test laboratory and other consulting services.

COOK Report: So companies that wish to roll out Internet services in Japan will come to you for help? And if some disgruntled engineer from an American service provider wanted to come to Japan, if you liked him you would hire him?

Fujiwara: Yes to both questions.

COOK Report: What are you focusing on in your interoperability test laboratories?

Fujiwara: We are looking at several specified IETF standards. For example IPv6. Bay networks implemented it. Fujitsu and NEC implemented it also. We will ensure that their implementations interoperate by working with their prototypes on a confidential basis.

COOK Report: It seems that in the US no one is much interested in implementing IPv6 now. In Europe the feeling is very different What is the situation in Japan?

Fujiwara: Japan has just started - basically because Japan is a follower of the United States. But in Japan the consumer electronics industry is very interested. If, for example consumer electronics based on IP services included refrigerator with IP addresses, then some breakthroughs will occur.

COOK Report: And if your stereo, wrist watch, telephone and TV all had IP addresses, then because of the sheer numbers involved, you would need IPv6 because of the issue of insufficient IPv4 addresses. Although the thinking in the US is that, if you do not put such devices on the net, IPv4 can fuel almost unlimited continued development of the dial up and leased line industries. One reason for the lack of enthusiasm in the US is the tremendous installed base of Ipv4.

With much less installed base in Japan, it may be easier to go straight to IPv6? Now if you do this with consumer electronics and that catches on and becomes popular, perhaps it could throw a major shift of world markets in your direction if you have deployed Ipv6 and we have not? Is that part of your strategy?

Fujiwara: Yes.

COOK Report: Are the questions of interoperabilty between IPv4 networks in the US and IPv6 networks in Europe and Japan serious?

The Future Use of IP Numbers

Fujiwara: No. They are not serious. But if the Internet uses only PCs, we will not need version 6. But if everything that can use the communications spectrum to communicate, does so with IP, then version 6 is necessary.

COOK Report: What about electric power management? For example if electric powered devices, had IP addresses, would not there be profound implications for use of the utilities grid for power management?

Fujiwara: Sure. But add to this all automobiles. All trains, and even all train seats.

COOK Report: That's a fascinating and good idea but there are serious implications to such a plan. For example. Suppose there's a dictator of Ipv6 for centralized registration and tracking purposes?

Fujiwara: Well, leaving aside such issues, there are also concerns about IPv4, Cisco's OSPF and other basic Internet protocols which with some things simply do not communicate well. So we will use our interoperabiity testing laboratories to find out the minor problems, like timing.

COOK Report: Is anyone doing that in the United States? If there is, we are not aware of it.

Fujiwara: The University of New Hampshire is doing some work in the area.

COOK Report: Scott Bradner runs the router testing laboratory at Harvard. But Cisco is so dominant in the U.S. market probably because its software does not work well anywhere else.

Fujiwara: Anyway, at Christmas time we will establish this Network Operational Engineering Laboratory (NOEL). And we already have another joint venture. It is the first commercial Internet exchange or

Japan Internet Exchange Corporation known as JPIX. KDD and IRII etablished this exchange and 14 additional companies have joined.

COOK Report: And it also includes 14 major carriers, an ISP, Cisco and NTT needless to say?

Fujiwara: But NTT is still quiet because their investment is regulated by the Ministry.

COOK Report: So they're not eligible to join?

Fujiwara: No. But NTT itself or the subsidiary will connect somehow.

We are also working with Inferno which is a new operating system by Cunningham and Ritchie the authors of Unix. This is a completely new operating system designed for the Internet. It has an entirely new kernel and is focused on devices like the set top box. We are helping Bell Labs explore marketing possibilities in Japan.

Accelerating Internet Growth

So my next goal for our Institute is to accelerate Internet growth here. Prof. Jun Murai is also an advisor for the Institute. We take our resources about half from the academic world and about half from the commercial ISP world. We are now into our second year of operation and fortunately our first year is already just profitable. NTT is also our client. As is every carrier. We have declared our services to be neutral. They are open to all and not favoring any one player in the market. Therefore we have no real competitors.

Recently I have discovered an American company, ISP Alliance of Alpharetta Georgia (www.isp.alliance.net) that has a similar strategy. It is affiliated with UUNET, Ascend, AT&T, Sun, MCI and others and provides downstream ISPs with outsourcing services for marketing, customer support, billing and a whole range of services.

COOK Report: So your idea then is to help ISPs to get started and to compete? But what are your ideas about how fair competition can be facilitated. In determining fairness what do you think some of the issues may be?

Fujiwara: For example suppose one person has a good idea of content

sources throught the Internet. But suppose he can't find enough engineering skills in routing and related things to get his content on line? We will help him to make up for his lack of technical expertise and expertise in content will be able to succeed.

COOK Report: Do you foresee any danger of monopolisation in the Japanese market by a huge player such as NTT for example?

Fujiwara: well this is my personal opinion. In Japan, anti trust law doesn't exist. The reason why the ministry divided NTT last year was to divide a company controlled by the Ministry of Postes and Telecommunications. Their purpose was really to increase the government control of the company.

COOK Report: But the relationship between MPT and NTT had always been very close?

Fujiwara: Yes, they are in one sense the same organization.

COOK Report: So you are saying that you certainly don't see anything happening that would cause any serious challenge to NTT's position. But do these changes make possible niche organizations where as the market expands new companies can grab specialized services that NTT may not be offering and succeed?

