The COOK Report on Internet

Building Tools for Edge Based Control

Understanding Edge IPv6 versus Backbone IPv6

VoIP and Vonage - When Customers Become Competitors

Open Spectrum Versus the Spectrum-as-Property Worldview

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We are finding more evidence that the phone companies are caught in an undertow from which they cannot escape -- unless the FCC and, or Congress does something truly idiotic like grant them a monopoly on fiber to the home. "Grant them complete control over the glass and then they will invest" will run the tired argument. The first problem is that they have pledged this before and done nothing. The second problem is that if they were given yet another opportunity there is and will be no enforcement for any of the pledges they make.

To borrow the metaphor from the 19th century, the result of granting them a fiber monopoly would be to hamstring the entire American economy into reliance on "canals" in order to scare off this new and chaotic world called "railroads." While other countries are building "railroads" - that is broadband - for us not to do so would irreparably handicap what is becoming one of the most basic infrastructures of a modern economy. We are already behind. The Organization for Economic Cooperation and Development (OECD) ranks United States only 17th in utilization of communication services. [Quoted in Feb 1 Pulver.com letter to FCC Chairman Powell.]

But fiber is fast you say and speed of connection is the issue – not control over access. What is wrong with such a scenario? Well consider the ZAP mail experience as written by Clay Shirky on January 7, 2003. http://shirky.com/writings/zapmail.html What is wrong here is not speed of connection but rather control over the technology. The phone companies cannot see the world in any terms other than those of control.

A Matter of Mindset -- ZapMail and the Telcos

Consider what happened to the hot new company Federal Express in the early 1980s. There was this new fangled device called a fax machine that scanned a document and sent the resulting digital bit map over a phone line. The time was just before the split up of ATT and the explosion of customer premises phone equipment. Fed Ex totally missed what was happening. Thinking that its competitors were the other over-night delivery companies, it spent 200 million dollars in an attempt to one-up them by buying expensive new fangled fax machines and building a dedicated phone network to run them on.

As Shirkey writes in his essay, they failed to see that the breakup of ATTand the consequent opening of the network would allow their customers to buy their own fax machines and by being able to use the PSTN, become their competitors. They underwent a huge build out for a business that wasn't there. With the network opened up, Fed Ex's customer bought thousands and then tens of thousand and then hundreds of thousands and eventually millions of fax machines. Rather than rely on Fed Ex for the faxing service, Fed Ex's customers bought their own fax machines and did it for themselves. Today rather than rely on centrally controlled circuit switched technology, increasingly large numbers of phone company customers are taking telecommunications into their own hands.

It is a simple matter of economics. The cost of communication via IP is but a fraction of the cost of doing it the phone company way. In our January-February issue we saw how the large corporate enterprises are beginning to pull their voice service from the PSTN. This issue examines why Ipv6 is unlikely to ever be significantly deployed in backbone of the Internet. It also will show how IPv6 deployed at the edge of the network, in the hands of the end user customers of the phone companies, could do a great deal to redress the ongoing consolidation of power into the hands of the central control minded tel-

On the Inside
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cos and cable companies.

We have been learning a lot more about the technology of VoIP. In our April issue we shall return to VoIP and shall show how new developments are already beginning to lower the artificially high costs of international phone tariffs. We anticipate writing about the technology and mechanics of the use of VoIP on a global basis as a substitute for expensive circuit switching. The cost spread between international circuit switched calls and VoIPcalls which can be routed from one part of the PSTN to another is now so huge that it has spawned a global grey market. In part because so many people are so busy making money from it, this grey market has never been discussed in detail in the press. Beginning with our April issue we shall do so.

The stark fact is that the blades of the VoIP scissors are closing in on the telco's cash flow. On the one hand one blade is the result of large corporations withdrawing voice traffic from the PSTN and running it over their corporate IP networks. On the other hand the other blade is derived from international VoIP wholesaling by companies like ITXC and activities by thousands of phone card middle-men hammering long distance rates ever downward. The ability of the phone companies to charge more for a minute of voice traffic than they could for a minute of data traffic is rapidly diminishing. Recently the difference has been as high as seven to one. That is if a telco could make a penny for a minute of data transfer, it could make seven cents for each minute of voice transmission.

For the most part the seven-cent differential is no longer there. Bits are bits. One cannot really distinguish voice from data bits. That any price difference exists at all is increasingly a regulatory artifact. In two or three years market and technology pressures will have driven the differential to zero. When this point is reached, the telcos could find their revenues slashed by two thirds. They will

than have all the relevance of Zap Mail.

Canadians Abandon Faith in Facilities Based Regulation

Meanwhile the regulators cannot keep pace. Testifying before the Senate Commerce Committee on January 14, Chairman Powell said "The Commission has before it a number of major proceedings that will attempt to improve and advance the goals of the 1996 Act. With the benefit of hindsight, we will be able to assess the last seven years and consider how we might improve the regulatory environment to more aggressively promote facilities-based competition, to promote major investment in advanced communication infrastructure, and to reduce regulation—all hallmarks of the Act." (p. 6)

As we showed last fall in our asset-based telecom issue (Vol. 11 Nos. 8 – 10), *the Canadians have essentially given up on trying to make facilities based competition work.* It is too bad that the FCC feels trapped in the requirements of the 96 Act. As Powell describes it, the FCC is in danger of striking out having taken two swings and failed on both occasions. The Canadians, realizing the impossibility of the task, have gone onto better things.

Powell has shown some interesting changes during the past year. Among them is a journey from saying that he didn't know what the public interest was to the following remarkable statement. ". . . we will be guided exclusively by the public interest, and resist the pressure to view our exercise as awarding benefits and burdens to corporate interest." (Page i). Of course the proof will be not in words but rather in actions.

On page four of his text he said: "In addition, broadband connections have also put pressure on wireline networks as many consumers that migrate to broadband for their Internet services have dropped their second telephone lines (which were used for dial-up Internet services). Moreover, 2002 saw the introduction of reliable Internet telephony services through a broadband connection. Companies such as Vonage are providing consumers with a direct substitute to their traditional wireline phones." "These various sources of competition have contributed to the first declines in total access lines for the four major ILECs since 1933 (the only previous year where access lines declined)."

Vonage and Cisco

With his mention of Vonage, we can certainly see that Powell has more clue than he possessed a year ago. We are about to sign up for this service that for the first time takes a Cisco product (the AT186) VoIP gateway and treats it as a consumer product. The gateway plugs into the RJ-11 jack at the back of the phone and Ethernet into the cable modem in the back of the gateway. The result is unlimited long distance in the fifty states for $40 a month – plus very attractive rates to the rest of the world. It is important to note that Cisco, as a device selling company and not a phone company, is well positioned to profit from the VoIP price scissors.

Furthermore those who have read the *New York Times* January 23 coverage (http://www.nytimes.com/2003/01/23/technology/circuits/23sher.html) of our work with Tsering Gyaltsen Sherpa will see another interesting aspect of what could be a new found Cisco view of the world. Cisco donated Aironet 350 radios to the Everest base camp project at Dave Hughes' urging. These are radios that Cisco markets to connect LANs inside of building in large corporations. Prior to this it seems never to have occurred to Cisco marketing people that these radios can be used to bridge a LAN to a VSAT at 5500 meters over a distance of two kilometers. The Times wrote: "Mr. Forster eagerly donated three Wi-Fi radios on behalf of his company. Such radios enable the creation of wireless networks that can relay data within a couple of hundred feet or as far as several miles as the crow flies, much the way that local-area networks, or LAN's, work in offices. "What I like about this project is that it demonstrates that the technology developed for a LAN in a building can be applicable beyond that," Mr. Forster said. "This may be as far outside the building as you can get."

For the first time Cisco is beginning to understand that these radios can be used not just on a corporate campus but rather can be used to replace the local loop in community based applications be it Nepal or in connecting community networks in Wales where Forster, at Hughes' urging, has also involved Cisco with positive results. Of course, if they work in Nepal, and in Wales, they will work in the US. Unless acting in ignorance and on behalf of the telcos, our political and regulatory system forbids it.

The bottom line of all these events signifies only one thing. The local telephone company's standard business model is dead. Rendered extinct by users taking control of inexpensive technology and using it for their own purposes. Because Cisco, unlike Nortel and Lucent, always had its major business outside that of the carriers and the ILECs, it is in the wireless and VoIPareas much better equipped to deal with the world in the aftermath of the death of the carriers than its more telco-oriented sister companies.

We signed up with Comcast Cable Internet earlier in January in order to install Vonage. On Monday January 27 we ordered the package. The question of selecting the Vonage phone number was not immediately clear although with hindsight it seems obvious. The service gives a separate phone line with its own phone number. We still have our 609 882-2572 number. Dial our new Vonage number 703 738-6031 and you will also ring our desktop phone. Moreover if you are in the Washington DC suburbs and 703 is a local call, dialing 703 738 6031 gets you through to us for a local call regardless of whether you are a Vonage customer. The Vonage web pages http://vonage.com did not have an 800 number listed for dial in. Frustrated. We sent email asking to talk to a real live human. Not five minutes later our phone rang and a very helpful resident of Connecticut who worked from his home as well answered our questions. We completed the order chose the Vonage phone number and were billed $40 for the first month service, $30 for account activation and $10 shipping for the Cisco ATA 186 gateway.

The package arrived the next day. The only hassle was buying a two line phone (price range 30 to 60 dollars) and the right RJ11/14 connector. Installation was a breeze. Total plug and pay. Well almost. We signed up for Free World Dial Up and that does not work with Vonage. Why? Because the gateway is shipped pass word protected and to work with FWD a proxy IP number must be inserted.

The Cisco gateway retailing for $200 and available wholesale at $135 and "free" from Vonage is very compact. Roughly 6 inches by 6 inches and less than 2 inches high. Plug in the power cord. Plug in the RJ11 from the phone and connect an Ethernet cable from the gateway to our 8 port fast Ethernet switch ($45). With line 2 on the phone set as the default (the VoIP line plugged into the gateway) pick up the phone and dial. The gateway has a large red light on the top that glows red when working.

The experience actually was totally plug and play! It was not even necessary to open a network panel and configure an IP number for the gateway. Our Apple Airport Base Station did that transparently acting as firewall and router. They quality is excellent. Our first international call was to Arcady Khotin in St Petersburg, Russia. The cost was seven cents a minute. The same rate that we were paying ATT for domestic long distance.

The Center is Dead

The center is dead. Forward movement is at the edges. The major focal point for this issue is IP v6. Farooq Hussain shows why its chance for significant deployment in backbones at the core of the Internet is effectively zero. However in a discussion with David Reed, Bob Frankston, Francois Menard and Farooq we are introduced to the concept of V6 at the edge of the network. We begin to understand how V6, in the hands of end users at the edges of the network, could redress the shift toward the center that has taken place in the balance of control within the Internet. Indeed we have begun a fairly in depth exploration. It is not yet really clear what Microsoft will offer in order to make edge based IP v6 applications plug and play. Standards would help enormously. Five to ten years ago the IETF would have been the place to turn. Today it might be the IEEE.

Or it might even be the Consumer Electronics Association. At some point, we hope to offer input from Virginia Williams who is active at CEAin leading an effort to enable whole families of devices plugged in at the edges of IP networks to find each other. In a conversation with her on January 30 we learned that there are several consortia of companies within the consumer electronics field that are exploring a range of issues that could be described as loosely related to Edge Based v6. We hope to describe these efforts in more detail in a future issue.

Editorial Calendar

In the next issue we shall return to Voice over IP. In the one after that we likely shall do a reprise of asset based telecom which is now going global in major ways.

IPv6 Going No Where - Political Push Fails to Propel Elegant Solution Lacking Market Pull

Former Drivers of Address Space, Device Addressing and Wireless Seen As No Longer Critical

While Very Important at Edge, v6 to See only Niche Backbone Deployment

Highlights

Editor's Note: Farooq Hussain was the Principal Investigator for the Sprint NAP and moved shortly after the NSFNET transition from Sprint to MCI joining the team directed by Vint Cerf. He left MCI just prior to the completion of the merger with WorldCom having worked on both the merger plan with BT and subsequently WorldCom for the Internet components of MCI. He was with AGIS for a little over a year helping to establish a business relationship with Telia of Sweden who subsequently bought AGIS out of bankruptcy. Currently, he is a partner in a research and consulting firm Network Conceptions together with Phil Jacobson [also an ex-MCIer]. We interviewed Farooq on January 3, 2003.

Is IPv6 a Deployable Protocol?

Hussain: IPv6 and the question its deployment is wrapped up in a series of quite complicated tensions which are difficult to articulate. My interest is in focusing on the policy issues that surround it as well as the lack of any reasonable way to determine what the commercial value of deploying it would be. There are two camps. One says IPv6 is not needed and won't happen and those who say it is absolutely necessary and will happen. These diametrically opposed positions all stem from a very fundamental issue of where we are with protocol development.

Two years ago a major international carrier whose networks were certainly applicable to IP v6 commissioned me to develop an IPv6 strategy for them. (This carrier has operations in Asia, Europe and North America and is financially stable.) I hadn't paid a lot of attention to what had been going on with IPv6 before mid 2000 or so. Like everyone else I had been reading all the announcements that it was "about to happen" and my first inkling was that as long as it was about to happen, perhaps this client should be doing something about it.

At the time there were three or four large US Operators, most notably WorldCom and Sprint who were saying that they had v6 networks operating.

COOK Report: In the sense of test networks or were they really production?

Hussain: I believe the old vBNS had v6 going. You had in the engineering community a lot of tension between those who were strong proponents of v6. There was some middle ground among those who were not really bothered one way of the other while on the other side there were and still are some very very strong critics of v6.

There has been, from the very beginning, a considerable amount of tension within the IETF about the need for an approach to IPv6. Lying at the very foundation of an understanding of where v6 is going is the necessity of understanding the rationale for its creation back in 1992 - 93. Everyone said then that we were going to run out of address space. This concern about address space continues up to today to be stated as the key rationale for IPv6.

The reality is that the problems with the Internet protocol that v6 was designed to solve have been managed during the course of the intervening decade both without v6 being available and without it having become a convincing alternative to the existing v4. Some critics now would say that part of the problem is that the whole goal of expanded address space is just propping up the established concept that every device reachable from the Internet needs at least one permanent layer-three address.

The Presumed Address Space Shortage

Ten years ago this was actually not such an unsound approach. We then had this idea that the car would have its IP address and that within the car maybe the air conditioning system and carburetor also needed their own IP addresses. Just as every house has a phone number, everything was to have its own IP address. But things have turned out rather differently. We are much more sensitive to devices and uses being session oriented. And having, as a result, temporary addresses.

Now we are looking at problems of the Internet in going forward a decade later and it will not necessarily be appropriate to say that what has happened over the past 10 years to the way that v6 has developed actually applies very well to the current situation.

COOK Report: In terms of current operational economic and technology concerns?

Hussain; Exactly! On all levels! But the difference of opinion in the engineering community is really substantial. Seen in this light we have had a parallel path of the pursuit of the development of v6 while, at the same time, IP Sec, MPLS, NAT all of these things, let alone the management of address space, have happened and, in their respective ways,

have extended the viability of v4.

COOK Report: And there is now a lot of infrastructure in place that depends on what people thought might be only temporary patches. These patches are in fact now turning into very permanent looking fixtures.

Hussain: Yes. As time passes, it becomes less and less appropriate to call it only a patch. I think that if you suddenly started telling people that NAT addressing is only a band-aid, they'd look at you as though you were more than a bit loony. It is here and working fine. When you get into these discussions, you have arguments that are about issues of technical and architectural elegance. People will look you in the eye and say but v6 was designed to have security as an integral component. It has auto configuration as part of its design. We know all this but if we look around we are forced to acknowledge that it still isn't here. It has a lot of nice "features' - yet people still are not using it.

COOK Report: Shades of OSI! It is the outlook that says I will promise you everything if only you are patient.

Hussain: It definitely is afflicted with bits of OSI. But the road to v6 started out in a fever pitch rather more like the march to Y2000 fixes because everyone was propelled forward by the idea that the exhaustion of address space would kill the new-born Internet. Also what may prove to be the most damaging thing for IPv6 is that governments have mandated its use. One might ask why on earth they would do this? Why would there be official political battles, at the national level on behalf of a communications protocol?

Institutional Proponents of v6

The main source of institutional support for IPv6 now in the US is to be found almost exclusively within the Department of Defense. No one else really battles for it. But even then it is really difficult to say exactly how strongly DoD is really pushing it. Someone has made a decision to support it and, whatever the reasons for doing so, are not really completely clear to me. The other parts of the US government don't seem to care.

In Europe it is very strange to see that the European Commission is hugely in support of v6. They have quite a few initiatives, including a couple of major ones, on-going to push forward the protocol. Meanwhile Japan has long been in favor of v6 and indeed has become the one government to actually mandate v6. You have then a significant portion of the OECD countries in terms of their respective economic power who are in favor of v6. But looking at the over all situation, you must say that the US is not quite there. That Japan, from the government perspective, is totally pushing it. Europe is trying to push it and, in fact, there is an international alliance between the European Commission and Japan to endorse and promote IPv6.