Fujiwara: Yes. I think this is the hope of the New Common Carrier services reform. This is the logic of Japan. The government controls the activity of the corporation. The goal of the government is not to accelerate the market but just simply to control.

COOK Report: Is it your purpose to say to the Japanese government that you better think not as much about control and rather more so about market acceleration?

Fujiwara: Yes. The MPT needs to think less about sending its high executives into high executive positions in NTT. Just as, for example the Ministry of Finance can install some of its retired executives into the position of presidents of banks.

To Choose: Control or Market Acceleration?

COOK Report: But with style of government control, if I were a high level executive with NTT, what motivation do I have to explore or investigate or adopt new leading edge technologies?

Fujiwara: There is some truth to this. Nevertheless NTTs engineers have good opportunities to make presentations at international conferences and they have very adequate research budgets - almost one million dollars per person.

COOK Report: To conclude. Do you hear much talk about IP swallowing everything?

Fujiwara: Here in Japan our Internet access structure is based mainly on dial up either with an analog telephone system or ISDN.

COOK Report: If I have a business with say 20 to 50 employees, are you saying that I could not have a leased line from my business to the ISP's nearest POP?

Fujiwara: You could have such a line but those who do represent a little less than half of Japanese businesses. As soon as our Internet is based mainly on leased lines and routers, then Internet telephony will take off. I think it will take about two or three more years for this critical mass to develop. Right now the cheapest leased line connection is $350 per month 128 kilobit per second connection through NTT's OCN Division. Let's say it was only one tenth the price or $35. That would mean a significant breakthrough for Internet telephone service.

We do not have your $19.95 a month service. Dial up here costs $20 a month plus per minute local charges for the amount of time spent on line. For example five hours a day usage would cost over the period of a month about $160 not including the $20 charge for the ISP.

COOK Report: Will this change any time soon?

Fujiwara: I don't think so. Not unless at the high levels of MPT they decided that it should happen.

COOK Report: What do you see as the most fruitful direction for the growth of NTT?

Fujiwara: NTT has no competition in Japan. Therefore it should expand its business outside of Japan. However the United States and Europe represent very tough markets for NTT because they are already well organized and well served. It makes sense for NTT to concentrate on Asia. The best strategies may be fiber backbone plus radio and a step-by-step expansion.

Let me add that "sufficient technical knowledge" is frequently a synonym for "I want absolute control." Reality today is that CEOs most of the significant Internet corporations make profoundly important decisions that affect the course of the Internet's evolution, and they have little technical knowledge. They have good staff, good consultants, good advisors. The same applies here.

The Green Paper public policy/rule making proceeding now underway provides a critical platform by which the U.S. government - at this unique and critical juncture in the evolution of the Internet - can lawfully transfer its existing administrative responsibilities and stewardship maintained over the past twenty years to a stable, balanced, open, and well-constructed industry body that will no doubt serve as a model for a broad range of other self-administrative activities.

There are clearly a broad array of "bits and bytes" technology, as well as new applications and services that benefit immeasureably by the new styles of engineering decision making (e.g., IETF, W3C, OMG, etc.) That is why I've evangelized these institutions for the past eight years. At the same time, on the other end of the scale, there are some highly contentious matters that essentially require public due process proceedings and invoke all kinds of legal, public policy, industry, international, complexities. As the Internet gets forever bigger, as the investments get huge, as the infrastructure gets critical, as the Internet becomes an intrinsic part of all communications - there will be more disputes and contentions that are only amenable to these [Green paper like] public decision making processes.

Ira's open, straightforward, self-deprecating, and amiable style also engenders confidence and support by nearly all parties. - **Tony Rutkowski**

In Search of a Meta-View of Internet Change

A Conversation with Tony Rutkowski on Issues Facing Internet Industry that Cut Across Technology & Jurisdictional Bounds

Editor's Note: We interviewed Tony Rutkowski in London on January 28. Tony currently runs two notable web sites: www.wia.org and www.ngi.org. The first contains and especially rich lode of material on Internet DNS and other governance issues.

Rutkowski: Tracking developments and trying to make sense out of them in this industry is getting to be more and more challenging. You have an increasingly complicated three dimensional matrix of change on going as new entities realize that the Internet means their future is at stake. It is complex enough now so that you must bite off a piece of the matrix and get really good at following that one aspect or you try to see at a higher level of abstraction where the whole process is going.

I try to organize what is going on by having a rough stack in which the stuff is layered. On the ground floor are all the network kinds of developments above which you have the applications and so on. At the transport level you have the ATM SONET kinds of developments and the backbone developments with the backbone industry re-vectoring.

You have transport; network; applications and then ancillary services for the network. Now some of this can be lumped into infrastructure and some into infostructure.

COOK Report: Info being content?

Rutkowski: I am not sure content is a useful term any more. You have content in both infostructure and infrastructure. You can also have a meta level where you have content about content. You have developments occurring all these different sectors. And then you have specialized aggregates of things which can be grouped by realms in which they function.

COOK Report: So you have some vertical planes slicing through the horizontal?

Rutkowski: Yes and then specific large market places and their interests are slicing through it to form a third dimension. For example entertainment. The transport mechanism can become a form of Internet access if you use the vertical blanking interval in TV.

COOK Report: For @Home?

Rutkowski: Not only @Home but also virtually the entire broadcast industry.

COOK Report: Is anyone actually talking about digital TV being inside of IP packets?

Rutkowski: I have actually heard the idea of IP mentioned for the use of the transport of MPEG2 with HDTV. The FCC has allocated spectrum for HDTV which is essential a single large digital bit stream which affords the opportunity to deliver all kinds of media in one direction.