But looking at all this official support you need to ask what is going on here? Is it not good enough to get adopted on the face of things? It is rather unusual to look at a protocol and proclaim that somehow it is the key to some economic power. Or that it will lead to some terrific economic advantage. It seems to me that this outlook is one that fights the last battle. It says that the US gained great advantage from IP v4 so let's try to gain comparable advantage from being the first with a replacement for v4.

I am not at all sure that this makes much sense anymore because the rational for v6 is about controlling and managing address space. Where you find the heaviest endorsement of v6 is where the routing registries have the most severe policies. Japan certainly falls into this category. APNIC pushes v6, but within APNIC, Japan pushes especially hard.

In the initial allocation of v4 address space, the claim was and remains that the United States allocated address space in such a way that certain countries were left very short changed.

COOK Report: If you had a Class A address block and many universities did and still do, you had more address space than all of China.

Hussain: Quite true. Take therefore the Japanese position that Japan is very tight on address space and that it is required therefore to manage it very carefully. Consequently it is going to mandate the use of v6 because doing so frees Japan from any constraints imposed by the arbitrary nature of the way in which the initial allocations were made.

The Position of Japan

In this context the most important paper that I would direct your readers to is one that they really should read before getting absorbed into the detail and finer issues of why v6 is in my view unlikely to be anything more than a niche protocol. This paper was published by Glocom in January of 2002. Its title is "Is IPv6 Necessary?" It is by Nobuo Ikeda and Hajime Yamada. See http://www.glocom.org/tech_reviews/tech_bulle/20020227_s2/ The paper is well put together with a very balanced argument. But note also that it is from Japan!

The authors estimate that we are unlikely to run out of v4 address space for another 15 years – if ever. I haven't seen this paper really challenged. When I read the paper, I wondered what would be the EC reaction? Would the EC just quietly defuse its support? There has been an enormous push back from European ISPs who fear that they might be mandated to deploy v6 just as ISPs in Japan were. In Europe there is push back against the EC directive as well as all the hype that you hear for it. What I do see is that, in Europe, the conclusions of the paper are being wished away.

Since the Ikeda -Yamada paper is basically a research paper, the proponents of v6 breathe easier knowing that it won't fall into the hands of the trade press that goes on cobbling out simplistic arguments that we better hurry before address space is gone and the huge numbers of wireless users all of whom will have device dependent IP addresses arrive. All these assertions go unchallenged except within that core community that had serious issues with v6 from the very beginning.

COOK Report: The people with the issues are those who have v4 infrastructure in place, are running happily and do not want to have to make the huge investment in changing?

Hussain: Yes. But furthermore the huge investment in changing would require a rationale propelling the change. Why would we be making a huge financial commitment? What would we anticipate our return to be on such an investment?

If you have a large network and are required to implement this protocol, you can derive an operational or internal benefit. Or it can come because there is market pull. It is something that customers want. Now we have been told that customers will want v6. But the window of when customers will really want it has been moving outward now by 2 to 3 years every six to eight months.

Window for Alleged Market Pull Keeps Receding

When I first started looking at this in the year 2000, the period 2001 –2003 was going to be the big and explosive period of IPv6 adoption. Two years later we are looking at a period of somewhere between three and five years before there is any indication of a recognizable market pull in the wireless arena. Projected pull that is 3 to five years distant is something that is too uncertain to be a reason for us to commit to capital expenditure now. In short I think it quite safe to assert that currently, there is no reason to deploy v6 because of market pull.

There are ways to implement v6 as tunneled within v4 within a backbone network. You might consider doing this as a means of gaining experience with it as a protocol. Most players out there who say they have v6 are implementing it in this sort of marginalized way. When you look at what operational benefits are to be gained by turning a backbone network at the Internet core into an IPv6 network, there are really precious few. To turn a backbone network into a v6 network, there are actually quite a few levels of complexity to undergo. To arrive at v6 you will need to do serious levels of protocol translation at the edges because obviously all but a negligible fraction of your traffic will be originating and terminating as v4. From an operational standpoint, as a large network, saying v6 does this and that better than v4 for me makes no sense because no such a network lives in isolation from the Internet. You have to be dealing with v4 anyway and what you end up with therefore is in effect a dual direction that is now being pursued.

So where are we now? I would say that v6 is a pretty solid protocol. There is a lot being done to address transition. Most of the key core router manufacturers – Cisco, Juniper – and a couple of others such as Hitachi have announced releases for v6. They are basically offering their routers with dual stacks. Networks that deploy v6 will be doing so with dual stacks. This means that you will have v4, v6, MPLS, and must have a dual stack DNS - in short you will have a lot more complexity to deal with. Heading in this direction does not mean that you have chosen a path to operational efficiency and cost savings in the core of the network. But in tough economic times this is the direction in which everyone must head.

COOK Report: Well suppose a university wanted to operate v6 only on its campus? But even doing it just on its own campus would increase the cost of operation?

Hussain: You have to ask just what it is that they would gain from v6? Do they need to run v6 because they don't know how to do NAT? Or because they won't have enough address space? When I was evaluating v6, I found a very ambivalent position on the part of educational institutions. The 6 Net that has six or seven hundred institutions is hosting the networks in general of small research departments. I really don't think that these departments are representative of the campus network of the entire the university.

The bottom line is that we are having a problem in finding a commercial rationale for deploying v6 solely on the justification that it is more elegant than what we have as an alternative. The debate between elegant v6 versus plain old v4 is beginning to bear the marks of the disputes of MACs versus their PC brethren. There is precious little that v6 a decade ago was designed to do that cannot now be done in other ways. You can almost certainly say that there are some things cannot be done with v4 in ways that are as elegant as those to be afforded by v6. The problem was that v6 has simply not been there for other purposes because its whole design rationale had been driven by the warnings of v4 address space exhaustion.

COOK Report: All the talk was of the 60 MPH collision with the brick wall which because of Cider and DHCP didn't happen.

Hussain: Don't forget NAT. All of this has become part of a fabric that is global in scope. If you now try to envisage a transition to IPv6 set against this existing installed infrastructure of v4, I think the Glocom paper not sarcastically suggests that it will take centuries. If there was some market pull, one might say there is a rationale for it to happen.

Isolated Rational – Wireless 3GPP

I think the rationale for IPv6 exists only in very small isolated cases. Let me look at them by putting the small isolated case that is the most contentious of the lot first. Wireless. The wireless environment has really had a number of interesting twists and turns. V6 has taken a decade to declare that it has solved the address space problem by essentially giving everyone infinite space. But in parallel our way of handling address space has become so good that we no longer need the solution that v6 has labored so long to achieve. It is very unclear that we have an address space exhaustion problem that cannot be managed. Moreover we have managed it quite well so far.

The other issue is why does every device need an IP address and the conclusion is that it probably doesn't. So put these two things aside and look at what you have. You have networks that are carrying

IPv6, IP SEC, MPLS and Ipv4. My contention is that in the future IPv6 will be the smallest niche component of this traffic.

COOK Report: But once upon a time wireless devices were going to need fixed addresses. Do we now have the equivalent of DHCP for wireless?

Hussain: I think the situation about wireless is fundamentally unclear and quite contentious. 3GPP, which is the third generation mobile project, adopted IPv6 as their protocol of choice in 1999. In doing so they probably gave v6 the strongest endorsement that it has ever received. It claimed that each cell phone would have its own IP address and that there would be billions of handsets. The requirement for using IPv6 to handle such addressing issues seemed to make a lot of sense. But there were a couple of problems.

COOK Report: For one until a cell phone becomes totally digital it doesn't need an IP address. Right?

Hussain: Correct. And furthermore they may never get to that point because there is something else going on with the wireless operators in terms of their selecting v6 as a protocol. The mobile operators and certainly those outside the United States have been very pleased, and rightly so for that matter, in terms of their ability to establish mobile roaming. When they approached third generation roaming requirements for data, it was their intention to have a third generation wireless network run as an IP network. But their idea was there would be the old Internet and a new 3GPPInternet with its own addressing and its own domains. If you want to send traffic to it (3GPP) you would have to connect to it and peer with it.

There was a moment in time during the height of the bubble when for the blink of an eye you might have said "my god these people are trying to compete with and over take the global Internet with one of their own construction!" They simply didn't seem to understand the most fundamental points of what they were dealing with in terms of the Internet. On top of all this, at some point the mobile operators decided to have a competition to establish exchange points for mobile Internet operators that were also delivering other kinds of Internet services.

If you were an Internet operator you could have an exchange agreement. (Cable and Wireless, the Amsterdam Am Six, Sprint were among those involved.) A whole bunch of mobile operators got into this group that was interested in creating exchange points. These mobile operators were trying to create an insulated domain that was outside of the management of the routing registries. The efforts never really took hold. No body complained about it but also nobody pointed out that it was really a very flawed approach.

COOK Report: They were adding another layer of complexity.

Hussain: If mobile Internet had actually started to take hold, I think they would have seen a problem of huge dimensions.

COOK Report: Why?

Hussain: The exchanges we have now are just hanging on. Segmenting the market further into exchanges for just mobile operators would not I think have made much sense. I think there were factors at work here beyond just ones of getting IP connectivity to your cell phone that had slowed up and disrupted things in the mobile market place. This slowing and disruption was I think a fortunate side effect for those of us concerned about the Internet's strategic direction.

So now what we actually have to ask is whether it will be 2007 when 3GPPstarts to happen and we are all going to have to be ready with V6 because this is the kind of forecast date they are asking us to look at right now.

COOK Report: But if we have software radios coming on line right now by then we shall have software defined cell phones.

Hussain: Exactly. At the beginning of 2001 they were talking 2005 at the beginning of 2002 they were saying it was going to be 2007.

COOK Report: By 2005 your cell phone will sync to other cell phones in the neighborhood and likely be able to figure out what kind of address grid it is in. In this sense a geographical addressing system could become possible?

No Impact Before 2007 But by Then Whole Nature of Wireless Will Be Changed

Hussain: Exactly. Other than this belief that we are going to run out of address space, the only rationale for v6 is that we are some how going to have billions of mobile users whose operators are going to need v6. My analysis of this has brought me to the estimates of others that claim by 2007 mobile requirements could make an impact. The problem is that by 2007 there will likely be enough other changes in the way mobile works such that no one else will want these IPv6 related capabilities.

COOK Report: Because there will be other better and cheaper ways of doing it?

Hussain; And these are already showing up now. The compelling arguments for v6 are based on two things. Address space considerations and mobile developments that might represent an uncontrollable growth problem that would exacerbate the address space issue.

COOK Report: If Powell carries the open spectrum reform forward, history may show that it was this effort that rendered IPv6 unnecessary.

SONY Proclaims v6

Hussain; Precisely. However, here is a final issue. About 18 months ago a high SONY executive declared that all future SONY devices would be IPv6 addressable and warned that all service providers had better deploy v6 to be ready to take advantage of Sony's roll out.

The problem is that even if SONY's strategy were to work, those v6 devices

would have to talk v4 as well because all networks will never convert over night. In order for the device to operate however the protocol must be transparent and it will have to work as well on v4 as on v6. You are just adding another level of complexity with no real payoff since if it will operate v4 there is no real need for it to operate v6.

COOK Report: So even if the networks were impressed enough to start investing and even if they had enough cash to do so (which they do not), the issue off added operation complexity would suggest that they don't go forward with v6?

Hussain: Yes. In a couple of years you will see all the major core routers with dual v6 and v4 stacks. You will be able to serve customers by setting up v6 tunnels inside of v4 for those customers which for some reason or other just have to have v6. You could also use MPLS to set up a native v6 PVC. But the aggravation to do this is extensive and even if it were cheap, the idea that your engineering team will be eager to rush out and embrace v6 just isn't likely.

We may well be faced with quite an irony if we are faced with the need to run two versions of IP on the internet – v4 which will likely never go away and v6 for which there may be a few niche markets? IPv6 was intended to replace v4. It is unlikely that it will ever achieve this goal. But it certainly has its advocates and its niche applications. Given the current direction in which we are going we will not have a permanent address for every device as envisioned in v6. There could be some circumstances that include the possibility of a global 3GPPnetwork that insists on having fixed IP addresses for every device dependency. So instead of one IP protocol to be managed you will now have two.

One has to ask whether the purported benefits – address space, security and auto-configuration are worth it. Do these benefits outweigh the aggravation of having to manage two versions of IP in the network? In other words IP Sec would be nice, but if the cost of getting it on a meaningful scale is a multi billion dollar global reconfiguration program, are there other less expensive ways of ensuring security? The answer is very likely yes.

Still No Market Pull

COOK Report: At one point a good v6 stack in Windows was supposed to bring on the v6 revolution?

Hussain: The irony is that a lot of people have now come out with good v6 stacks and the existence of these stacks isn't doing anything for anyone.

COOK Report: Once upon a time you were going to use SIP to be able to turn on and off your home air-conditioner. Now however the air-conditioner and a bunch of other stuff sit behind your home firewall and you don't want it to be universally addressable?

Hussain: That is about where we are. These applications are suggested as things that are doable with IPv6 but they are not market driven applications. There is no evidence that there are large numbers of folk out there who want to do this.

COOK Report: At one point people were complaining about firewalls holding back end-to-end v6 capable architectures but if we didn't have firewalls out there protecting our cable modems from Klez worms what would we do?

Hussain: Exactly! There are pluses and minuses on both sides but from the perspective of a network operator the worst of all worlds is emerging in that they know that they will have to deal with v4 for the vast majority of their customer and transit traffic but that there will also be certain circumstance in which they will have to envision carrying v6.

They will have to manage both and they may or may not make a decision in a couple of years time that their core network would be v6.

COOK Report: Is there any reason why they might go to v6 in the core?

Hussain: Only because they routers are already enabled and they could do it without having to spend any significant extra money. Doing it would increase costs and add complexity and in the absence of market pull it is unlikely that they would do it. Right now I don't see a pull.

DREN did exists as a defense research network run originally by ATT. They lost it and Global Crossing had picked it up. But when Global Crossing went bankrupt more than a year ago WorldCom having had in the vBNS experience in playing with v6 won he contract. But the only market pull here is coming from the US DoD that, as I said earlier, is the only substantial advocate for v6 in the USA. DoD might indeed want vast numbers of devices with fixed v6 addresses. But the DoD's requirements are likely to have a military rationale and not one that will translate into creating a broad commercial market pull for the general implementation of IPv6.

Is IPv6 Necessary? - One Year Later

COOK Report: We asked Nobuo Ikeda, one of the authors of Is IPv6 Necessary?" http://www.glocom.org/tech_reviews/tech_bulle/20020227_s2/ to give his opinion on the subject of his paper a year later. He replied

Ikeda: I suggest you ask comments from Jun Murai, the global leader of IPv6. He and I discussed this problem in a recent IETF meeting and agreed that the problem is not the "shortage" of addresses but rather applications to take advantage of v6.

COOK Report: May I send him your suggestion?

Ikeda: Yes, but I'm not very much interested in v6 because we have reached a conclusion. Yet it's important to make it clear because there are still many people who believe in v6 without knowing it. Our paper on IPv6 was downloaded by 17000 people last year.

COOK Report: In other words v6 is dead?

Ikeda: I think it is still alive as an ideal. As Larry Lessig emphasized in his book "The Future of Ideas", it was the E2E architecture that made possible the explosive innovations on the Internet. But today it has drifted far away from this principle. The Internet is complicated, opaque, and controlled by service providers. Can we take it back to the E2E ideal? I'm not optimistic about that. Today, five years after RFC 2460 that recommended IPv6, the number of v6 sites has increased to 1259 from 1046 in November 2001 - about 180 sites per year among more than 40 million sites on the Internet. How many millenniums does it take to replace v4? See http://www.cs-ipv6.lancs.ac.uk/ipv6/6Bone/Whois/index.html#full

Some people argue that "ubiquitous computing" requires IPv6. However, it is not v6 but Auto-ID that is prevailing as the international standard for RFID. And I don't think it would be so ubiquitous as they imagine. Indeed NAT is ugly, but it protects average users from direct attacks on their IP addresses. We even don't receive e-mail by E2E. It's the reality of the Net whether you like it or not. The cheapest way to recover the E2E would be to reallocate v4 addresses of which only 3% are used. I recommend that ICANN to have "address buyouts" to buy back idle addresses by reverse auctions and sell them through auctions. [Editor: Not trusting ICANN, we are glad that the chances of this happening are quite remote. But as a general principle we see the point that Ikeda makes.] I proposed a similar mechanism for opening spectrum in my article "The Spectrum as Commons".

http://www.rieti.go.jp/jp/publications/summary/02030001.html

Indeed the problem with IP addresses is similar to that of the spectrum "shortage". In fact, spectrum is not running short; it is only monopolized by incumbents who can't use it efficiently. Internet people are accusing the incumbents of stifling the innovations made possible by new radio technologies. I would make a similar accusation for MIT, Apple Computer, Hewlett-Packard, and other organizations that each have more addresses than all of China.

IPv6 at the Edges

IPv6 Seen Not as a Backbone or Transport Solution But Rather as User-Applied Edge-Based Overlay Supporting End-to-end Applications Highlights

COOK Report: Asking for comments, we sent the Interview with Farooq to Bob Frankston (one of the developers of VisiCalc), and to David P Reed, and Francois Menard whose names should be quite familiar to our readers.

On January 20, 2003, **Bob Frankston** replied: It's very important to distinguish between V6 at the edges and V6 in the backbone. The reason that V6 is not currently available is that those who are the guardians of the net -- the backbone people are just worrying about their internal issues and there is no concept hereof actually using the network.

Here is what I wrote last summer: Edge Protocol (EPv6) rather than IPv6 http://www.satn.org/archive/2002_06_30_archive.html#85208157

I recently (June 21st, 2002) spoke at the IPv6 (Internet Protocol version 6) summit (http://www.ipv6summit.com/ipv6-program.html). I was invited to speak about the issues raised in my essay on the Importance of Encrypted IPv6. In that essay I pointed out we need to assure that every system connected to the Internet has its own (IP) address so that it can be a full peer participant. Encryption is important because the separation of the application layer (TCP) and the transport layer (IP) has been weakened by providers who are second-guessing the traffic on the network.

Despite the urgency there are many who wonder if we'll ever be able to make the transition from IPv4 to IPv6.

The answer is "no" because that is the wrong question. The idea of transitioning the entire Internet to a new protocol represents a failure to understand that the Internet has thrived because it is defined by its users rather than by a central authority. IPv6 has been designed as a protocol that tries to meet the needs of the user (application) layer and the transport layer at the same time. While IPv6 does a reasonable job at meeting both requirements the deployment model is seriously flawed because it ignores the dynamics of the Internet as a marketplace driven by the needs of each user. [snip]

IPv4 (or just "IP") represented the birth of the Internet by shifting the power to define the network to the users at the edges.

The Internet has thrived because supply is driven by demand. New application services are supported by simply provid - ing more transport (or IP) capacity. Rather than wait for new capabilities to be defined, users will create their own so - lutions. (When I say "users" I don't mean all users create applications. It only takes one motivated, creative individual with some time on their hands to create an application that will be adopted by millions of others. We just don't know which user that will be.)

[snip] The solution is severing the dependency upon IPv6 as a way to meet the needs of the transport layer. Instead we need to focus on the requirements at the edge of the network.

Edge Protocol 6

I'm proposing a new protocol called Edge Protocol 6 to give us the benefits of the larger address space and simplicity. It gives us the ability to make immediate use of IPV6 technology at the edges using the Internet as-is.

We must not lose sight of what is really important, namely recovering the simplicity of the Internet by giving each end point a public presence. By implementing security between end points not only do we have a chance of understanding what is happening, we can also choose our own policies. Barriers between systems (including firewalls) seem more focused on fear than on allowing organizations to create value.

There is no requirement that the edge protocols and the transport protocols be the same. It should be consistent and convenient to leverage common formats. Those of us at the edges have already paid a high price in waiting on those of us who are tweaking IPv6 for use within the backbone for the Internet. This continues to be a dysfunctional dependency. We must learn from the success of the Internet itself and treat the relationship between the IPv6 and what I am calling EPv6 as similar to the separation of UDP from IP or IP from Ethernet packet formats.

Though this is really Edge Protocol version v1, I am calling it v6 for marketing reasons and it looks a lot like IPv6. The big difference is in the requirements. We can deploy EPv6 on the existing IPv4 Internet now. Not only does this avoid dependency upon unmotivated service providers, it also allows us to ignore those who are trying to build out an IPv6 network since we shouldn't care whether their efficiencies come from adding capacity or clever protocols. In fact, we should discourage any cleverness in favor of just adding capacity.

Key EPv6 Characteristics:

• Supports a larger address space. Addresses can be composed using the existing IPv4 addresses as a prefix so we can use the existing infrastructure.

• Address resolution can use the existing

IPv4 DNS Entries (A records) as well as the newer AAAA (IPv6) records. Thus I could say "rmf19.myhouse.frankston.com" where "myhouse.frankston.com" is a V4 address part.

• Connections are assumed to be encrypted in order to discourage favors from those who are fixated on "efficiency" and other meddlers.

• While there are elegant approaches to the problems of NATs (those routers you buy for your home), EPv6 implementations can even fall back to TCP tunnels. The advantage of TCPis that it maintains a connection through NATs but the disadvantage is that it can impose arbitrary delays and overhead. From a marketing standpoint, however, it means we can use EPv6 without changing the NATs and that can create a demand for better solutions. The risk is that the pain won't be great enough to force a change but that isn't all that bad.

• EPv6 is meant to enable new applications. Transitioning existing services is a secondary priority though being able to access EPv6 web sites from older systems is important but can be done at the application level.

The Internet has been seriously weakened by the need to share IP addresses among a set of computers. We're ten years overdue on remedying the situation. The availability of EPv6 is a key part the rebirth of the Internet. The P2P (Peer to Peer, including Instant Messaging and other collaboration tools) community already represents a significant pent up demand that is ready to catalyze around a commonly accepted way to provide a large address space with direct connectivity between systems at the edge of the network. The use of encryption helps assure that the connection is indeed direct.

Transport providers who do want to take advantage of the IPv6 addresses to simplify routing will also benefit by having a demand for their services. The process will start by building on IPv4 but the ability of EPv6 will also make it easier to meet the demand using IPv6. IPv6 without such a demand isn't very interesting.

V6 in the Backbone and V6 at the Edge is Entirely Different

On January 20 **Bob Frankston** reminded us in response to the IPv6-in-the-backbone focus of our interview with Farooq:

The purposes of V6 in the backbone and V6 at the edges do not have any relationship whatsoever. Period. No qualifications. This has lead to the tragedy of the misperception of a commons. The backbone has indeed accommodated itself to V4 since trying to address each atom on the net individually is a very big problem and unnecessary. The IP "address" is like the circuit ID in the phone network and it encodes a routing though not necessarily a precise one.

V6 in the backbone has become a feeding frenzy for those who miss the PSTN and want to bring back QoS (AKA discrimination in favor of legacy traffic and to justify maintaining scarcity) and MPLS (circuits are forever). There's also the bad idea of providing mobility at the IP layers. (Yes, saying this is in conflict with complaining about temporary IPaddresses but that's a longer discussion).

There is indeed no market pressure form the sheep at the edges so there is no way ISPs will make it a priority and waiting for them is pointless. The reason we need addresses at the edges is to give every end point a first-class public presence on the net with a modicum of stability. NATs, and VPNs and Firewalls have already destroyed the Internet replaced it with a series of walled realms that don't trust each other and are constantly being invaded. Each invasion is seen as fatal thanks to the Maginot line mentality.

EV6 rides very well over the V4 network (modulo NATs) though native implementations would be nice. V4 tunneling does have its issues. The reason we don't have V6 is that it is a repeat of my experience with home network. I am not around to harass the network people to make sure they get rid of excess baggage and recognize a “just-do-it” mentality as a priority. This includes being willing to do whatever it takes even if that means using TCP tunnels through recalcitrant NATs until they can be brought into line. Efficiency without connectivity is a form of death. It's also vital to address other issues like working with the existing V4 DNS and extended it with dynamically finding local end points.

And, of course, the edge users must have encryption because of all those bell heads lurking around trying to impose their terms of service and other forms of smart-assed meddling.

Converting the Internet to V6 is a bad idea. It must be adopted at the edges to meet needs and can coexist just fine with the old Internet. New apps can thrive. It probably makes sense to have some V4<=>V6 http but for the most part you want to go to a v6 server you must have a v6 client

In your newsletter it is vital to distinguish between EV6 and BV6. Backbone V6 is not at all interesting to me though some of your readers may care. As long as BV6 is an opportunity to bring back dead ideas, however, it may actually make the net worse. Steve Deering agrees that the ideas are bad though I don't know if he'll agree they make the net worse. In short the lack of EEV6 (End/Encrypted) V6 is a definite liability for those of us who want an end-to-end edge controlled network that I open to innovation.

David P Reed: Bob doesn't need me to agree with him. His points above are dead on, and in many ways put more succinctly than I would be able to.

Needed: an End-to-End Overlay

My only amplification would be that those of us who see no need for BV6 or a twisty convoluted web of walled gardens with trolls at all the gates may need to revolt, and do an end-to-end overlay network of our own (just as the original Internet was an end-to-end overlay network). When is a revolution necessary? When the current market leaders keep building instruments of control -- like NATs, like usage policies that bar certain

kinds of uses, and like attempts to charge merchants a percentage on every transaction on the net -- rather than what the users really want.

COOK Report: How can the users at the edge install their own IPv6? How do the users revolt? What is the cost of doing so? What can users do on their own? What do they have to get an ISP to do?

Frankston: Let me start with the idealized answer -- the one I believe would be the case were I still at Microsoft. It's the same as the one for home networking. It would "just work". In fact, there is a V6 implementation in XP right now but it is missing key "just work" elements:

(1) It doesn't try to "just work" and you have to do all sorts of setting and tweaking. The .Net server version doesn't seem much better. (2) It requires a cooperating NAT and ISP for type 41 packets. It should support various alternatives even if they represent large performance hits. (3) It doesn't do encryption well or automatically or universally and confuses encryption with authentication. (4) It doesn't allow me to simply use my V4 DNS. (5) It's concerned about transition instead of simply giving me V6 capabilities.

None of this is fundamental.

To oversimplify, V6 is simply a 128 bit address. It is typically divided into a prefix portion and a local portion. One of these is reserved for a particular way of using the V4 address as a prefix but it's possible to define additional approaches. The local portion is arbitrary and can be based on the MAC address, for example.

There are some difficulties:

The tunneling packets are a different type so may run into barriers. There is no reason for this to be necessary. Since it is a different type of packet you can't just tell your NAT to forward the packets to a given port. There lots of ways to name a machine and you can have global prefixes and local only. Making sure you have the right one for the return path is a challenge. It's not clear why this has to be a problem but there seems to an effort to have special addresses. One reason is to keep the local addresses constant even if your ISP connection flaps but you then have to make sure you know the purpose of each address in order to expose appropriate. I don't see that this should be a big issue but it adds complexity in explaining things to users and forestalls "just works" unnecessarily. Encryption without prearrangement. I presume it is very doable but haven't drilled down. Local and dynamic DNS -- not sure if the protocols are in place

But none of this is a killer. Roll your own? Sure. The problem is getting someone with the right time and expertise to do it. In the MS world everyone is waiting (and waiting) for Microsoft. Linux/Unix? There's no telling.

I think the first step is to simply get the backbone and edge agendas separate and then we can make some progress. Too few people understand the Internet and just treat it as a telephone-like shopping network. There is no pain because legacy apps work and few people see beyond the capabilities of that past. The one middle ground is to write apps for V6 and then go over V4 as an accommodation instead of thinking "V4"

Farooq Hussain: I certainly have no issue at all - rather I'm in agreement - about making a distinction between the value of deploying v6 at the Edge (Ev6) and the deploying it in the backbone (Bv6). There are definitely reasonable rationales for placing emphasis on the edge deployment and good reasons to stay away from Bv6. But assuming that Ev6 gathers some impulsion in the years ahead, Backbones will have to route v6 support http v6/v4 and v4 to v6 and vice versa aside from the necessity for dual stack DNS.

The points that I was trying to emphasize with Gordon were that:

(1) v6 should stop being viewed as a replacement for v4 particularly on the grounds that there will be address space exhaustion.

(2) Having 2 IPprotocols on top of all the rest that happened to backbones is both painful and inelegant, but not necessarily commercially or operationally unworkable. Just at the moment, its really hard for me to see what would commercially motivate any carrier to deploy v6 other than sensible forward positioning at a very low level of commitment.

(3) I certainly agree with the comments of David and Bob that the Edge has more value, rationale, and probable commercial viability than Bv6 at this point. Still we'll need to understand the kind of commitment that Microsoft is willing to put behind v6 as well as others like Sony for example. I'm not sure that I grasp the picture of the grass roots 'brush fire" that might accelerate the promulgation of Ev6. I fear that Ev6 is caught in the same grip of conflicting government policy, giant multi-national enterprise, and other institutional interests. If Ev6 can make a compelling case for adoption based on a business/commercial rationale, this - based on the points David has made earlier - applies to a different segment of the market than that of the backbone carriers though they will be impacted by it.

Frankston: Just to avoid ambiguity -- the E in EV6 means EdgeV6 or Encrypted Edge V6. I presume the government policy question is about Encryption and, at this point, I would make a strong case that an enlightened government would push strongly in favor encryption -- were we to have an enlightened government. Encryption is merely like expecting people to take responsibility and lock their own doors rather than saying only police are allowed to have keys.

Role of Microsoft

The reality is that much of this depends on an enlightened Microsoft and, to be very very specific, Christian Huitema. He's doing everything "just right" but I haven't seen a sign of his going beyond that and separating edge from backbone requirements and emphasizing encryption and edge deployment.

When I worked there well before Christian joined the company there was no awareness about making Internet connectivity simple and I see that as my main accomplishment. Nevertheless, it's still a very difficult idea to remain faithful to.

Consumers never asked for home networking and they are not asking for V6. They are asking for higher and higher firewalls and, as you can see from the MSN ads, they want only bits with good intentions to be allowed through. Consumers are still asking for more and more broadband for browsing and not for sharing.

As to http v6/v4, I would argue that too is entirely edge. Those who care to listen on both Internets would have dual ported servers. The big public servers like CNN will do that, especially if they are strongly encouraged and the Microsoft IIS and Apaches do it automatically. The old V4 servers will still be accessible to all systems since I don't expect the V6 systems to drop V4 client support even if they don't have a public appearance. I don't mind the NATs as a legacy accommodation -- the problem is there is no alternative.

Bv6 is then freed to give more routing flexibility. In fact one can run V4 over a V6 backbone or visa versa. It's just an internal design issue. But why bother with Bv6? To the extent that Bv6 is a better route description than using a native prefix, then you might as well use it. But if the routing portion is really only used to get you to the a Ev6 connection point, then it's not as vital. We would greatly reduce the pressure on the address space.

There is one big problem in my nice story. I don't like the notion of a single level of V4<=>V6 switching. There is a point to which the V4 prefix takes you from where you switch to your local v6 router. One can nest additional routing internally so you can cascade but the bit layout story isn't as clean. Still, even with that caveat, we must get started and give every system a public presence and, with encryption, bring the meddler-free Internet.

Next we can start teaching people that an Internet Access Provider and Internet Service Provider are unrelated functions and just because ATTBI changes its name to Comcast is no reason to change their email address. But that's the dotDNS agenda and more.

COOK Report: On Friday January 16 I had Comcast cable modem service installed. Howver my mail comes from fast.net. Fast Net also does my DNS service for cookreport and hosts my web site. Therefore Fast Net is my (Internet Service Provider (isp) and comcast my Internet Access Provider (iap.)

Frankston: For now, let's get EEv6 shipping. And Bv6, doesn't matter to me, that's between Farooq and his manager and shouldn't interest us users though your readers might care, maybe too much.

COOK Report: Just to be 100% clear. You meant Edge V6 or Encrypted Edge V6. Right?

The Necessary Tools

Frankston: When Farooq wrote Ev6, I wanted to make sure we're explicit. I would like it to mean Encrypted and Edge but one can talk about them separately. Encryption of the pipes can be done independently of the applications. The purpose is to bring back the naive simplicity that allowed us to assume our conversations were not being overheard. App-to-app encryption is more appropriate when we want strong security between apps that have their own security model. The pipe security is a compromise as is TCP(which gives the apps circuits at the price of potentially very long delays vs. UDP). In this context, Encryption is then just an edge V6 issue.

Dual port boxes? You get them now. Every XP with V6 is dual port. It's just that the current V6 implementations are a pain to configure and use and get past the NATs and you don't have easily usable encryption. But I should've emphasized that we do have dual V6/V4 in XP. May complaint is that they have 90% of the mechanism there but haven't put the effort in to the take it all the way to "just work". There is a very strong case for saying V6 already is deployed but just not tweaked. And not encouraged. IIS -- Microsoft's Web server and Apache is the primary one on Linux. Get those two working smoothly and you have dual support everywhere (at least potentially).

As to complexity. The V4 prefix approach means the net works as-is. Native V6 routing means that the Ev6 machines use Bv6 addresses rather than those with v4 prefixes but otherwise the edge apps work the same. The Bv6 infrastructure is then able to use native V6 routing rules. Farooq would know more about that than I do. I presume they have more explicit structure that allows the backend routers to do something better. Although there is the risk that better might not really be better as things like MPLS and QoS are unproven conjectures and, I would argue, bad ideas. But I presume that those can be shed and V6 will put more knowledge about the net into the bits. But, again, that's a mixed bag.

Hussain: I agree that the MPLS is probably a bad idea in this mix - but it may prove to be a fact of life in many backbones. My feeling is (also based on Bob's observations above) that Ev6 *may* drive Bv6 but doesn't have to. Left on their own backbones don't have sufficient rationale or commercial incentive to go to B6.

Francois Menard: Bob's dead on.

I'm trying very hard to get [Canadian] municipalities to implement IPv6 open access across municipal FTTH networks so that MPLS doesn't squeeze-in and end-users become required to run PE`s. I'm seeing ISP's provide value added services by offering commercial access to tunneling servers on their premises which bridge to the good old legacy Internet. For as long as two service providers across two different municipal FTTH system would want to interconnect with IPv6, there would then be a parallel Internet.