COOK Report: This reminds us of the guy who said that you can send IP over anything - even wet spaghetti. It can carry virtually anything under any conditions. It looks like we are beginning to see a whole multiplicity of mediums that have never been used for IP before put to work?

Rutkowski: Sure. In a way IP is becoming irrelevant. It is just becoming the glue that holds these media together and it is increasingly taken for granted as the assumed platform. If it is merely "glue," the important thing is what is happening above and below it. I think it has come through loud and clear at this conference that everything is now interrelated with everything else.

COOK Report: And this is one reason for the difficulty of creating an Internet Industry Association? The industry is now so broad and all encompassing that if an Association were broad enough to encompass everyone, it would be so general and vague as to be meaningless? Or if it were specific enough to satisfy some, you couldn't hold all the divergent interests in a single targeted organization?

Rutkowski: Sure. It is almost being reflected in some of the corporate paradigms. Look at the Hewlett Packard people at this meeting. There is no Internet division within the company. Rather, there are Internet developments through out the company - very likely in every single division.

COOK Report: Let's look at it from a different angle. how long can the various components of the Internet - like for example, DNS - continue to scale without breaking down? Now you yourself have said that people have been asking this question for the past decade without the net's having broken down. When you look at the current situation, does everything seem surmountable? Are there any stone walls out there?

Rutkowski: I don't see any.

COOK Report: How about DNS? Are there some people out there with ideas about replacement technology?

Rutkowski: In the agent or "object" community people have already come up with the definition of Internet standards that address the need for an Internet environment where you can have mobile objects versus stationary objects. The world will have a plethora of different kinds of objects - some of which are stationary and some of which are mobile. In this environment you have to have a DNS system which will deal with that. For sure the current DNS will not. There will have to be some alternative naming system.

COOK Report: Has anyone described such a system?

Rutkowski: Not that I know of, however I also think that it is a trivial problem to solve.

COOK Report: So when it is really necessary, it will happen and happen quickly?

Rutkowski: Yes. It is one of the simplest services that one can conceive of. Rapidly growing numbers of zone files can be handled by caching them in clever ways around the network.

Bandwidth

COOK Report: Let's take a look at Qwest and Level 3. How do you evaluate those who are offering new sources of bandwidth?

Rutkowski: Everyone who lays fiber or has radio spectrum - that is to say everyone who has a physical transport

medium will be reinvesting those assets to provide various kinds of connectivity. The motivation here is just to continue to keep up with the growth in bandwidth demand.

Just look at Mike O'Dell's silicon cockroach theory. [**Editor's Note**: According to Bill St Arnaud's posting to the Canarie list on January 27 O'Dell states that in1996 UUNET deployed NxOC-3 backbone links while in1997 UUNET deployed NxOC-12 Backbone links. In late 1997 and early 1998 UUNet will start deploying OC-48 backbone links and in late 1998 UUnet will start deploying NxOC-48 backbone links. UUnet on average installs a new T3 every day. MCI and UUnet have a number of OC-3 customers and MCI has connected its first OC-12 customer - Microsoft. Microsoft has on order 2 more SONET OC-12 links for Internet service.]

Bandwidth demand has been growing exponentially, but for some unexplained reason, last year it grew by ten times - a hyper exponential growth. In 1998 it's unclear whether growth is going to be just plain exponential or grow by ten times again. I think everyone concedes that there is this phenomenon where the market place for moving IP packets from point A to point B is expanding exponentially. Therefore, it is only natural that anyone who has physical media or money to invest in physical media will be offering new transport services. There are rather few markets with such growth and successful investment in such a marketplace is pretty well assured.

COOK Report: As new providers come into the game, what about their ability to route traffic and interconnect via public or private exchanges?

Rutkowski: There are many who are looking at that marketplace and those sets of problems.

COOK Report: Who?

Rutkowski: You have the Ciscos and the Pluris's of the world. Pluris, in theory, looks as though it can scale indefinitely with its massively parallel architecture. You have Ipsilon. You also have an emerging terabit routing community.

COOK Report: So, while routing seems tractable, what do you do when you need to connect new backbones into the earlier ones? The public exchanges are horribly overcrowded but the private exchanges can't really be tracked because, by their very nature, we really don't know how many there are.

Rutkowski: True. That is not well understood and needs a couple of years at least to straighten out. Bellcore is looking at it. I think it is encompassed within some of the critical infrastructure initiatives.

COOK Report: Are these related or are they independent from each other?

Rutkowski: They appear to be independent. To some extent there is a general appreciation that this is an emerging significant problem that needs to be dealt with. But those

problems represent marketplaces. So you see companies like Bellcore doing things like providing services that may take the form of a continuing forum. But what is also occurring is that the US government itself is beginning to take an interest in this as a problem.

There has been a Presidential Commission on Critical Infrastructures for a while now and while it had examined a wide variety of infrastructures, it had not looked at the Internet. Andy Sernowitz and I went to the commission and talked with them. First to educate them on why the Internet should be designated as a critical infrastructure. And secondly to alert them to things associated with the Internet that could represent single points of failure and could damage that infrastructure. For example the scaling of traffic, problems of interconnection and hacker attacks on the system.

COOK Report: Where does Sernowitz and the Association for Interactive Media (AIM) fit into this?

Rutkowski: AIM is a fascinating development representing the interests of a broad array of new Internet constituents. They represent new small entreprenuers who are affected by these developments in Washington but have no voice in the process.