This is in my view a (the) killer app for IPv6 ... I'm not sure why it seems so difficult for people to believe in this ... And if its true in North America, it'll be even more so once open access is properly provided in Japan.

I guess that, rather than debating this philosophically once again, I'd rather throw everything I have into regulatory interventions, like the one which is going out tomorrow in the context of a PartVII

of CAIP to the CRTC. This is going to result in IPv6 being deployed. I'm totally convinced that it's going to end the tight control that incumbents have over last mile DSLand cable modem in Canada and which intentionally destroys innovation through mandating IPv4 and denying IPv6.

So Where's Market Pull?

COOK Report: What is to create a market pull? How do you package and explain and then ignite that?

David Reed: Products. Too many products are limited by NATs.

If Ev6 had the property that it automatically ran over NATs, which would not be hard, it would be adopted by lots of new products. Multiplayer video games, CE devices like Tivo and Replay, home security cameras, VoIP phones using SIP... all of which are fundamentally "edge-to-edge" devices (not edge-to-server) and the need to traverse NATs is causing huge customer support and marketing problems.

Yeah, I know about STUN and MIDCOM and UPnP for IGD's, but when all is said and done, Ev6 overlay networking would do the job better, and be more standard, especially since each of those solutions are limited in scope (STUN for home networks, but not corporate ones, MIDCOM for corporate if only the corporate firewall people didn't believe that new applications are evil, and UPnP IGD's are essentially restricted to Wintel clients with a fig leaf of a Linux implementation).

But I'm not holding my breath for Ev6 from anyone focused on communications (operators, vendors to operators, IETF). The communications industry seems not to care about enabling new products at the edge. They seem to want to control and tax any new innovation, strangling it in its crib. None of this "rising tide lifts all" nonsense for them. :-)

I have some hope for the Consumer Electronics industry and the computer apps (hardware and software) industry just doing something like Ev6 for its own needs, with or without the IETF. Anyone want to form an IEEE committee for edge-to-edge scalable overlay network standards? We could call it "VigorNet" because it would regain the vigor of the original Internet.

Bob Frankston Jan 22: I want to clarify the "Xbox" argument.

People claim we don't need EV6 because we can also work around each problem on a case- by-case bases. But that case-by-case basis has brought us a mess. Look at how many of the resulting products require setting proxy information and firewall settings and all sorts of other stuff. Still other applications require external servers to act as relays.

This problem is not only just creeping ossification but also the inability to do new things without a lot of arcane knowledge that locks one into the accidental properties of each of these work-arounds. And as the work-arounds fester the resulting scab is confused as a somehow necessary part of the environment. It is reminiscent of the Heidelberg scars that showed that the student was a great swordsman and, by extension a scholar. Firewalls have become the condoms of computing and NAT's inability to pass interesting traffic makes them into firewalls. Finally we have the "marketplace" assuming that all bits have intrinsic meaning, and asking for these filters to become omniscient.

All of this works very very well. At least by comparison with the ancient world of scribes and quill pens and 1990. We can browse and we can download (a terribly asymmetric word) and we can use those old telephones without having t crank the magneto. How could anything be better? After all, doesn't all this changing stuff threaten all that we have? I would argue that the answer is no.

Edge V6 as a Sub Routine Library

One way to think about EV6 is as a common subroutine library just like TCP. TCP gives us those despised circuits but at the application level where they provide some convenience but are still not intrinsic. The advantage of Ev6 is that it leverages the intellectual energy that has gone into the Internet protocols and gives us a minimal commonality that happens to parallel the minimalness of the basic IPv4 Internet.

I compare Edge v6 with MIME which became the common way to extend email rather than having to choose between a lot of different ways to transport binary and multipart messages. We didn't transition email to MIME, we just made it available first to those who understood the need and later to those who just like pretty stuff. The mistake is to try to transition the existing Internet to V6. The real need is for enabling the applications that don't work well though the existing protocols. Depending on how deep their V4 assumptions are, we will find that existing applications can be reimplemented atop V6 with modest effort.

Without V6 we have no synergy for each new application we have to make new arrangements to work around each of the myriad problems. However, with encryption and the assumption that new applications aren't hopelessly naïve, we can reposition the firewall as a temporary scab rather than as protection

In building our edge architecture, we should then go on to complete the picture with "dotDNS" so we can avoid making ICANN the ultimate authority on meaning. Building an Edge IPv6 architetcure would also subsume much of P2P. The P2P effort is about two things: (1) -applications and (2) work-arounds. Each P2P effort has its own novel solution to tunneling through the barriers and its own unique way of generating persistent handles (names). Mostly these are just idiosyncratic and poor reinventions of the common mechanisms and divert efforts from actually doing anything interesting.

While I'm a great believer in marketplaces, I find that they don't automatically give the optimal path between two

points. If we just look at existing applications, then, by definition, they do not "need" v6. Just like we didn't need the Internet for incrementally better TV or for better faxing.

It's only by accident that we got to experience the web because the Internet had lowered the barrier to creativity enough for Tim Berners-Lee to hack it together in his basement office.

IPV6 is similar. Those of us who have worked with trying to connect things recognize the importance of a consensus that would allow us to have devices that "just connect" instead of constantly having to work around impediments. The marketplace does have this just connect need but some many IPv4 accretions are standing in the way that it can't articulate it.

The simplest solution would be a for a high profile end point player like Microsoft (more than just like) do to do the right thing. Given that the "IP Stack" business is problematic in the presence of players who bundle theirs in ways that make unbundling extremely difficult, an interim alternative would best be done as public spirited project, perhaps by students or others with a need. It can be implemented as an application level library written atop UDP – it doesn't have to be deep in the system. The application would then listen on an EPV6 port for TCP and UDP connections that serve as the IPv6 tunnel from another system.

This outcome would serve as a V6 shim at the application layer. It can let us assume V6 while waiting for "official" implementations.

What is Holding Back Use and Deployment

The major impediment is a lack of understanding that the Internet is really about simple end-to-end connectivity and the rest is but a detail. But instead of viewing the net as a future opportunity, we find that there is the normal tendency to confuse it accidental properties with what they could be and because those properties work then we assume that obviously we don't need anything else. There should be a clamor to bring back simple connectivity. Yet everyone seems to be in love with firewalls, NATs and gargoyles of all sorts. All this is combined with a menagerie of hobgoblins such as QoS, MPLS and cleverness at working around problems instead of solving them. The Edge V6 need is there. But in order to understand the need, people need to understand the Internet first.

There are existing implementations of IPV6 on XP but they don't "just work". Perhaps writing an application that simply does the configuration would go along way towards usability. Having done that we would still have to address the lack of encryption, the inability to get past recalcitrant NATs, and the inability to leverage the IPv4 DNS entries to name interior systems as the norm. Unfortunately encryption has gotten entangled with authentication. I'm not a crypto expert but we should be able to have a modest level of crypto between two systems that don't know each other.

A secondary problem is that the application support is uneven but I'm not worried about that since it can come later. I want to be able to do simple things like have a VoIP application that just streams between two end points and doesn't use complicated protocols. The fact that such applications are not ready attests to the importance of early Edge v6 availability so we can work out such problems. These are the technical issues. They may have changed greatly in the last year since I looked at the stuff!

Deployment

We should build EV6 on the specifications for BV6 to the extent we can. Doing so will give us an extended address structure. In deployment the most important step will be to use the IPV4 address as a routing prefix. We may need an additional option for a form of routing that is able to get past older NATs.

This is entirely separate from the question of an IPV6 backbone – that is only a performance issue. It would be nice, however, if the NAT boxes could be repurposed as V6 router at the edges of the local network. That would give us the biggest performance improvements.

Taking Advantage of V6

The major value of V6 is in allowing users to connect devices and not just big iron and web sites. In doing this, the role of the DNS in providing a stable handle becomes very important. Not only do we not need the .com semantics, in this endeavor we must be assured that the names are unique and valid basically forever. This is all the more reason for creating a TLD (I call it .DNS) that simply provides unique identifiers and NS records – the pointers to the actual DNS records which would be maintained by the owner of the identifier.

Note that mobile IP seeks to provide a stable relationships but it does it at the plumbing layer. Such application level stability belongs at the application level and not the network level. Mobile is another example of an experiment masking as a basic protocol and it has contributed to the confusion over IPV6.

COOK Report: *Above the Fold* for January 29, commented - "Convinced that large "enterprise" networks of the future will be shaped by the Internet, by ever-increasing needs for security and mobility, and by the convergence of voice and data, Hewlett-Packard's new network strategy is to move more intelligence and control from the core of a network to its edges, using cheap switches populating those edges." We sent the url to Bob Frankston and asked for his evaluation.

Frankston: It is an example of screwing things up. Notice level four prioritization -- that's a synonym for breaking the end-to-end connectivity for users by second guessing the applications. And not a word about V6 or extending the addressing model. But lots about security in the network which means more and more speed bumps, twisting passages and meddling police biddies.

Note their press release "Its ProCurve 5300 series switches delivered last summer, for example, which cost about $65

per 10/100 port, implement a broad range of security features as well as Layer 3 and Layer 4 traffic prioritization features. "They let the customer deploy next-generation intelligence at the network's edge at a commodity price point," said Clark.

This sure looks like another one of them bellheads run amuck. It would be wonderful if they provide more information about the network but adding intelligence and discrimination into the heart of the network (the edge is in my PC, not in the IT switch) is just more of the old telco control paradigm.

Two Internet Futures - With Edge IPv6 and Without Edge IPv6

By Bob Frankston and from http://www.Frankston.com/public/ESSAYS/EncryptedIPV6.asp

We can loosely separate two agendas:

The backbone agenda is about improving the efficiency of the Internet infrastructure. For the sake of this essay I will only note these issues to the extent they seem to interfere with the edge agenda.

The edge agenda is about making more addresses available so each host can have a public presence. It is about making more addresses available as well as improved protocols for automatically assigning addresses. For simplicity I'm focusing on the increase in the number of addresses. IPV6 can be deployed at the edges of the network using the existing IPV4 network as a transport.

The two agendas are intertwined to the extent that there must be an agreement on the format of an IPV6 packet and the layout of the IP address. But now that there is agreement on the packet format, we can and must deploy IPV6 from the edges.

With and Without

To understand the importance of IPV6 we can compare two scenarios.

Without: If we continue business we will simply accept that the Internet used to be exciting but we have to get back to business as usual. Experiments at public access will have mixed results and all-to-often will fail. Hotels will provide some access but it will be limited and expensive. We will find the Internet is increasingly like television with the transport providers carefully selecting which services will work and how well they will work. To most people this won't seem to be a problem and the economic doldrums will seem to be a higher priority. After all, this is the post Internet era and we should reduce our expectations.

With: I'll have to tone this down to be taken seriously. But think about being able to take your computer anywhere and it would just be connected. But why not? Especially if I could just drop an access point anywhere and connect simply and securely. What might not be obvious is that the kind of "Moore's Law" price/performance improvements that have made email free (once one has paid for a pipe to the rest of the Internet) would operate to make these access points act as part of a common good in the same way that we generally allow others to benefit from porch light or a restaurant doesn't charge for tap water. These aren't free either but it would seem counter-productive to try to charge a passerby who uses that light to read a map. The key to driving this cycle is simplicity. This is not the post-Internet era. We haven't even started to explore the possibilities.

One lesson I've learned with VisiCalc is that seemingly minor decisions can make a big difference. In making home networking a normal retail product I took a step towards demystifying the Internet and making connectivity just another commodity. But I was only able to take the first step. I accepted the evil of NATs (Network Address Translation) as I awaited the deployment of encrypted IPV6.

We have waited too long and there is no reason to wait any more since IPv6 can be deployed from the edges without waiting for any changes to the Internet itself!

Customer Owned Networks

ZapMail and the Telecommunications Industry

by Clay Shirky Highlights

First published January 7, 2003 on the 'Networks, Economics, and Culture' mailing list. [***COOK Report***: See http://Shirky.com/nec.html in order to subscribe to Clay Shirky's very good mail list. Republished here with permission.]

To understand what's going to happen to the telephone companies this year thanks to WiFi (otherwise known as 802.11b) and Voice over IP (VoIP) you only need to know one story: ZapMail.

The story goes like this. In 1984, flush from the success of their overnight delivery business, Federal Express announced a new service called ZapMail, which guaranteed document delivery in 2 hours. They built this service not by replacing their planes with rockets, but with fax machines.

This was CEO Fred Smith's next big idea after the original delivery business. Putting a fax machine in every FedEx office would radically reconfigure the center of their network, thus slashing costs: toner would replace jet fuel, bike messenger's hourly rates would replace pilot's salaries, and so on. With a much less expensive network, FedEx could attract customers with a discount on regular delivery rates, but with the dramatically lower costs, profit margins would be huge compared to actually moving packages point to point. Lower prices, higher margins, and to top it all off, the customer would get their documents in 2 hours instead of 24. What's not to love?

Abject failure was not to love, as it turned out. Two years and hundreds of millions of dollars later, FedEx pulled the plug on ZapMail, allowing it to vanish without a trace. And the story of ZapMail's collapse holds a crucial lesson for the telephone companies today.

The Customer is the Competitor

ZapMail had three fatal weaknesses.

First of all, Federal Express didn't get that faxing was a product, not a service. FedEx understood that faxing would be cheaper than physical delivery. What they missed, however, was that their customers understood this too. The important business decision wasn't when to pay for individual faxes, as the ZapMail model assumed, but rather when to buy a fax machine. The service was enabled by the device, and the business opportunity was in selling the devices.

Second, because FedEx thought of faxing as a service, it failed to understand how the fax network would be built. FedEx was correct in assuming it would take hundreds of millions of dollars to create a useful network. (It has taken billions, in fact, over the last two decades.) However, instead of the single massive build out FedEx undertook, the network was constructed by individual customers buying one fax machine at a time. The capital expenditure was indeed huge, but it was paid for in tiny chunks, at the edges of the network.

Finally, because it misunderstood how the fax network would be built, FedEx misunderstood who its competition was. Seeing itself in the delivery business, it thought it had only UPS and DHL to worry about. What FedEx didn't see was that its customers were its competition. ZapMail offered two hour delivery for slightly reduced prices, charged each time a message was sent. A business with a fax machine, on the other hand, could send and receive an unlimited number of messages almost instantaneously and at little cost, for a one-time hardware fee of a few hundred dollars.

There was simply no competition. ZapMail looked good next to FedEx's physical delivery option, but compared to the advantages enjoyed by the owners of fax machines, it was laughable. If the phone network offered cheap service, it was better to buy a device to tap directly into that than to allow FedEx to overcharge for an interface to that network that created no additional value. The competitive force that killed ZapMail was the common sense of its putative users.

ZapPhone

The business Fred Smith imagined being in -- build a network that's cheap to run but charge customers as it if were expensive -- is the business the telephone companies are in today. They are selling us a kind of ZapPhone service, where they've digitized their entire network up to the last mile, but are still charging the high and confusing rates established when the network was analog.

The original design of the circuit-switched telephone network required the customers to lease a real circuit of copper wire for the duration of their call. Those days are long over, as copper wires have been largely replaced by fiber optic cable. Every long distance phone call and virtually every local call is now digitized for at least some part of its journey.

As FedEx was about faxes, the telephone companies are in deep denial about the change from analog to digital. A particularly clueless report written for the telephone companies offers this choice bit of advice:

Telcos gain billions in service fees from [...] services like Call Forwarding and Call Waiting [...]. Hence, capex programs that shift a telco, say, from TDM to IP, as in a softswitch approach that might have less capital intensity, must absolutely preserve the revenue stream. [http://www.proberesearch.com/alerts/refocusing.htm]

You don't need to know telephone company jargon to see that this is the ZapMail strategy.

Step #1: Scrap the existing network, which relies on pricey hardware switches and voice-specific protocols like Time Division Multiplexing (TDM).
Step #2: Replace it with a network that runs on inexpensive software switches and Internet Protocol (IP). This new network will cost less to build and be much cheaper to run.
Step #3: "Preserve the revenue stream" by continuing to charge the prices from the old, expensive network.

This will not work, because the customers don't need to wait for the telephone companies to offer services based on IP. The customers already have access to an IP network -- it's called the internet. And like the fax machine, they are going to buy devices that enable the services they want on top of this network, without additional involvement by the telephone companies.

Two cheap consumer devices loom large on this front, devices that create enormous value for the owners while generating little revenue for the phone companies. The first is WiFi access points, which allow the effortless sharing of broadband connections, and the second is VoIP converters, which provide the ability to route phone calls over the internet from a regular phone.

WiFi -- Wireless local networks

In classic ZapMail fashion, the telephone companies misunderstand the WiFi business. WiFi is a product, not a service, and they assume their competition is limited to other service companies. There are now half a dozen companies selling wireless access points; at the low end, Linksys sells a hundred dollar device for the home that connects to DSL or cable modems, provides wireless access, and has a built-in ethernet hub to boot. The industry has visions of the "2nd phone line" effect coming to data networking, where multi-computer households will have multiple accounts, but if customers can share a high-speed connection among several devices with a single product, the service business will never materialize.