While a typical trade association would concentrate on lobbying a senator or house member, while AIM's approach is to find out who on their staff is the Internet maven. Those on the staffs who use the Internet will take a particular interest in explaining problems to their bosses and are likely to continue to urge the boss to take an interest in the new group.

Technical Discissions from Inet-access
Making LECs More Efficient - Routing Decisions Based on Correct AS information - Routers vs layer 3 Switches

On February 13 there was an interesting exchange on inet-access between Avi Freedman and Sean Doran.

Avi Freedman: [The Bells] can't complain about ISPs clogging their networks when they offer discounted 2nd lines targetted to Internet customers and sell unlimited-use Internet access themselves. In fact, they should just do the IPRS for real - IP Routing Service, where they manage modem banks and terminate IP into ISPs via SMDS or Frame or something. It'd get users good connects; shrink interswitch use by Internet users to 1/20th the bandwidth (for IP muxing vs. shuffling DS0s full of modems screaming with an-

alog or digital representations of the underlying IP data).

Sean Doran: Oh Avi you are asking for bad juju here. In order to save money by doing statmuxing by [means of] doing a "terminate IP into ISPs via SMDS or Frame or something", you have to actually statmux. Getting the statistical part is extremely hard work, particularly when you realize that economy only comes through overbooking. Overbooking necessarily implies either buffering or loss. Buffering can be too small, in which case you get loss. Buffering can be too large, in which case you get queuing delay.

Buffering can only be "right" when you have a mechanism such that the average queue length is exceeded only in the presence of transient congestion. This can only be done with TCP if you have a RED-like queueing discipline.

In other words, in order for Bell or ANY other fast packet level two provider to statmux TCP traffic properly it has to watch what's going on in TCP land or have a means of imposing flow control on boxes talking to the fast packet fabric. Admission flow control is very very hard to do correctly in the presence of any type of

delay, even when you make it simple by having an explicit per-destination transmit token.

So, you end up with too tight a loop and you see flow control becoming too strict, causing queueing backpressure in the IP router handling TCP traffic, which in turn will ultimately translate into TCPs backing off, gracefully or via slow-start. Or, you end up with too loose a loop and you see flow control not be strict enough, and you are back to witnessing either drops or increased queueing delay within the L2 switching fabric. In other words, statmuxing is hard work, and typically the more traffic is aggregated the more statistical miscalculations will hurt. So, having a LEC of any nature do anything other than virtual circuits with reserved bandwidth is asking for trouble.

Freedman: I disagree - keeping 64k circuits (assume all ISDN, which is the most efficient) open all the time when most circuits are not filled is wasteful. Not to mention 56k for 14.4 of data. So even massive overprovisioning is possible and they still save money. If they go on the 50%-link-fill rule - or even 25%-link-fill-then-get-more-in-place rule - they should be fine.

Doran: Note that in modern equipment such virtual circuits are almost invariably switched, and it is there that the LECs get their economy. Further refinements of the current model such that quiescent circuits are torn down, or that circuits are ramped up very quickly on short term demand and ramped down on much longer term lack of demand is possible, however bandwidth must be stable for relatively long periods of time after a ramp-up or a ramp-down or really really bad things happen to TCP.

In fact, it is best for LECs of all stripes to concentrate on very fast set-up and tear-down of circuits and making that economical for end users (like Cisco 7xx series boxes, for example, and for big networks' dialup pools) and for their own fabric. This allows them to benefit from their deployed per-time-unit charging plant in offering a service which for most users would be no different -- except in speed -- from POTS for connectivity to ISPs. Of course that last sentence is utopian; they likely would far perfer to make more money rather than save on costs, and so there is no economic incentive to transition.

There is, however, theoretical scope for allowing switching these really fast "circuits" on or off at relatively small multiples of the 125 usec framing rate of the PDH/SDH/SONET phone network. So, while it would still be a "circuit" in that there would be no room for an overcommit, if reservations can be managed relatively fast you get very short-live virtual circuits, which is nearly as good as packet-switching or statmuxing.

A thousand PDH/SDH/SONET frames gives you scope to talk to a reservation agent that is a fair number of kilometres away, and 8 circuit set-up/tear-down options per second. Assuming my midnight maths are right, this translates into bursts at DS0 of 875 bytes which gets you very near what you would hope to accomplish with packet switching at the same rates. The efficiencies necessarily worsen at faster rates, of course, unless you parallelize reservations much the same way you multiplex DS0s.

Of course, this is approaching ATM's reservation nirvana, where "the only hard thing is in the reservations system", however the scope is somewhat easier given design constraints of synchronous reservations and transmissions. It also makes it possible to make some use out of work on speeding up ISDN.

Freedman: Now that is true. Basically: (1) There's probably at least 50% waste of capacity in digitizing stuff (maybe it'll go down to 25% when ISDN comes in to play more). (2) Then, on top of that, there's probably 60-70% or more waste in keeping DS0s open for IP traffic, on average. Is my admittedly informal Wild-Assed Guess.

Using AS Numbers in Routing Decisions

Freedman (Feb 22): Administritative allocations or assigns in SWIP records have nothing to do with Internet BGP4 routing.

Doran: Not yet. Remember that the IRR people and a collaboration of people from Cisco and Juniper have each proposed a different mechanism for enforcing a policy that each prefix's origin AS be authorized (via strong authentication involving encryption) by the entity to which one of the registries delegated the address space initially.