The wireless ISPs are likely to fare no better. Most people do their computing at home or at work, and deploying WiFi to those two areas will cost at worst a couple hundred bucks, assuming no one to split the cost with. There may be a small business in wiring "third places" -- coffee shops, hotels, and meeting rooms -- but that will be a marginal business at best. WiFi is the new fax machine, a huge value for consumers that generates little new revenue for the phone companies. And, like the fax network, the WiFi extension to the internet will cost hundreds of millions of dollars, but it will not be built by a few companies with deep pockets. It will be built by millions of individual customers, a hundred dollars at a time.

VoIP -- Phone calls at internet prices

Voice over IP is another area where a service is becoming a product. Cisco now manufactures an analog telephone adapter (ATA) with a phone jack in the front and an ethernet jack in the back. The box couldn't be simpler, and does exactly what you'd expect a box with a phone jack in the front and an ethernet jack in the back to do. The big advantage is that unlike the earlier generation of VoIP products -- "Now you can use your computer as a phone!" -- the ATA lets you use your phone as a phone, allowing new competitors to offer voice service over any high-speed internet connection.

Vonage.com, for example, is giving away ATAs and offering phone service for $40 a month. Unlike the complex billing structures of the existing telephone companies, Vonage prices the phone like an ISP subscription. A Vonage customer can make an unlimited number of unlimited-length domestic long distance calls for their forty bucks, with call waiting, call forwarding, call transfer, web-accessible voicemail and caller ID thrown in free. Vonage can do this because, like the telephone companies, they are offering voice as an application on a digital network, but unlike the phone companies, they are not committed to charging the old prices by pretending that they are running an analog network.

Voice quality is just one feature among many

True to form, the telephone companies also misunderstand the threat from VoIP (though here it is in part because people have been predicting VoIPs rise since 1996.) The core of the misunderstanding is the MP3 mistake: believing that users care about audio quality above all else. Audiophiles confidently predicted that MP3s would be no big deal, because the sound quality was less than perfect. Listeners, however, turned out to be interested in a mix of things, including accessibility, convenience, and price. The average music lover was willing, even eager, to give up driving to the mall to buy high quality but expensive CDs, once Napster made it possible to download lower quality but free music.

Phone calls are like that. Voice over IP doesn't sound as good as a regular phone call, and everyone knows it. But like music, people don't want the best voice quality they can get no matter what the cost, they want a minimum threshold of quality, after which they will choose phone service based on an overall mix of features. And now that VoIPhas reached that minimum quality, VoIP offers one feature the phone companies can't touch: price.

The service fees charged by the average telephone company (call waiting, caller ID, dial-tone and number portability fees, etc) add enough to the cost of a phone that a two-line household that moved only its second line to VoIPcould save $40 a month before making their first actual phone call. By simply paying for the costs of the related services, a VoIP customer can get all their domestic phone calls thrown in as a freebie.

As with ZapMail, the principal threat to the telephone companies' ability to shrink costs but not revenues is their customers' common sense. Given the choice, an increasing number of customers will simply bypass the phone

company and buy the hardware necessary to acquire the service on their own.

And hardware symbiosis will further magnify the threat of WiFi and VoIP. The hardest part of setting up VoIP is simply getting a network hub in place. Once a hub is installed, adding an analog telephone adapter is literally a three-plug set-up: power, network, phone. Meanwhile, one of the side-effects of installing WiFi is getting a hub with open ethernet ports. The synergy is obvious: Installing WiFi? You've done most of the work towards adding VoIP. Want VoIP? Since you need to add a hub, why not get a WiFi-enabled hub? (There are obvious opportunities here for bundling, and later for integration -- a single box with WiFi, Ethernet ports, and phone jacks for VoIP.)

The economic logic of customer owned networks

According to Metcalfe's Law, the value of an internet connection rises with the number of users on the network. However, the phone companies do not get to raise their prices in return for that increase in value. This is a matter of considerable frustration to them.

The economic logic of the market suggests that capital should be invested by whoever captures the value of the investment. The telephone companies are using that argument to suggest that they should either be given monopoly pricing power over the last mile, or that they should be allowed to vertically integrate content with conduit. Either strategy would allow them to raise prices by locking out the competition, thus restoring their coercive power over the customer and helping them extract new revenues from their internet subscribers.

However, a second possibility has appeared. If the economics of internet connectivity lets the user rather than the network operator capture the residual value of the network, the economics likewise suggest that the user should be the builder and owner of the network infrastructure.

The creation of the fax network was the first time this happened, but it won't be the last. WiFi hubs and VoIP adapters allow the users to build out the edges of the network without needing to ask the phone companies for either help or permission. Thanks to the move from analog to digital networks, the telephone companies' most significant competition is now their customers, because if the customer can buy a simple device that makes wireless connectivity or IP phone calls possible, then anything the phone companies offer by way of competition is nothing more than the latest version of ZapMail.

First published January 7, 2003 on the 'Networks, Economics, and Culture' mailing list.

Discussion of Clay Shirky's ZapMail Essay

Unlicensed, User Financed, Edge Based Connectivity Technology -- Locustworld Meshbox in Context of Building Edge Based Wireless Transport Highlights

Editor's Note: From a private mail list and used with permission, we present a discussion on Clay Shirky's ZapMail essay.

Andrew Odlyzko: A great essay. I agree with the general conclusions. Still, a few vital points are missing from your piece. The main one is that ZapMail failed primarily because FedEx underestimated how popular faxes would be. Initially fax machines were expensive and usage was low. Under those conditions it made sense to offer a service that would be used by all those small businesses that could not afford their own fax machine. *But technology and exploding demand led to dramatic declines in prices, so that business model went out the window.*

Another key point that was missing is that the reason faxing could become a product instead of a service was that it rode on the existing telephone infrastructure. What do you think would have happened if you had to build a totally new physical network for faxes?

VoIP is indeed destroying the old business models, and in particular is leading to a flat-rate pricing regime. However, VoIP by itself does not deal with the basic problem of providing connectivity. It does not lower the costs of the first mile, which dominate. WiFi potentially does (and I emphasize potentially, because we don't know yet how this will play out), since it may allow us to avoid the costs of wiring up every household.

COOK Report: What Andrew is calling for may already be on the verge of happening. On January 20, 2003 Guy Kewney, of Newswireless.net published an article, "Become a wireless ISP: for £300," at the Register web site. The article certainly gives a partial answer to Andrew's question.

Keweny wites: "While the learned are laughing at Negroponte's fantastic "futuristic" vision of a mesh of interconnected wireless LANs "like lilypads which you hop from one to another" a UK company has produced Mesh wireless technology which you can buy and install, today, for under £300. Fancy setting up as a rival to BT Openworld? Even in a remote village? Easy: buy a Locustworld MeshBox; half the price of a home PC. You're in business."

"The software is the key to Locustworld. Written by text-message pioneer Jon Anderson, it configures a group of wireless access points into a coherent "mesh" and connects them to any broadband Internet node available."

"Most experts regard the mesh approach as hugely complex, because of the effort needed to set up the mesh. The system used to be known as a "parasitic network" - although the fashionable term these days is "symbiotic" - the idea is that you turn a group of wireless nodes loose, and tell them to introduce themselves to each other. Then you set up routes through the mesh. It can be fiendishly complex, but Locustworld's mesh does this for you. You just buy the node from them: the current model is £250 plus VAT."

"The last legal obstacle, according to founder Richard Lander, was the decision by Oftel, allowing people to share their broadband with up to 20 others. The excitement in the UK hasn't been quite as high as it was in the US, but even there, it seems only "nerds" really picked up on it - probably due to an article by Anderson which was flagged on SlashDot in December. It should have hit the headlines big time, since it allows a street to share all their broadband nodes, at a huge cost saving. It would allow a vicar in a small village to hire a leased line, and share the costs with all his parishioners - without any technical expertise." Editor – Readers should without fail read to the rest of the article at http://www.theregister.co.uk/content/59/28972.html

David P. Reed: Unlicensed, user-financed wireless technologies potentially do (allow us to avoid the costs of wiring up every household.) Wi-Fi is a brand name for something that is much more narrowly defined than that, which does not scale to handle the first mile problem. I think Wi-Fi's success may initiate a business model change here. However, what you said is like saying the Apple][will replace timesharing. At least say "personal computers" and "unlicensed wireless networking technologies".

Andrew Odlyzko: Yes, a very good point. I was using WiFi just because that was what Clay had in his essay. Other forms of wireless are likely to be more important in the long run, as WiFi seems to have too many problems.

On the other hand, I would dispute the claim that unlicensed user-financed wireless technologies are the only serious competitor. Licensed centrally run networks could also be a disruptive factor. The key issue is that of cost. So far we have been stuck for the last couple of decades in a situation that it cost around $1,000 per household to provide connectivity, whether it was through copper or coax. Because of monopoly rents, such connections then got valued at $2,000 to $5,000 each. However, with wireless (and it can be licensed wireless) we may potentially get to (1) lower cost per household, as the need to wire up each residence disappears and (2) a more competitive situation, in which each connection is valued closer to the replacement cost.

"Spectrum Control Thinking"

Anders Comstedt (CEO of the Swedish fiber utility) [For wireless to take hold in the local loop, such wireless] really does not need to be "unlicensed" even. The question is how low a threshold you can create for the "local micro group" in solving the access problem. Right now the spectrum control thinking, from ITU downwards, prohibits anything but big business to be players. In fact, I am in the middle of trying to "sub-license" to individual users and small groups a chunk of spectrum to use as "fibre extenders" where we right now cannot offer fiber (suburban, rural). It turns out to be illegal, not only nationally, but some also claim violation of international spectrum treaties.

Odlyzko: Clay, a few vital points are missing from your piece.

Shirky: You know that moment where you get a cute little Yamaha dirt bike, and then you drive it by the Hell's Angels clubhouse? That's what I felt like posting that URL here.

All your points above are, of course, correct, and there were several economic details I glossed over in order to get the Zapmail story into 150 words. FedEx went into an oil-intensive business in 1973 (ruh roh), and so they were used to managing inflation, and misunderstood how quickly technology prices could fall.

They also misunderstood that poor quality/high convenience was a tradeoff users were willing to make (their fax machines were letter quality at a time when Type 3 faxes sucked). This mistake was also made by the music industry vis-à-vis MP3s, and is now being made by the ILECs vis-à-vis VoIP.

Roxane Googin: In my opinion, "The Crummiest technology always wins". I use that statement (a quote of myself) often. Also, "the next paradigm never mimics the prior one". The reason for that is that the new paradigm by definition is able to solve a problem the old one could not. Otherwise, it would not be "better" enough to generate adoption. So, look for two variables to change at once, both implementation cost and sales channel. One variable alone does not usually do the trick, tricking analysts. Look for the second enabler to be the big hit. In this case, look for people to adopt a crummy sound quality in exchange for really cheap service. Along the way, they will probably accept poor security, latency, down time all in the name of radically lower costs. In some way, look for disintermediation of some middle-man.

Odlyzko: Clay: Another key point that was missing is that the reason faxing could become a product instead of a service was that it rode on the existing telephone infrastructure. What do you think would have happened if you had to build a totally new physical network for faxes?

Shirky: This is probably the biggest omission. FedEx actually built a proprietary network to handle the data transmission, because the planning stages were pre-Judge Green. This makes FedEx's mistake less confusing -- needing a proprietary network for data transmission really did look like a lock-out scenario -- but the increase in flexibility of end user devices caught them by surprise.

Adding that to the article would have made it more historically accurate, but (I think) less illustrative for the general reader, for whom the breakup of ATT is right up there with stagflation as a memorable event.

VoIP is indeed destroying the old business models, and in particular is leading to a flat-rate pricing regime. However, VoIP by itself does not deal with the basic problem of providing connectivity. *The "Got WiFi? Why not throw in VoIP? Want VoIP? Might as well add WiFi" effect is going to make these two technologies more intertwined than they are today, and I am betting that the intertwining happens fast.* [**Editor's Note** - for us the dynamic was get cable modem in order to get VoIP.]

COOK Report: Almost three weeks later (January 28, 2003) on the telecom reg mail list the IRU's Robert Shaw underlined Shirky's perception that wireless, broadband wireline and VoIP could shake up the market in unexpected ways.

Shaw: "The Japanese market is undergoing an extremely dynamic and complex transformation with regards to IP telephony. Its genesis is probably in Japan's having decided that the deployment of broadband networks was extremely critical to Japan's future. In January 2001, a Cabinet-level Task Force on IT Strategy (led by the Prime Minister) announced its "e-Japan Strategy". The strategy set ambitious targets for 30 million households with high-speed Internet access (e.g., DSL, CATV, FWA) and 10 million with ultra-high-speed access (e.g. FTTH) within five years."

"In 2000, the Ministry of Public Management, Home Affairs, Posts and Telecommunications (MPHPT), in order to encourage deployment of DSL, established rules for local-loop unbundling and co-location. These rules made it much easier for new ADSL operators to interconnect with the local networks of the incumbent, NTT. Since then, a number of new ADSL service providers entered the market, and you've noted, one of the most successful has been Yahoo!BB (http://bbpromo.yahoo.co.jp), which started an ADSL service in September 2001 at a very low monthly charge of JPY 2400 (~US$ 20) for up to 1.5 Mbit/s connection speed. It also provided specific broadband content & services, including a VoIP service available exclusively to subscribers."

"Like Hanaro Telecom in Korea, Yahoo!BB's entry from outside the normal telecom circles, energized competition among ADSL providers and set a price benchmark. Most providers' monthly charges fell to around JPY3000 (US$ 25), and the quality of service has been rapidly enhanced from 1.5 Mbit/s to 8 Mbit/s. In the fall of 2002, several providers started offering access at 12 Mbit/s. The combination of low prices and higher speeds is clearly working. The number of ADSL subscribers in

Japan now stands at almost 6 million with around one half a million being added per month (MHPHT stat's are at http://www.soumu.go.jp/joho_tsusin/eng/Statistics/dsl/index.html)."

"Cable modem service providers have also been affected by competition from ADSL. Most CATV operators have upgraded their access speed to over 2 Mbit/s and brought down their prices."

"It's interesting that number exhaust was mentioned as Japan has now taken an unusual (if not unique?) regulatory approach to numbering plan allocation for IP terminal devices. Yahoo!BB had been bundling VoIP with subscriptions which allowed free calls to other Yahoo!BB users and cheap calls to regular phones either in Japan or internationally. However, you still had to keep your other number/phone for incoming calls as there was no way to address/terminate calls. This is about to change as MHPHT decided last year to issue telephone numbers specifically for IP devices (starting with a 050 prefix). In November 2002, MHPHT handed out ~7 million numbers to ISPs (see http://www.techinformer.com/english/crd_ip_967540.html). Consortiums of ISPs are now deciding they're going to work together to terminate calls, in some cases for free (see http://www.idg.net/english/crd_ip_964701.html)."

Declining Price's Impact on Market Viability of New Technology

Brough Turner: [Referring to Andrew's emphasis on cost.] A few years ago we were providing components to some major equipment providers for wireless local loop (WLL) systems. At that time, I concluded there was no big upside for Natural Micro Systems as WLLjust plain cost too much ($2K+) per subscriber. Then three years ago, there was a flurry of WLL activity in Asia where the intention of new competitive operators (in Hong Kong for example) was to use DECT (cordless technology) or Japanese PHS technology to provide WLL within 30 story apartment buildings. That looked like it would break $1000 per subscriber, but I haven't followed what came of it. Most recently I noticed another form of WLL being deployed by newly licensed competing fixed operators in India. It's called CDMA (IS-95) and it's being provided without cell-to-cell handoffs or roaming, i.e. with "limited mobility" (thus not infringing on those with mobile service licenses). The good news is that WLL seems to have gotten down in price to costing no more than mobile (by adopting mobile technology).

My question (for David or Andrew or anyone): If it were done centrally, are there any realistic prospects for breaking the $1000 per subscriber barrier anytime soon?

Odlyzko: That is the big question. The costs of all the electronics are coming down, so this should happen, but we really need some real data from the field (including management costs).

David Reed: No. The cost would be very high, because the local laws bar antennas without full town review. Needham (my town) is currently holding up a point-to-point high-speed provider by requiring that the Zoning Board review every antenna. The particular antenna being blocked is a 6 inch square surface mount patch antenna on a wall of a tall building, facing another tall building with line of sight. The patch antenna would be painted the same color as the building, and looks like a flat-surfaced piece of construction material.

What are they doing this for? The answer is money. Because the solution being deployed costs way less than $1000 per point served, they seem to feel they can tax the hell out of the service providers to bring the cost up to the current cost umbrella set by T1's. So the only solution is getting customers to finance their own networks, and vote out the idiots...

The Problem of Generic Use of Wi-Fi

I am working very hard to prevent the whole unlicensed thing becoming about a very limited technology. Legislators are being asked at this very moment to eliminate unlicensed operation and replace it with WiFi (the trademarked and patented and IEEE 802.11 controlled standard). Outlawing any other radio systems in the U-NII bands. Letting Microsoft define what WiFi is or is not.

Yeah, stupid people colonize terms. Also very smart people take advantage of that. Synecdoche is worse than metaphor. There is a huge difference between a mandated but "limited" MAC layer (what Microsoft says on the Hill) and an open wireless space. It's the difference between the ITU and the old IETF.

It's not just a question of language preference. You know that.