There is some debate over details that may lead to a synthesis or at least a greater interoperability between the two models. Note, however, that Tony Li's presentation at NANOG was not simply hot air, nor was Yakov Rekhter's comment

that they aim to have something deployable in less than glacial time.

The point is that enough "accidents" have happened involving ASes improperly announcing various prefixes, that the usual suspect large providers are virtually certain to enable vendor code of this nature as it becomes available and reliable. Consequently, I hope your comment does not remain true for very much longer.

Freedman; (And, of course, noone's talking about making routing decisions off of the SWIP data, though people are talking about checking that data before trusting route database entries).

Doran: Well, yes and no.

The way of looking at it is that BGP is a mechanism over which one can lay routing policy along the lines of, "accept a route only if the origin AS is authorized to announce the NLRI", or "accept a route only if the path attributes matches what has been codified in the IRR". The first is the new policy we are talking about, and there are two competing proposals for enforcing that policy.

http://engr.ans.net/rps-auth/rps-auth.html and ftp://ftp-eng.cisco.com/yakov/draft-bates-bgp4-nlri-orig-verif-00.txt

The second has a venerable history even prior to the creation of the IRR, and could be extended such that one does make routing decisions based on a combination of the SWIP/rwhois database and the IRR.

Returning to the mechanism again, when a BGP speaker hears an announcement it has the option of accepting it or rejecting it, then it has the further option of using it or not using it, then it has a final option of propagating it or not propagating it. (For completeness, withdrawals are a funny case; you generally want to propagate withdrawals for which you have made related announcements, which requires knowing to whom you announced things, which not all implementations do, for reasons of limiting state. If you do not keep this state you almost certainly want to propagate all withdrawals you receive.)

So, in fact, your comment is not accurate. Routing decisions will be made using the registries' data, in that either the IRR or some other distributed database (or both) will be populated with an authorized mapping of prefix to

originating AS, and that mapping will be used to determine whether or not any given announcement will be accepted or rejected. In other words, the allocation database will very definitely become a part of the global routing system, and frankly, it's about time.

Routers vs Layer 3 Switches

Sean Doran (responding on Feb 24 to a querry by Lex Luthor): Firstly, no, many "level 3 switches" cannot be "cut-through" except for a very narrow definition, given media-level requirements of error-checking and the need to verify the IP header before anything else, and the need to update the header before finally transmitting it towards the destination.

Lex Luthor: What about Cisco's tag switching, or Ipsilon's IP IFMP? Don't these protocols allow remembering the circuit state you need to enable cut-through?

Doran: I don't know about Ipsilon's IFMP, actually, although it may just be acronym-fault. MPLS and Cisco's tag switching both encode information into the encapsulation header that can indicate things that the IP header cannot, as the entry interface. In general encapsulating protocols could indicate all sorts of other things too, such as absolute time of arrival, or inter-arrival time, which could be useful for real-time traffic. This does not in itself enable cut-through. It may make some of the non-FIFO/TQD queueing disciplines I described in my last message much easier to configure to match particular policies, though.

Luthor: In the tutorial at http://www.networkmagazine.com/tutors/9705tut.htm, Steve Steinke describes tag switching and IFMP as some sort of "soft state" that makes the packet forwarding qualitatively different from normal routing. What do you think of his description?

Doran: I skimmed it. His history is very telephony-centric, and as a result he has mis-ordered the arrival of connectionless packet networking, but that is a minor detail in an otherwise OK article.

It doesn't really make much sense to use the word "switching" to describe a scheme wherein state beyond forwarding address is maintained. Remember that any forwarding device is going to have a table like:

```
destination0   next-hop0
destination1   next-hop1
destination2   next-hop0
destination3   next-hop0
destination4   next-hop1    ...
```

The amount of processing one does to resolve the destination to be looked up in this sort of table can be large in some implementations, particularly if policy is involved. Policy decisions typically result in an expansion of the forwarding table, essentially deaggregating the destinations on boundaries other than the destination-address-bits in the frame header.

For example, in the table above, destination0 could be 1.0.0.0/8 with the TOS T (throughput) bit set to 0 (normal throughput), destination1 could be 1.0.0.0/8 with the TOS T bit set to 1 (high throughput). In order to make this kind of decision based on TOS bits, somewhere a router has to grind through the IP header. In traditional routing, this is done once per router. In encapsulation routing (e.g., MPLS) this is done once at the entry to a network of MPLS-talking routers.

One might call a network of MPLS-talking routers a "switched network" in that IP is not used within that network directly for making forwarding decisions, however there is still a hop-by-hop analysis of header values to do a table-lookup, exactly as in every other type of datagram-forwarding device. So, "switching" here is a very IP-centric point-of-view. Note that encapsulation networks treat IP (and perhaps other protocols) as payloads; the networks still make tabular forwarding decisions, there needs to be a routing protocol to generate consistent forwarding tables throughout the network, etc.

When you look at the article's Last Word ("So you can't distinguis a router from a switch by OSI layer.") you have to consider the ISO Reference Model as just a way of describing things, rather than a universal codification. Having IP as a payload in MPLS does not automatically make MPLS layer 2 (what then happens when MPLS is running on Frame Relay?), nor does it suddenly make IP a layer 4 protocol. The reality is that MPLS and its payload are both network-layer protocols, and with other encapsulations (GRE, EON, etc.) there could be more of them stacked one on top of the other. Other than that, the first paragraph of the conclusion is not so bad.

The second paragraph is a bit confusing; it seems that the author apparently says that a switching network tends to be connection-oriented, while a routed network is not. This is an interesting argument. To some extent any router that does not engage in the independence assumption of packets could be said to be doing this, and this includes some relatively weak queueing disciplines. It could even be said that in the presence of fancy queue management that really does take into account particular flows' behaviour, one is merely emulating a connectionless service on top of a connection-oriented one. What the CL vs CO argument has to do with switching is beyond me, however, and it looks like the author has simply tried to avoid making the argument that switching and routing with respect to datagrams of any nature are both synonymous with forwarding. That is, however, the argument I make.

Ah on reading to the bottom I remember what IFMP is. It's silly. Not only do you have to worry about scaling to handle IP traffic, but you also have to worry about scaling to handle potentially large numbers of VCs or SVCs (with set-up and tear-down as scaling factors). Moreover, as the article notes, there is network management difficulty in deciding upon configuration thresholds. It is also not clear what is hoped to be gained, except perhaps a deployment of a multiple FIFO/TQD queueing discipline (one per VC) which is easier to build for lazy inventors than a queueing discipline which is smarter.

Moreover it works with ATM alone, which is stupid.

MPLS has the advantage of being multiprotocol (MP) in both directions -- it will encapsulate non-IP traffic as well as IP, and it will run on any type of transport medium.

Doran: [Here is what I said yesterday.] Let's make it a bit more difficult by considering two simultaneous TCP flows. Here is a network:

```
XmitterA----[      ] [       ]---ReceiverA
            | switch1 |--| switch2 |
XmitterB----[      ] [       ]---ReceiverB
```

Luthor: In this description, and the previous one, you are multiplexing XmitterA's and XmitterB's packets onto a single port. I agree that in this case cut-through could never work for TCP. But what if the situation was as follows:

Doran: Not multiplexing, but concentration. If the line between switch1 and switch2 were larger than the sum of the lines between the Xmitters and

switch1, or the lines between the Receivers and switch2, it could not become a congestion point and therefre would not be doing concentration. It still would be doing multiplexing, however.

Luthor: But what if the situation were as follows:

```
XmitterA------[    ]----ReceiverA
              | switch |
XmitterB------[    ]----ReceiverB
```

In this case, the switch could conceivably understand that there are really no traffic issues between XmitterA and XmitterB, and that it could partition itself into two seperate busses that don't even talk.

Doran: It probably doesn't have to do any such partitioning; the backplane in any given fast box in modern times is likely to be a crossbar or a banyan or a Batcher, a SMS or some such. In a well-designed switch there can be no contention for resources in this

case. Contention will only happen when multiple transmitters are sending to a single receiver.

Luthor: Yes, this is true of only two of the eight patterns of traffic possible between two transmitters and two receivers, but for some networks it may be far and above the most common pattern. Is this the "cut-through" ability that I see listed as a feature of many of the routers in my copy of Network Magazine Buy-

Executive Summary

Internet Gridlock pp. 1 - 8

We examine the landscape in the aftermath of the Green Paper and find that a proliferation of power blocs are jockeying to impose win/lose scenarios on the outcome of the restructuring of DNS and IANA. We offer a short history of the conflicts over the past two years in an effort to show the origin and development of the win/lose downward spiral.

Too many of the players, including POC and CORE, see the DNS situation as one where they win by atttacking NSI. "Dot" gov has been turned over to the United States General Services Administration and Educom has proposed to take over .edu". "Dot" com of course is what everyone sees as the prize. The Green Paper proposes that NSI must open a front office (registrar) operation and separate that from its back office (registry) function.

The Green Paper also proposes that NSI must "give the U.S. government a copy and documentation of all the data, software, and appropriate licenses to other intellectual property generated under the cooperative agreement, for use by the new corporation for the benefit of the Internet." Material covered under this phrasing certainly includes the database contents for .com which was described for us by one observer as "the mother lode of all Internet strategic databases."

"It contains for two million registrants the contact info (name, phone address and email) on up to three people for each name. (Technical, admin and billing). That alone would give possessor the name of almost every sysadmin in the US (or maybe the world if you combined it with other DNS databases from CORE for example) as well as the "owner" of every Internet associated business. Doing a "whois" search by name would raise considerable privacy issues. That's why the POC/CORE idea of aggregating it with all, other TLD data in one central database is so frightening. Not to mention that the revenue value of being able to e-spam or telephone solicit that community is enormous." The Green Paper speaks, without, we think, having thought through

the consequences of using this material "for the benefit of the Internet."

While the Green Paper leans toward approving profit making registries, it also mentions the existence of a strong strain of opinion favoring non profit registries. We have found out a good deal about those on this side of the equation. Among them is, not surprisingly, ISOC. Don Heath confirmed in email to us on 3/6/98: "We advocate a public trust - non profit model for registries." Educom is of the same general persuasion, having submitted a response to the Green Paper, the salient points of which Mike Roberts outlines for us in a side bar. The Educom and (presumably ISOC) proposals would bar for profit registries by banning private ownership of domain names which are regarded as belonging to "a public space which requires public interest stewardship on behalf of all users of the Internet."