Clay Shirky wrote: David, I'm going to differ with you on the subject of language. The general audience, for whom that piece was written, often adopts technological synecdoche, where an example of a class stands in for the whole class. (Palm describes many PDAs, the Web means the whole of the publicly accessible internet, and so on.)

Anyone who struggled to write about "pen-based computing" remembers what it was like when the Palm came along -- you could get a light to go off in the readers head much more easily, but the tradeoff was a loss of generality in the description. When writing for the public, it was often a tradeoff worth making.

In this case, I believe that WiFi has come to mean "unlicensed wireless networking technologies", and I will not be surprised if non-802.11b technologies get deployed under that name, or at least described at their launch as being "like WiFi."

Jim Forster: I liked Clay's paper too. I made a comment to him on this part and thought I'd pass it on to you all as well:

Shirky: Cisco now manufactures an analog telephone adapter (ATA) with a phone jack in the front and an ethernet jack in the back. The box couldn't be simpler,

Foster: That's the first time I've heard of

cisco product that "couldn't be simpler"! Amazing, I didn't think we knew how to make simple things. Well, we're a big place so there's always some lunatics lurking somewhere.... Fortunately!

By the way, folks like Vonage will put a ceiling on the value of the voice service that can be built on top of a broadband access service. It's a lot easier to build a competitive voice service on top of broadband than it is to deal with competitive ISPs on top of broadband access, because the former case can take advantage of IP addressing to reduce to nearly zero the transaction cost of setting up a voice service, whereas pretty much all the schemes for setting up "competitive ISPs" have significant transaction cost, since there's no switching layer below IP in some cases. And adding such a switching layer just keeps the network from staying dumb.

I love competition but I have yet to see a broadband access network that has a low transaction cost layer below IP that facilitates "ISPChoice". This was easy for dialup Internet because of the switching that's fundamental to the PSTN. ILECs naturally followed that model with DSL and put ATM in the middle, which is not adding particularly any value but is adding a lot of complexity. Worse, they never really did Switched Virtual Circuits.

David Isenberg: You've clearly struck a chord with your ZapMail essay -- about a dozen SMART People have forwarded it to me. [snip] Who's going to run the connectivity network after telephony-classic and cable-TV-classic are dis-intermediated? This is the big unasked question, as Andrew Odlyzko pointed out. (Fortunately for Fedex, the runways are not owned by American, United, or the US Post Office.)

Googin: To address David's and Andrew's question as to who runs what when the incumbents get disintermediated. I have gotten that question since 2000. The answer is "who knows"? While technological trends are somewhat deterministic, human behavior is not. The best we can do is set "boundary conditions", as trying to pinpoint a "solution" tends to blind you to alternatives outside of our collective limited imagination. That is, in my opinion, the most productive line of reasoning is along the lines of: the next paradigm will most likely have these characteristics: (a)peering, (b)fiber backbones (c)low budgets (d) a way around greedy city governments, bla bla bla. How they are implemented beyond that will probably be determined by some wild-eyed 20 year-old with tatoos. CHAOS. GO FOR IT.

Open Spectrum - Property Rights World View Dies Hard

Exploring the Problems with the Farber-Faulhaber Have-Your-Cake-and-Eat-it-Too Spectrum Arguments Highlights

Editor's Note: In August 2002 university of Pennsylvania Professors Gerry Faulhaber and Dave Farber put themselves squarely in opposition to the ideas of Open Spectrum and a commons for spectrum being explored by the FCC spectrum task force with a paper suggesting a combination of spectrum auctions and easements.

The whole idea of the open spectrum movement is that technology developments enable radios to be so sophisticated that they can stay out of each other's way in their use of spectrum. Consequently exclusive property rights for spectrum are no longer necessary.

Farber and Faulhaber claim to have cobbled together a property rights regime for spectrum that makes consideration of an open commons politically feasible. The approach is certainly contradictory on the surface. One version of the debate may be found at http://www.interesting-people.org/archives/interesting-people/200206/msg00083.html

Recently it was debated again on the Open Spectrum mailing list in preparation for a seminar in Tokyo.

On January 9 **Robert Berger** wrote the Open Spectrum mail list: It looks like I will be presenting the arguments promoting a more pure Open Spectrum Commons vs. the Faulhaber/Farber argument for Property with Easements approach at a GLOCOM Symposium Jan 21 (web site is http://w3.glocom.ac.jp/project/wireless/ but its all in Japanese)

The core of the Faulhaber/Farber argument is that all spectrum should be privatized using something like the FCC's Kwerel & Williams "Big Bang" auction. [They] add that the private property would have "easements" that require the property owners to allow for spectrum "underlays" using wideband spread spectrum or Ultrawideband and maybe also allow for cognitive radios to utilize local unused, but allocated spectrum.

They claim that this would deliver the best of both worlds (the economist's desire for market forces to allocate narrowband, high power spectrum and the engineers desire for a spectrum commons.

They even claim with a straight face that because of the strength of the commons, that will force the price of spectrum property to near zero. If this is true, it seems to me to ask the question as to why bother making it private property in the first place.

My claim is that their approach is based on a false assumption that such a market would be open, unbiased and transparent. If history is any guide, the people who will get the spectrum as property are the top monopolists / oligopolists / lobbyists who will use their market, capital and political power to eliminate economic interference under the guise of eliminating technical interference.

The last thing that broadcasters, cellular operators, RBOCs, DMCA wielding content owners and other existing giant corporations who get their monopoly - oligopoly power from the government enforced artificial scarcity will tolerate is making it free and abundant. And they have shown over and over that they will use every legal, political, economic and media manipulation tool at their disposal to stop any such competition.

I would appreciate any suggestions, additions or input on how to focus and amplify the support of promoting an Open Spectrum Commons vs. a private property giveaway. One specific I am looking for are examples of how entities have used their power to squash similar moves.

The few I have thought of so far are:

* NAB's uses Congress to eliminate low power FM

* The general hobbling and then repudiation of the Telecom Act of 1996 through lobbying and media manipulation

* The RBOCs' use of legal, regulatory and active non-compliance with the Telecom Act to facilitate the downfall of CLECs

* Content Owners' use of DMCA to manipulate ISPs and software companies as well as to distort the Internet's end-to-end paradigm

* RBOCs getting laws passed to block Municipally owned telecom networks

Nobuo Ikeda: As I said, their argument is self-defeating: if the price goes down to zero and spectrum becomes commons, nobody will buy the property that will be eventually worthless. Conversely, if someone buys it, he will do everything to maximize its value by monopolizing it.

So the logical conclusion is: they assume that there will be sufficient fools that buy the spectrum in "Big Bang" auctions and lose money. I think it is an interesting economic theory based on "irrational expectations".

Robert Berger: I am sure that Faulhaber and Farber are sincere in their belief that they have proposed a win-win scenario. I just think its naive to believe that the people who will buy the spectrum (and who think they already own it, that is

Broadcasters and cellular operators) won't manipulate things to consolidate their power further.

The problem is that the folks in power will use this approach as a Trojan horse to get the government to effectively give away the spectrum to the incumbents under the guise of having easements. Then they will use their power to at least make the easements useless and thus continue to force spectrum to be a scarce resource.

Larry Lessig: That's certainly one argument. The problem is that it puts you outside your space of expertise. They will respond about conditions for competition, etc., and that will leave the argument at a stalemate.

Why not focus on the costs of their property system--in particular, the costs it would create for a spectrum commons. Then the argument looks something like this: (0) Coase said you should only adopt a property system if the benefits of the systems outweigh the costs; (1) they acknowledge a property system imposes costs; (2) if you thought a meshed UWB etc. architecture was ideal, here are the costs a property regime would impose on getting to this architecture.

This trades on the intuition that many have (in the face of the extraordinary growth in commons architectures) that the commons might indeed be the best architecture, without you having to prove that the market would not work.

Yochai Benkler: I agree with Larry that there is no need to resort to the argument that market actors are greedy. The structure of the arguments about limitations of property, effect of property on commons, and transaction costs, that I make in <http://benkler.org/OwlEcon.html> 30-39 is roughly as follows.

I Limitations of property
1. Assumptions:
a. Demand for wireless communications is localized and highly dynamic.
b. Transaction costs of identifying who needs to communicate, with what equipment, at which set of microseconds, in which 30-300 meter bubble, are nontrivial.

a. If spreading a signal over a range of frequencies wider than most "spectrum" owners currently possess would result in such low power spectral density as to not displace anyone else's communication (because the contribution to din the other pair would need to overcome would be trivial), transaction costs will prevent an efficient collection of permissions to spread a signal to that bandwidth. No one will undertake the transaction costs just to permit a non-displacing, hence zero cost, transmission possible. This is recognized by Faulhaber and Farber as the anticommons problem, to which they offer the easement solution. (of which more below)

b. It is impossible to price "spectrum" efficiently without computing the displacement effect of all the possible network/equipment/communication configurations that any given sender receiver pair could actually use to achieve a communication, given their own equipment and present cooperative equipment.

Only when one does so, can one acurately state what the social cost of a wireless communication is. This computation is precisely the computation needed to achieve communications in an open wireless network. So all property-system costs associated with identifying demand, clearing it, and pricing it, will lead to systematic divergence from efficient pricing. That the direct transaction costs of property are higher than those of commons is also recognized by Faulhaber & Farber, but they do not specify the effect or magnitude of these costs--that is, that they undermine the one thing that property in spectrum could do right--price bandwidth. (the main argument of the article is that commons have more capacity and scale it more rapidly for any given investment in total network infrastructure, except that property could improve sometimes, through efficient pricing. That transaction costs cause systematic divergence from efficient pricing is quite fatal to that approach).

II. Limitations of easement. Here's a direct quote of the answer I give on pages 35-39:

While [Faulhaber & Farber's] modified system is much better than the pure property system, it is still substantially constraining to open wireless network design, and again it is Coase who helps us understand why. In both his Federal Communications Commission piece and in the Nobel-winning article he wrote the following year, The Problem of Social Cost, Coase introduces the problem of the physician and the confectioner who are neighbors. The confectioner's equipment makes vibrations that make it difficult for the physician to see patients. Normal legal thinking at the time would treat the confectioner as "causing" damage to the physician by making noise and vibrations. One of Coase's great insights in that article was that the physician is "causing" the damage to the confectioner by being so sensitive, just as much as the opposite is true.

Who should be shut down or made to pay cannot therefore be decided on the basis of stating who is "causing harm," but should rather be based on whose activity is more socially valuable. The lesson is directly applicable to the proposition that open wireless networks need not be adversely affected by an exhaustive Big Bang auction of property rights as long as they are permitted to operate without interfering with rights owned under that regime. If, however, we define the operating parameters of open wireless networks based on the sensitivities of the property-based services, we have effectively treated the property-based system as the physician, and the wide band devices and agile radios as the confectioner. But saying that we will allow confectioners so long as their equipment does not vibrate is not to say that we now allow both physicians and confectioners. It is to say that we have chosen to make the world safe for physicians and constrained for confectioners. This may be the right decision or the wrong decision from a social welfare perspective, but it is a decision in favor of one approach, not an accommodation of both.

To be less metaphoric and more specific let me be clear about the effect of high-powered property-based services in a frequency band on open wireless systems.

The level of non-cooperating radiation in any given band affects the extent to which a system needs processing and co-operation gain to achieve a certain rate of information delivery through an open wireless network. The more radiation there is, the greater the complexity of the solution to the problem of communicating information through the channel. The greater the complexity of a system, the greater the cost of the equipment needed to implement it. So, holding all other things equal, if you permit only open wireless systems to operate in a given range of frequencies, they will be able to achieve a given throughput at lower cost than they could if they need to achieve the same throughput in the presence of high powered communications.

While the modified property right is much better than the perfect property rights regime in that it does not completely prohibit open wireless systems, it still imposes a burden on the development of those systems. Perhaps the proponents of spectrum property rights are correct, and that burden is socially justified given the relative value of both types of approachesÅ\the proprietary and the openÅ\to wireless communications. But the modified property right does not allow us to eat our cake and have it too. We must still choose how much we will have of each type of wireless communications facility.

Ikeda: In economic terms, the spectrum must be used as (pure) public goods, not as commons (common pool resources). The difference is that commons is "rival" i.e., many people can't use the same resource at the same time, while public goods are non-rival. If sufficient spectrum is opened, it will be non-rival because we can increase the capacity by adding stations.

Typical public goods are parks. It is absurd to allocate parks in markets, because dividing parks will break its value. The problem is to maintain its quality by public administration. "Easement" is irrelevant because parks are totally open.

As Larry and Yochai said, the logical order is important: if the problem of spectrum can be solved by technology, it should not be solved by market mechanisms for which social costs are very expensive. The FCC economists should prove technically why the spectrum can't be used efficiently as public goods. If they can't prove it, their economic arguments don't make sense.

Berger: The fools aren't the people buying the spectrum, its those of us who would allow them to get away with "owning" what is inherently a public commons and then getting to set the rules.

Kevin Werbach: For Farber and Faulhaber, easements are a hedge. I don't think they believe that prices will go to zero in a commons, or that the commons will work at all, but they can't rule it out. As good economists and engineers, they recognize that if the assumptions open spectrum advocates make are true, a commons is indeed a better ordering mechanism than a market for most spectrum.

The question at issue here is whether government can create them in a way that ensures they can be viable. The assumption is that, by defining the owner's property rights as stopping at the edge of the easement, a win-win solution will emerge. But that depends on real-world conditions. At the last open spectrum meeting at Harvard, Andy Lippman pointed out that the FCC's "interference temperature" might leave easements too narrow to be commercially viable for underlay uses. This becomes an empirical question. It's a narrower one than whether spectrum owners will try to poison competition in general.

David Reed: Spectrum is not like real property (land) in so many ways that the "easement" metaphor is inappropriate.

Carliss Baldwin recently reminded me that the human race had been dealing with land rights for many thousands of years before "fee simple" ownership was invented. Even then, there are a lot of limitations on what rights exist in land under such ownership.

Also, the "big bang" auction provides no revisability when technology and applications change. WIthout such revisability, there is no sensible price for a permanent transfer from the public to today's investors. Markets cannot discount future value in the face of technology change over more than 3-5 years, much less decades. Even if such revisability were built in (in the form of, say, 7-year terms), effective revisability might be blocked by political power considerations as they are today in the case of TV licenses.

The problem is that there is no clear economic value to selling the right to exclude, when simultaneous use is possible and getting easier. If there is a compromise that leads to auctioning some of the spectrum, it's clear that society benefits by making that right revisable, with little or no cost for the revision. Sure, the price paid to the gov't would be lower, but even if the auction guys are right, the long term cash to the government would be larger as a stream of renewal payments.

And it's clear now (it probably should have been in 1934) that spectrum usage technologies and applications get obsolete. Newer, more efficient technologies should be given a chance to "buy" spectrum if that is what is needed, in competition with old technologies.

Thus I would argue that if big bang auctions are truly the best thing, let's require that the purchasers buy their spectrum every 3-5 years in a new big bang.

Faulhaber: the author [Robert Berger] understood at least part of our message. Not only do we suggest underlays, but we also suggest that governments (not just the Feds) may want to maintain ownership of large (or small) swaths of spectrum to hold in commons. In fact, private firms and foundations may want to do the same thing (e.g., a firm may want a commons to promote its own phones/radio). This happens today in spectrum (Part 15 et al.) and it happens in land (Federal, state and municipal parks, even private parks and gardens). What makes the author think it will be different in spec-

trum?

Noting that we claim "with a straight face" that marginal price will be near zero, so why should we want a market, this pretty much misses the point we have made forcefully: it is both the effects of a market and (perhaps in the long run) the effect of a commons that will lead to short- to medium-term near-zero prices. But ownership for some uses makes good economic sense, despite the religious fervor of some commons advocates, and property rights will fill that need.

The diatribe about monopolies/oligopolies trying to get their way by influencing government seems naive muckraking in the extreme. Of course everyone tries to influence the government in their own interest; that's what the Open Spectrum movement is about, e.g. And of course corporations do this, and have always done it. And of course the rest of us do it as well. Is the author claiming this is some special evil from which we need protection? By what government? The one in which he gets all the influence? Welcome to Planet Earth. This is the way things work here; they always have and they always will. Deal with it; nobody's going to rescue you from reality. And guess what? It actually seems to work pretty well, even if it isn't what you read in your high-school civics book.

Ikeda: As usual, Prof. Faulhaber's theory is very unique in economics. What does "marginal price" mean? He must have invented it, because there are no such terms in any textbooks in economics.

And why does ownership make sense? Maybe because he believes that commons will bring about the "tragedy of the commons". It is a wrong application of Hardin's famous article. He emphasized that the "tragedy" takes place when there is no "technical solution".

http://dieoff.com/page95.htm

So we should investigate whether there is a technical solution before we discuss economic solutions. If we can supply more capacity than demand by opening spectrum, it makes no sense to "fill that need".

Timothy X Brown (University of Colorado) Consider what I'd call "The Disney Argument". Property values may not go anywhere close to zero even with competing alternatives and having large swaths set aside as a commons. Consider Disney who bought a big chunk of swampland and created value from nothing. Disney is able to extract high rents and nearby property values in Orlando are relatively high. This is despite a plethora of competeing theme parks and despite a big chunk of Florida being set aside as a free park.

By analogy, if someone with deep pockets locks consumers into a wireless service in a particular band, the value of that band could be held quite far from zero.