Registrants would pay for a license to use the name just as we are now having to pay for a license to use spectrum which the ITU holds "in the public trust." Tony Rutkowski points out that any language calling DNS a public resource, as does the ISOC signed MoU, assures ITU involvement forever, since their treaty charter assigns them a permanent role where such resources are involved." See for example Article 12, paragraph 3 of the ITU constitution "In the exercise of their Board duties, the members of the Radio Regulations Board shall serve, not as representing their respective Member States nor a region, but as custodians of an international public trust. <http://www.wia.org/pub/itu-constitution.html>
See also <http://www.wia.org/dns-law/pub/ITU_Telecom_Regs.htm> Rutkowski adds: "What keeps the Internet outside the grips of these provisions is Art. 9 dealing with "specialized" networks and systems that are not in the same category as those "generally available to the public." The same critical boundary is also found in other major instruments such as the WTO GATS Telecom provisions and the national laws in many countries and regions like Europe." Given that ITU Secretary General Tarjanne has openly declared the ITU's Interest in becoming the governing body of the Internet, we can only wonder about the impact of the ISOC and Educom phrasing.

Furthermore the concept of the Registry owning the names, and only renting their use to registrants is exactly how the Interna-

tional Telephone Number System works to give the PTTs control of phone system customers, where one cannot get any kind of dialtone without first renting a number "From The Phone Company," which owns your number and can change it as dictated by the "Needs Of The Phone System." Unlike spectrum, to which it is sometimes comapared, the DNS name space is essentially infinite.

We continue to find references to IBM and AT&T, first in databse construction for CORE and more recently in running a non profit .com database. If doing so would give these giants access to NSI's .com database, we can understand why they would be eager to step up and perform such a "service" for the Internet community. As we have documented in previous issues, under the stewardship of Brian Kahin and Becky Burr, these two companies seem to have become the leading lights of the InterAgency Working Group's industrial policy.

Educom's call for non profit and education representation on the IANA Board reminds us of Ira Magaziner's statements in his interview with us that, the non profit, education and trademark sectors pushed heavily for what became, at the last moment, seven user group representatives on the policy board. Unfortunately, this changes totally the nature of the IANA Board from a source of technical policy for Internet names and numbers to a general Internet governing council and puts a top down imprint where it most certainly does not belong.

We have here a series of circus rings with 'elephants' jostling each other in win/lose struggles. In the central DNS ring is NSI backed by SAIC and defended in a current lawsuit by no less than Lloyd Cutler, the biggest legal pistol in DC. Standing somewhere in the shadows against NSI, either is or has been IBM and AT&T, their entrance facilitated by Kahin and Burr. Also trying to gain a foothold is the the Open Root Server Coalition. See www.open-rsc.org. ORSC is playing a *non-zero-sum* game in the hopes of attracting enough participants from the Internet commnity to turn the tide from zero-sum to non-zero-sum politics.

IAHC sought a win/lose solution and began our current sad downward spiral. Rather than lose IAHC's opponents called in

US government, which has handed them a victory making IAHC/POC/CORE a current loser. Rather than accept their loss POC/CORE calls on the EC and EU to fight the US. The result is that, in another ring, the Europeans lead by Bangeman are trumpeting accusations against the Americans. These are not the only "rings." In a third we have the US Congress, in a fourth Asia, and in the fifth the US Judiciary.

The IANA Transition Advisory Group (ITAG) is in a sixth ring. This group (Randy Bush, Geoff Huston, Brian Carpenter, John Klensin, Steve Wolff and Dave Farber) is composed primarily of long time close associates of Jon Postel. ITAG is appears to be set up to perform the detailed design of the new IANA corporation. Drafting the articles of Incorporation and the By-Laws is something that has to be well underway right now for there to be a chance for Magaziner's timeline to work. Unfortunately, the pattern being followed is very similar to Jon's appointment of IAHC. ITAG is a closed, top down, appointed group working to revamp the most critical aspects of the Internet. We have seen no sign that, apart from getting initial clearance through Magaziner, the ITAG will do other than present its redesign to the world as a fait accompli. IAHC was the previous such win/lose solution concocted by Jon as IANA.

It is becoming clear that the new IANA will have broader powers than the old. ITAG may be the most important "working group" in the history of the net. It is a shame to see that it has not adopted the IETF tradition of openness and is working instead behind closed doors. What will be done to ascertain if the result has any consensus behind it? When ITAG is finished, will it present its draft anywhere before sending it to Magaziner? Now that rule making is underway contacts with government must be done in the open. ITAG as a private sector group falls outside these constraints. Any corporation wishing to affect the outcome at this moment has to be thinking about whether an approach to ITAG could be fruitful. This approach is hardly fair to the groups that are working in the open to develop broad consensus for a solution to the DNS problem. One such is the Open Root Server Confederation. We recommend a look at their work in progress at <www.open-rsc.org>.

Ira Magaziner - as Ring master - is trying to be an honest broker of what is best for the Internet and is taking an internationalist stance that ironically the European's miss as being US centric. The Internet community - no longer cohesive - is heavily fragmented. Fighting amongst itself, it risks surrendering the field to the ITU and the old line phone companies - players which will remake the Internet top down while deftly handing out higher prices, less innovation and less freedom for end users.

We owe our entire focus on the unfortunate aspects of the zero-sum (my win muct be your loss) behavior chronicled in our survey of the current mess to discussions with Einar Stefferud who with this problem in mind

has been helping to nurture the Open Root Server Confederation. While Vint Cerf disagrees with some of what we have written, he joins Stef in commenting for the record: "the zero sum mentality is a useful analogy to explain some of the extremal behaviour of various parties. "For me to win, you must lose" - a poor match to the burgeoning value of the Internet and its potential for growing opportunities for many parties."