Berger: Ok, you all convinced me I was going in a lame direction.

I've been working on how to convey the concepts that Benkler and Lessig suggested. Its tough to get it in without giving a tutorial on wireless communication, process and cooperative gain. (Benkler does a fabulous job in his paper but its 53 pages long :-)

What's more to the point is that its easy to argue against full on property rights. But I find that, like Benkler's own comments on the mailing list, its hard to come up with a strong rebuttal to Faulhaber / Farbers mix of Property Rights and Easements unless one wants to support a big bang conversion to all commons. (This assumes that the Easements are big enough i.e. pretty much all spectrum and enough power).

Its true that property rights limit the full capability of an open spectrum approach in terms of transmit power / range and would require the open spectrum devices to have more computational power than if there weren't private property narrowband high power users. But computational power is getting cheaper and we're not going to get rid of the incumbents overnight.

So is it really just a mater of calling for the right kind of easement and maybe saying, as Benkler does in his paper, that there should be no big bangs before there is more data? That instead we should have the equivalent of easements on existing spectrum allocations, allow more flexible use of existing allocations by current licensees and not do any permanent allocation to private property or commons property for a 10 year period?

My particular situation is that I was asked to be a controversial rebuttal to the Faulhaber/Farber position at a seminar that they are also going to be at. So I am looking for a bit of an artificially extreme position potentially.

Michael Calabrese: You might find the attached excerpt from our SPTF Reply Comments helpful (filed by New America, Consumers Union, Consumers Fed of America, Media Access Project, et al), particularly par. 4 below.

Licensing will be with us for quite some time; and so our emphasis is to retain the presumption in current law that (a) the airwaves are a natural system owned in common by all Americans (i.e., "public airwaves"); (b) an exclusive, government license to communicate impinges on First Amendment interests of both the licensee and of the public; (c) for both these reasons - and to preserve the flexibility of policymakers to adjust spectrum management priorities as technology changes - the current law requirement that licenses are TEMPORARY and transfer NO RESIDUAL PROPERTY INTERESTS beyond the term is critical.

In Coaseian terms, there is virtually nothing useful to be gained by transferring PERMANENT property rights in fee simple that could not be accomplished with complete but term-limited flexibility (ie, property-like rights) -- but, as you well know, there is a much to lose.

On January 13, **Robert Berger**: What would power management be like if we had the ideal world where we had a "pure commons", ie didn't have to worry

about legacy issues and not be relegated to being an "underlay".

Assuming wideband spread spectrum and/or ultra wideband techniquies. Is It expected that power outputs would be much more dynamic in range? For instance in less dense areas where there might not be a nearby unit available for relay, that a device might output in relatively high power? Would there be other high power outputs envisioned in an Open Spectrum world?

What happens to spread spectrum and ultra wideband when there is a mix of low power and high power users?

David Reed: I don't think the issue is just power management. Tim Shepard would like to consider the worst case where folks don't cooperate. (but in fact cooperation would evolve by default, if only the cooperation embodied in choosing not to "jam" others).

We don't know what the best tradeoff between the many choices we have might be.

Information theory and EM physics have not given us an "optimality criterion" - it is clear, however, that the current architectures are incredibly far from optimum as the use of radio communications scales up. More research is needed.

What we think we know about computation is that computation only consumes energy when information is destroyed. Thus computation need not consume energy.

What we know about communications is less. The core of communications is the 2nd law of thermodynamics - entropy in a closed system never decreases. Information is negative entropy. So in a closed system, communications is orthogonal (sort of) to energy use. And of course, we don't live in a closed system (we can use mirrors and solar motors to manipulate light from the sun to communicate, and the received photons can potentially power the detectors).

I'm sure this isn't the answer you wanted. But since we have enormous control of physical processes today, this is how we may have to phrase the question in the long run.

Interference in radio systems is not that well defined independent of a particular technology, and it is almost entirely related to architectural limitations of deployed systems, not radiated power.

Tim Brown: Many people have looked at decentralized low-power peer-to-peer communication systems. Many of the technical elements of such community networks have been worked out. The challenge now is how to make them work with users who do not know each other or necessarily trust each other. Why should anybody carry anyone else's traffic? Why should I trust someone else to carry my traffic? Why should I use lower transmit power if higher power will better ensure my packets get delivered? The key here is that there is no central operator who can police user behavior and conversely be sued if service agreements are not met.

Thus, beyond the basic technology and scaling issues open spectrum requires: (1) incentives for users to join, cooperate, and behave well. (2) methods for establishing trust between users' radios. (3) mechanisms for isolating non-conforming users.

These are tough issues that involve not just radio technology, but, economics, sociology, and security. Much work needs to be done. We are developing a community network testbed that we hope can address some of these challenges.

Reed: It is clear to me that considering these externalities is important. A major factor that drives standards is the value of interoperability to all participants. Not calculating that value and incorporating it into the model of technology, business, and user value leads to bad decisions. Interoperability is a "policing" force that exceeds what even a central operator can achieve.

Berger: Sounds like we need to be building test networks so we can get some actual data!

Tim Shepard: Ahhh. I fear that more test networks and examples would only further confuse things. For almost 3 decades computer scientists have been playing with radios and publishing papers extrapolating what they've learned about the particular radios they were playing with.

Reed: I presume you mean that said radios are not the kinds of radio systems that might spur innovative designs because they work quite differently.

I am greatly in favor of exploring alternative systems that might be scalable, and testing them in the real world. My favorite concept "societies of cognitive radios" is one such thing that is promising and ought to be tested - not because it is the only option, but because it is promising.

Theories tell you where to look. You've still got to test them. And in this case, our theories incorporate theories about economic behavior by future participants. Those can only be validated by tests in the real commercial world. (Remember 802.11 was a big surprise in terms of the economic behavior it has stimulated - so those who had a theory that 802.11 might be big news ended up proving it by putting it on the market. Prior to that it was NOT obvious what would happen with short-range unreliable unlicensed wireless).

For example, if we could only open up the software radios in today's 802.11a/b combo chips from Atheros, we could conduct lots of experiments at low cost. Not all important experiments, of course, but lots.

Outcome of Symposium

I believe that the Glocom Symposium on Spectrum Policy (http://w3.glocom.ac.jp/project/wireless/ if you read Japanese) went quite well. There were somewhere around 200 – 300 people from telecom companies, Internet, vendors, government and the press there. All the presentations are on the website, but in Japanese. I will see if they

can make the English versions available (they exist, just not at the website). The Symposium was simultaneously translated in English and Japanese.

Besides Faulhaber, Farber and myself, there was Professor Randy Katz from UC Berkeley who gave a very good overview keynote on the "Evolution of Broadband Wireless Tech and Community Access.

Masanobu Suzuki, President & CEO of NTT Communications gave a talk on Wireless Broadband, though it was really a state of the Japanese broadband industry and NTT Comm's vision of a personalized Internet service that is independent of transport. NTT Comm is rolling out a pretty aggressive 802.11 HotSpot (They own the trademark for HotSpot in Japan). NTT Comm (which is the long distance and other services portion of NTT when NTT was split similar to ATT/RBOC split) seems pretty progressive in many ways in their vision, but I think they still want to be vertically integrated and offer a One-stop-solution. Its not clear if that is one-stop for transport, security and related layers 1 – 3 or so or includes content (i.e. all layers). I believe the former.

Lindsay Schroth of the Yankee Group gave a presentation on the state of Broadband Wireless with a focus on licensed technologies.

Then Gerry Faulhaber gave his keynote which was basically a PowerPoint subset of the Faulhaber/Farber paper. He did bring up an issue that we in the Open Spectrum "camp" should address which is how will policy or etiquette or whatever we call the rules that facilitate the commons, will be set and coordinated? (Some of these issues might be power levels, infringement on property or property infringement on commons if we have the easements, etc). How do we avoid having the FCC step into that role and maintaining a regulatory regime?

I proposed that the technically related issues such as power levels, any need for coordination of modulations or protocols could be done through the IETF or an IETF like process (rough consensus and running code). And I'm sure the courts will get in there one way or another for the easement stuff...

Then I gave my presentation which I called "Not Time for a Big Bang" where I mainly focused on how it is not appropriate for us to jump right into turning all spectrum into pure private property, but instead look at it as a transition period where we need to not permanently block any future solution and yet must move forward and start deploying new technologies. You can download a copy of my presentation at http://www.ibd.com/presentations/No-BigBang.pdf.

Hajime Yamada from Toyo University / Glocom and who I work for here at Glocom gave a paper that shows what the policy trends are within the Japanese FCC equivalent. They are going much more slowly. The good news is that they don't want to jump into turning spectrum into property via privatization. The problem is that they don't want to abandon the "command and control" structure ether. They are though calling for investigation into new spectrum techniques and seem interested. But I would say that they are moving much slower than the FCC in ether direction. (This is my interpretation, it may not be correct!)

Sunao Takatori , president of Yozan Inc I Japan gave kind of a strange speech (He spoke in Japanese, so I heard it through translation. Don't know how much that made it strange) His published talk looked very interesting about his service which offers IP wireless service via 802.11 and PHS, but he only talked about how the Japanese people should trust their government bureaucrats and not question authority.....

And then Dave Farber followed up with commentary on all of the above. (Gerry Faulhaber had to leave to catch a plane so there wasn't really a debate).

I did get to talk with Gerry and Dave for a while and even though there are obvious differences, primarily Gerry's strong support for a significant position for private property, I got the feeling that their approach is more of a way to make something happen that breaks the "GOSPLAN" style of spectrum allocation. My interpretation is that they also strongly support the commons and they believe that their proposal is a way to make it politically possible. There is probably more we have in common with them than with people who want a pure property rights.

I also think that Faulhaber likes to argue :-)

If there was anyone else who attended the symposium, please put in your views of how it went as well.

ICANN and the Failure of 'Self Regulation'
How the National Science Board was Overruled by the Clique that Became ICANN - Part One

by **Gordon Cook**, **Highlights**

Although during the past year ICANN has become almost universally reviled, it is unfortunately not yet dead. One reason is that the fundamental questions of Internet governance posed by ICANN are not yet solved. Six years ago the primary question was the institutionalization of the IANAfunction. Today IANA works but the question of who pays for it and who controls it is still critical. Also today word leaked out from six clicks down in the NTIA web pages that the IANA function without public discussion has for four more years been sole sourced to ICANN.

ICANN is an on-going travesty. I maintain that is important to understand how ICANN was created, if we are ever to be able kill the one that exists and to avoid similar miscarriages of justice in the future. ICANN was to be all about the glories of industry self–regulation. Instead it has given us an excellent demonstration of what happens when you let the fox regulate life in the hen house. Or as another observer commented: ICANN isn't really about "industry self-regulation." Rather ICANN is an example of large-industry government collusion to safeguard mutual self-interests and lock out newer and smaller stakeholders.

In late December 2002 we discovered Larry Lessig's October 15, 1998 CPSR keynote address. In this little noticed speech reprinted with Lessig's permission in full below, Larry did three important things. He recounted in detail the process of ICANN's formation in 1998 including directly identifying the action taken by Joe Sims in September that torpedoed the IFWP process that had begun in June. The IFWP process in fact was critical because it was the only effort aimed at creating what could have been an open ICANN. But an ICANN as created by the IFWP process was not acceptable to Don Heath and Dave Farber of ISOC. During the summer of 1998 Heath, Mike Roberts and Farber were gunning for IFWP, and with Sims administering the coup de grace, they killed it. Lessig shows how.

Lessig also shows how these people took advantage of the widely held libertarian perception that if government did something, it was, by definition, bad. He shows how Sim's quote: "The single unifying force is that we don't want the government running things" became the mantra behind which ICANN was set up by the IBM, MCI, ISOC 'old boys.' ICANN was created as a tool to ensure that this clique could maintain control of the global Internet. Finally Lessig in his address, prophetically lays bare ICANN's anti-internet roots and philosophy by summarizing John Gilmore's remarks from September 1998 noting that ICANN had been built in ways that we completely antithetical to the earlier growth and development of the network.

ICANN was the aborted "child" of the privatization process. Some observers looking at the 1996 period have recently wondered why the "feds" just didn't walk away and avoid further involvement. I point out below that it was government policy to do just this until the ICANN clique found out and executed a veritable coup d'etat.

On January 6 2003 Temple Law School Professor David G Post wrote to the BWG list: As far as I know, I was the only person on the planet who called, in 1996, for the US Government to simply walk away from its expiring contract with NSI -- to do 'nothing,' to let the system find its own 'private' equilibrium, without government intervention. My advice was not followed. The US government hardly walked away; it handed something -- and God knows its damned difficult to characterize what it was or is, but it was and is *something* -- over to ICANN.

Professor Post, who has given me his permission to quote him, was not the only one with a good idea. I have long known what I shall now report. Starting in the summer of 1996, Don Mitchell had pushed this very policy of early disenagement at the National Science Foundation. In what follows I shall to my best to connect the dots to explain how sound policy taken with the best interests of the internet at heart was derailed and the take over by the ICANN clique (eloquently described by Larry Lessig in his October 15 1998 CPSR keynote address) enabled.

I have railed against ICANN from the very beginning. I can report now that I did so because Don Mitchell had been a key inside source on matters of Internet governance since January of 1995. Don has given me his permission to be publicly identified. Don should be justly proud of his career at NSF where from 1987 on he had a hand in virtually every important project on which the commercial Internet was founded. [See text box on page 40 below.] To the extent I have been "right" about ICANN, I owe my rightness to the education that he provided.

From his joining DNCRI in 1987 to his retirement from government service on July 13, 2002, Don did his best to defend the independence of an "end-to-end"Internet described by David Reed in his famous 1983 paper and later more broadly articulated by Larry Lessig in his books Code and Other laws of Cyberspace and the Future of Ideas. Don correctly explained to me as early as the the summer of '96 that the weak link was the fact that the DNS was becoming a strategic lever because the traditional Internet community hadn't considered names important and had allowed a single point of control

to evolve. As the Internet bubble began to swell, the sharks who wanted control over the action perceived this weakness and began to circle Postel, the IANAand the DNS.

Don emphasized again and again the problem of institutionalizing the IANA function. The function of the IANA had grown up in a closed community when Internet was largely an academic research project. This authority was never formalized and had no legal standing as the ITU's Robert Shaw showed convincingly in his 1996 analysis. For the last two years of his life, Jon was whip sawed to and fro. Finally as Dave Farber pointed out to me in an interview in 1999 Jon was told by his friends in early 1998 that after the episode of redirecting the root servers he needed an attorney to keep him out of jail. The "friends" found Jon his attorney. Joe Sims. It was Sims who then took over the process allegedly on Jon's behalf and gave us ICANN. Jon died six months after Sims came on the scene and shortly before the first ICANN board was announced.

How to Institutionalize the IANA

In the mid 1990s Don spent countless hours trying to solve what turned out to be an insoluble problem. How to institutionalize the IANAfunction. Workshops in 1995 and 96 had concluded that this was a necessary step but this was more than the NSF could have been expected to take on. To insiders it was becoming increasingly clear in 1995 that the Internet Society under Vint Cerf and Don Heath felt it should become the ruler of the Internet. How Heath worked together with Educom and John Patrick's largely IBM funded GIP to build ICANN in collaboration with the trade mark community has been well documented in writing by Michael Froomkin and Milton Mueller. What has not been documented is how Mitchell and the National Science Foundation, almost freed the US Government from the DNS tar baby before IBM, MCI, ATT and ISOC could create ICANN as a shield behind which they could execute their own personal coup.

By the summer of 1996 it was obvious that the situation was headed down hill. Mitchell began to draw up recommendations that the Foundation extricate itself. In late 1996, a memorandum proposing an "early conclusion" to the NSI cooperative agreement on March 31, 1997 was sent to the National Science Board. In a January 6, 2003 phone conversation Don reiterated what he had told me in February 1997. Namely, that The Science Board Committee on Programs and Plans accepted that approach. Don notes that this memorandum should now be available from the NSF public affairs office.

An early draft of the memo now in my possession states: "NSF has determined that the best course is to disengage from our involvement in and oversight of the registration activity. This action will be taken March 31, 1997, the end on the 4th year of the present award, as the date for our formal disengagement . . ." However because a number of things like the formation of ARIN in order to handle the distribution of IP and ASN numbers had to be completed, the memo informed the Board that no advance announcement of the planned withdrawal would be made. As the draft put it "it is important that our plan to withdraw from this activity not be prematurely divulged to the general public" in order that the necessary coordination between Network Solutions and "the appropriate Internet governing bodies" be achieved.

In February 1997 I was briefed by Mitchell and invited to a press conference scheduled to be held on March 18. The early conclusion of the cooperative agreement would be announced on that date. Two weeks later on the first Monday of March the press conference was summarily cancelled. Unfortunately, by Monday March 2 1997 NSF had been ordered by OMB to cancel its plans. I was informed on March 2 that the early conclusion of the Network Solutions Cooperative Agreement was off. In the nick of time those who would go on to create ICANN got their claws inserted into the right points of the political pressure process. Those who would attempt to rule the Internet through ICANN got the government to reassert control. I have often wondered what happened. How did the private and unannounced decision of the NSF get so quickly reversed? I think it now becomes possible to connect the dots and I encourage folk like Craig Simon and Ken Cukier who are writing books to do so with thorough research on their own.