Our Magaziner Interview pp. 1, 8 -15

The interview explores in depth the schedule for and steps to be taken in setting up the new IANA corporation. It puts on record the thinking behind the user members and Magaziner's reaction to the problems that they may cause. It shows the current state of his thinking in a detail not elsewhere available. He describes with candor the methodology of his approach. Those who don't take the time to look at and try to understand what he reveals here about his decision making process and the direction in which he intends to push events should not complain if, having opted out of the process, they are later unhappy with the outcome.

Analysis of Magaziner's Position, pp. 16 - 18

Ira Magaziner understands very well that the crux of the current problems are not just DNS but the entire range of IANA authority. We are worried that what Ira is doing faces several contradictions. He is working with an arbitrary but significant deadline of September 30 because, at that time, two things happen. First, the final six month ramp down of the NSF NSI Cooperative Agreement ends and with it the US government's authority over NSI's operation. Second, federal funds to pay for the IANA function end and, with that ending, the government's claim of authority over the IANA, if not ended, is sharply diminished.

In this context Ira wants to make sure that NSI shares registrations into the .com database. He also wants to have a new IANA authority in place with an international buy-in to a privatized policy board that will establish policies over the issuance of new top level domains and establish a new internationally agreed upon means of operating a single set of beefed up root-servers. A tall order in eight months under any circumstances - one that is made even more difficult by two years of zero sum struggles.

All of this operates in a context where, in the year since the U.S. government's involvement began, the importance of the Internet to the entire range of telecommunications has been growing and where many large corporations - motivated by a new-found awareness of the impact of the Internet on their future viability - are now quite eager to meddle in the process to protect their own self-interest. As a result, Magaziner is on the tightrope because he has lit-

tle time to get a group of powerful forces with conflicting interests to act on behalf of a mutually agreed upon common good. His need to find consensus among such a diverse range of interests could mean that he either runs out of time or agrees to a structure that will be unworkable.

QoS & Tag Switching, pp. 19 - 22

Paul Ferguson describes Quality of Service as neither network uptime nor the application of RSVP on a VPN but rather a complex series of engineering tasks which range from traffic management to capacity planning and may include every thing from differentiated services to tag switching. In a second interview Yakov Rekhter describes tag switching which is expected to provide traffic engineering capabilities comparable to what ATM provides today, but without requiring ATM. It will be released by years's end.

Internet in Japan pp. 23 - 25

In a Tokyo interview Hiroshi Fujiwara, CEO of the Internet Institute describes how his Institute is set up to provide technology transfer to emerging providers of new internet infrastructure in Japan. He also describes NTT's approach to the Internet market place and the interest of the Japanese consumer electronics industry in IPv6.

Rutkowski on Internet Meta Developments, pp. 26 - 27

Tony describes how technology issues lie along various layers of the protocol stack while issue of content slice vertically through them. He sees IP as merely "glue" holding the "layers together while the important thing is what is happening above and below it. " He likes the Association for Interactive Media which he sees as a fascinating development representing the interests of a broad array of new Internet constituents. 'They represent new small entreprenuers who are affected by these developments in Washington but have no voice in the process."

Technical Issues from Inet-access, pp. 27 - 30, 32

Avi Freedman and Sean Doran discuss stat-muxing as a means of more efficient use of the LEC network. A second discussion looks at whether network AS numbers may become directly used in such a way as to be certain that the AS number is tied to the correct set of prefixes. A third discussion between Sean and Lex Luthor focuses on the possibilities opened by tag switching and other layer 3 switching solutions.

ers Guide?

Doran: Probably not. You are looking for technical justification for marketing word-choice, when really there is none. Remember again that any buffering in the switch will also ultimately be occupied by TCP in its quest for equilibrium unless the latency of the switch really is zero bytes. Any delay, however induced, will lead to more unac- knowledged bytes on the wire. This is the really cool thing about TCP.

The other cool thing about TCP is self-similarity in aggregate. When you have lots of TCP flows operating in concert you will generally see a bursty plot of bits-per-second vs time when looking at any given line, or buffers-occupied vs time when looking into any given interface queue. This plot retains the same "raggedness" no matter what the time scale is.

Some of the phenomena behind the deepness of the troughs vs the peaks are known -- lots of the traffic is fundamentally bursty because of the nature of the traffic. People hit the "send email/send news" button or click on web pages. Protocols are somewhat lock-step. Ethernet and token-ring-style networks can add burstiness. Troughs can deepen because of global synchronization as a response to heavy congestion: a wave of traffic arrives at a FIFO queue causing lots of packets to be tail-dropped, which causes lots of TCPs to back off to slow-start. They all ramp up again and turn into another wave of packets that overwhelms queues. RED mitigates this quite a bit, but may not fully eliminate this phenomenon (we'll see at some point).

In other words, the scope for cut-through (i.e., bufferless) forwarding in routers handling lots of TCP traffic is small: an arriving packet must be destined for a quiescent interface, and any packets to the same interface behind it must both arrive sufficiently far behind that they are not delayed in a queue while the first is being delivered to the output interface. This can happen if the lines are the same size and there is no competing traffic, or the outbound line is bigger than the sum of its inputs. Even so, the "wave" effect cause by heavy-aggregate TCP probing and reaction to FIFO/TQD will tend to overwhelm any interface that is not bigger than the sum of its potential inputs. In many office environments, this won't ever happen.

However, in any office environment, we are talking about the order of microseconds of delay in queues, which is not a particularly long time. So, where is the value in doing cut-through forwarding, particularly if it adds complexity to the design?

The COOK Report on Internet
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