My Hypothesis

In interviews I conducted throughout 1998 with Ira Magaziner, Ira explained how as a part of his economic policy work on Internet commercialization for President Clinton he had during the preceding three years. When I asked Magaziner when the critical issue of DNS and trademarks surfaced for the first time, he told me that representatives of two large corporations came before his bi monthly staff meetings in either late November or early December of 1996. They then argued to argue that, unless trademark infringement in the DNS was brought under control, the Internet would never succeed in becoming the engine of economic growth for the economy that Ira had envisioned. I later kicked myself for not asking Ira which corporations came before him. Most likely it was IBM's Rogger Cochetti and ATT's Marilyn Cade. This meeting seems to have occurred in the aftermath of the National Science Board's acceptance of the planned termination of NSF involvement in DNS.

The NSF Tried to Walk Away

Had the NSB disagreed with what was presented in the memo, it would have objected and NSF efforts to disengage would have ended. It did not object. Consequently participants carried away from that meeting news that would have substantial impact on the continued development of the commercial Internet. Planning at the NSF went forward for some 90 days when suddenly on March 2, 1997 it was cut off at the knees. Policy control was effectively removed very suddenly from the hands of NSF and taken over by Kahin, Burr and Magaziner. What happened?

I suspect I know. James Duderstadt, the

President of the University of Michigan was also President of the Science Board. Doug van Howelling was the VP of IT at the University and a fervent supporter of IBM. The NSFnet backbone had been built at Michigan by MERIT with joint study partners IBM and MCI. Duderstadt himself has an association with IBM going back to the days of project Andrew ay Carnegie Mellon. It would have been very easy for Duderstadt to leak word about the highly sensitive plans at NSF through van Howelling to Cerf and Patrick who could then very quickly pull the necessary strings to get to Magaziner. Right now this is only a hypothesis. I have no proof. I suggest though that since the existence of the NSB memo is now known those doing formal research could use it to find out.

One thing is certain. The would be controllers of the Internet moved with great speed after the NSF determined that the DNS should be in effect declared fully mature and commercialized. Such a decision would have left IANA in the person of Jon Postel as the sole outside authority over Network Solutions Operation of the DNS. Either the movement on the part of those behind ICANN occurred as a complete coincidence or it occurred because word of the coming policy change had leaked. Circumstantial evidence points to a leak. Judging by what happened it seems likely that the IBM, MCI, ATT, ISOC group decided that they had to put a brake on the process approved by the Science Board in order to give themselves time to put ICANN in place.

At year's end the intellectual property contingent was holding a full court press to exert control over the DNS. In December 1996 the Patent and Trademark Office held meetings led by Attorney Lynn Beresford on how to handle the DNS. As 1996 turned to 1997 the IBM, MCI, ISOC lobby was getting Magaziner collared and Becky Burr was being taken from her place at the Federal Trade Commission and maneuvered into position under Sally Katzen at OMB in order to pull the plug on NSF efforts to extricate itself from supervision and control of DNS.

Since NSF wanted out, an interim manager had to be created. By April 1997 Brian Kahin and Burr were moved to NTIA in the Department of Commerce and put in charge of such a "manager" the Interagency Task Force on Domain Names. The announced goal was to develop a coordinated DNS policy for the US government. The reality was that Burr and her associates at the Department of Commerce were making the decisions and giving orders to NSF (which was still the legal point of authority over NSI) that the Cooperative agreement not allowed to expire. The chance to extricate government from the process was lost. We maintain that it was lost because the levers of ICANN control were not yet ready.

Had the cooperative agreement concluded in spring of 1997, as the NSF intended, the problem of institutionalizing the IANA function would have been forced out on an open table (or, possibly made moot) by the demand for (and creation of) additional TLDs. It might also have been forced into the courts. It certainly would have become more clear to many more people that one of the most critical underpinnings of the Internet, the IANA function, had no basis in law. Neither domestic nor international. If the play had been open, the high stakes mania that festered into the Internet bubble might well have not reached such a fever pitch. The industry might not have ridden so high and fallen so hard.

The over ruling of NSF plans for termination by Burr and her ISOC clique and the resulting extension of that agreement allowed a small number of high stakes players to keep the game closed. The game was still closed in June of 1999 when in the ICANN board emails we published Esther Dyson, IBM, Vint Cerf and Mike Roberts hatched a strategy to get money for ICANN from the venture capitalists of Sand Hill Road by warning them that their investment were in danger if ICANN did not succeed and by meeting with Tom Kalil in the White House to seek support. Today the investments of the Sand Hill VCs have largely vanished, the IANA function is still not institutionalized. Indeed today February 3, 2003 the IANA function was just handed back to the same closed group of high stakes players who profess to operate ICANN with openness. They are lieing. In reality the game is still closed.

Governance by Lawrence Lessig

Lessig Demonstrates How the Would Be "Self Regulators" Took Control - Part Two of How ICANN Came to Be Highlights

Editor's Note: Larry Lessig in the document that follows gives the best overview that we have seen of the details under girding ICANN's construction in the year 1998. In the talk that we republish with his permission, he shows how the GIP ISOC Clique found in Joe Sims an attorney who enabled them to take advantage of libertarian distrust of government to create an ICANN that they could use for their own narrow ends and brought on four years feuding and distrust. ICANN from the very beginning was broken. Such was the distrust of government that no one would own up to seeing the brokenness. Lessig saw it however and his analysis of what could be expected from ICANN from the position of hindsight more than four years later reads like prophecy.

Governance

CPSR Conference on Internet Governance, October 15, 1998 http:cyber.harvard.edu/works/lessig/cpsr.pdf

"The single unifying force is that we don't want the government running things."[1]

For the past year or so in earnest, and for some time before that, the government has been scurrying to find a way to pass off its role in running the domain name system to a private, nonprofit corporation. It has been scurrying because its contracts with Network Solutions and Jon Postel's IANAwere about to run, and because the theme of the day for both Democrats and Republicans seems to be that government cannot run things.

"The single unifying force is that we don't want the government running things."

The history of this recent privatization of governance is important; the facts are important. For they should drive us — this history, and the facts it tells — to relearn something our grandparents learned half a century ago. They should drive us, that is, to understand what government is for. To understand government's role not as some unnecessary appendage — the appendix of society, waiting to be excised by an overeager surgeon — but as an institution that makes possible a certain perspective on social life.

We have lost this idea, we inheritors of the 21st century. We have lost the ideal that there is a role for government here. We — especially we who spend too much of our life using electrons to interact; we — especially we, who still stand amazed at the potential of this wired world; we — especially we, who can't remember a time when there wasn't an underbelly to every story about a hero. We — children of David Lynch, who can't help but believe that, just underneath the surface of the sensible, there is a decay that can't be avoided. We listen to the promises of our governors no differently than Soviet citizens listened to the promises of their governors. We, like Soviet citizens, have heard it before. "Hope" is not a place; "Hope" was a television commercial.

In the few minutes that I can ask for your attention this morning, I want to think about this fact about us. I want to think about this reality that all of us know — whether Republican or Democrat, whether political or not. I want to think about its meaning. For we are at a moment of history where hope would come only if we could get beyond this despair. We are at the cusp of a moment when collective judgment should matter. But we are disabled from making that judgment; we are convinced no such judgment could be made. And so we resign ourselves to the religion of antigovernment — to this absurdly naïve thought that if we just privatize everything, all of our problems will go away.

"The single unifying force is that we don't want the government running things."

Now to my surprise, as I've talked about this subject of the new corporation that will govern domain names, I've discovered that not everyone is following the details of this story. Apparently the puritans enacted the Impeachment Clause of the United States constitution, so until that public flogging is finished, no serious attention in the nation can be spared for other public issues.

So let me review some of the facts, and retell some of the story, of this process that has led us to the place we are today.

As I said at the start, for about a year now the government has been shopping in earnest for a way to remove itself from Internet governance. It had at the start, through the funding of NSF and DARPA, supported the work of sometime god of the Internet Jon Postel in California, and then approved the contract with (what has become) NSI of Virginia to govern between them the allocation of top level domains. NSI holds the keys to four of these TLDs — .com, .org, .net, .edu; the balance was coordinated by Postel at USC.

But as the net grew internationally, and as questions were raised about this state-supported monopoly, the government decided that it was better simply to step aside. And so just a few months ago, the Commerce Department released a "White Paper" that called for the creation of a private, nonprofit corporation dedi-

cated to the interest of the net as a whole. The government, according to the White Paper, was to "ramp down" its involvement in the domain name system, and pass governing functions over to the private sector.

"The single unifying force is that we don't want the government running things."

The IFWP

Immediately after the White Paper's release, an organization called the "International Forum on the White Paper" formed itself. The organization was sponsored by a gaggle of Internet related interests, and was committed to convening a series of public meetings at which ideas about this new corporation could be debated. IFWP held its first meeting in Virginia, and then subsequent meetings in Geneva, Singapore and finally Buenos Aires. And through this movable feast of constitution-making, as my friend Tara Lemmey described it, the IFWP tried to hammer out a consensus on a set of principles for this new corporation.

At the same time that IFWP was born, however, there were others who were thinking about what the new organization should be. Primary among these others was the old organizations that were governing domain names. And here there were essentially two — IANA, located in California, headed by Jon Postel, and again, NSI. NSI joined the IFWPprocess at the start; IANA at first was uncertain. But after the surprising success of this first IFWPmeeting, IANAdecided that it should participate. And so in Geneva, IANAwas full participant in the debates, and came to the sessions with draft bylaws in hand. Representatives stood on the floor of the working groups in Geneva as equals; they argued their ideas as equals, and they tried as equals to persuade others that their vision of this new corporation was the best.

IFWP was eager for IANA's participation. But the participants were not eager to hand the process over to IANA. When Postel offered IFWPhis draft bylaws as a basis for their discussion and debate, the working groups uniformly rejected the invitation. Agreement on principles would precede debates about lawyers' language. And the participants were interested in the principles, not the language.

So IANA went its own way — partially. It continued to participate in the IFWP process, as if it was participating as an equal in that process, but it also continued to develop its own draft bylaws. In a classically Internet-like way, its drafts were made public on the IANA web site, and comments were solicited from the Internet community as a whole. And as a comment pinged at the right tone, the draft was changed. It evolved as ideas from the net struck its authors as good.

IANAthus proceeded as IFWPdid to develop its own view in the way that it thought such views should be developed. IANA in a process of comments and drafts that it ultimately controlled; IFWP in an extraordinarily messy but public process, with meetings that its directors could not control. Both processes had a claim to legitimacy; but each represented the views of the net in a different way.

The IFWP process, however, had more opportunity than IANAto say something significant about what this change represented. I remember a particularly significant moment, when Ira Magaziner flew to Geneva to give a 10-minute talk, and then turned around and returned to the United States. Launching the Geneva meeting, Magaziner said, "I'm going to welcome you, and then I'm going to leave. Not to insult you by withdrawing my attention, but to symbolize just how the United States government conceives of this process. Our job is to begin these discussions, and then get out of the room." His words were met with strong applause, and once finished, he did just what he said. Jet lagged, and a bit rumpled, Magaziner left the stage and returned to the airport.

"The single unifying force is that we don't want the government running things."

When the IFWP process was over, the steering committee of the IFWP wanted to transform the set of principles around which consensus had been formed into a document—a document that would form the basis of a new corporation, consistent with the principles of the White Paper. And so the IFWPinvited Harvard's Berkman Center to host a final drafting session, where the work of the international meeting could be transformed into a final document. The aim of IFWPwas that this final meeting draw together a representative group from the previous process, as well as representatives from IANA. IFWP's presupposition was that it would proceed only if these representatives would attend.

But here, the process stalled. For as Berkman scurried to see whether a meeting was possible, and spent hours on the phone with potential representatives, IANA made it increasingly clear that they would work to subvert any such final meeting. At first they were willing to talk about the idea of a meeting, so long as the meeting was not announced; and then, as time passed, and hence as time grew short, they became increasingly insistent that no meeting be held. Then just at the moment when Berkman could wait no longer, IANA's representative [**Editor**: Joe Sims] announced that he had secured from the major interests on the net — the corporate interests, the technical community, and some segment of the Steering Committee of IFWP— an agreement to resist any such final meeting. With his triumph, IANA's lawyer [**Editor**: Joe Sims] announced that Berkman and IFWP could hold their final drafting meeting if they wanted, but no one would come. **No one would come because through private negotiations, the content of which no one really knows, IANA had cut a deal with enough people to stop the IFWP process.**

Now, I don't mean to idolize what the IFWP had produced. And I don't mean to pretend that the consensus it had generated was perfect, or thick, or even consistent. There were problems with its process, not the least of which the economic problem of assuring representativeness. Only those with money could afford to fly to the most expensive cities in the world; and many with too much

money, and too little to say, seemed eager to fly.

But I do think there is something significant about this difference in process, especially as we become enamored of stakeholder government again. For while ideas in the IFWP process gained currency through public debate and public recognition, ideas in the IANA process gained currency in part at least through deals.

This was not IETF. It was not the product of a disparate collection of genius geeks, thinking through the engineering problem that Internet faced. It was a draft crafted by a lawyer — hired to represent his interests, and serving a complex set of interests, he hacked out his deal. It was a deal, a deal done by a very good lawyer, meeting in with many interests, and negotiating, to find an agreement. Doors closed. **This was the process that produced the ICANN draft.** It produced something else as well. For this lawyer who succeeded in striking the deal that was the ICANN draft—this Washington lawyer, skilled, one presumes, in making such deals—is also the author of something else of note to us. He is also the author of this phrase that I have recurred to so often in my talk. It was this lawyer who said, "The single unifying force is that we don't want the government running things." And in light of the process, and the freedom it allowed from the sorts of constraints that government might effect, we can begin to see why.

And so this should lead us to ask: When we don't have government running things; when we unite behind this mantra of anti-statism; when we erupt with this scream of what we don't want — do we know what we will have in exchange. When we don't have government, what will we have?

When Government Steps Aside

For here's the obvious point: When government steps aside, it is not as if nothing takes its place. When government disappears, it is not as if paradise prevails. It's not as if private interests have no interests; as if private interests don't have ends they will then pursue. To push the anti-government button is not to teleport us to Eden. When the interests of government are gone, other interests take their place. Do we know what those interests are? And are we so certain they are anything better?

*** At a conference in Georgia — former Soviet Georgia, that is — sponsored by some western agency of Democracy, an Irish lawyer was trying to explain to the Georgians just what was so great about a system of judicial review. "Judicial review," this lawyer explained, "is wonderful. Whenever the court strikes down an act of parliament, the people naturally align themselves with the court, against the parliament. The parliament, people believe, is just political; the Supreme Court, they think, represents principle." A Georgian friend was puzzled by this response, puppy-democrat that he is. "So why," he asked, "is it that in a Democracy, the people are loyal to the court, a nondemocratic institution, and repulsed by parliament, a democratic institution?" Said the lawyer: "You just don't understand democracy." ***

There is much talk these days about something called governance in cyberspace — much talk, followed by obscure questions, and puzzles. It is said that this idea — this idea of governing cyberspace — is anathema to our tradition. Who is cyberspace? Where would it vote? And it is said that this idea — this idea of governing cyberspace — is abhorrent to cyberspace itself. As John Perry Barlow put it, in his (maybe our?) Declaration of the Independence of Cyberspace: Governments of the Industrial World, you weary giants of flesh and steel, I come from Cyberspace, the new home of Mind. On behalf of the future, I ask you of the past to leave us alone. You are not welcome among us. You have no sovereignty where we gather.

But our problem is not the problem of governance in cyberspace. Our problem is a problem with governance. There isn't a special set of dilemmas that cyberspace will present; there's just the familiar dilemmas that modern governance confronts—familiar problems in a new place. Some things are different; the target of governance is different. But the difficulty doesn't come from this different target; the difficulty comes from our problem with governance.

Here's what I mean.

The net is governed already. It is governed in places by people — by people who set the protocols of the space, people who enforce rules on the space; and it is governed everywhere by code — by the software and hardware that sets the architecture of the place, and sets the terms on which access to the space is granted. These governors — these rulers both human and code — impose values on the space. Their actions reflect the values of the space. Their rules are expressed primarily through code, but their rules are expressed also as rules. They give the space the character it has. The most famous of these governors are bodies such as IETF — rulers with humility, who express their law in requests for comments — RFCs. These governors, by the way they act, by their humility, by their respect for excellence—these governors give their rules, and the spaces that they constitute, a certain value. A collective value, that has earned it respect.

One would have thought that the values of this space were values that we should have some say about — we, people who populate the net, we whose lives are affected, or taken over by the net, we who depend more upon the net than we do upon local government. One would have thought that these were values that we would have something to say about. But then one wonders, how? How is it that these values would be values we choose. How is it that we could choose? How is it that we could have a role when the "single unifying force" is that the only mechanism that we've discovered to date for imposing collective values on a social space — we call that government — is the institution that we are all apparently devoted to rejecting.

It is as if the laws of nature were being written; it is as if they were being written while we stood by and watched; and as if

we could see how these laws will affect us — affect us more completely than any laws of man — yet we still stand wondering, should we have a role in this writing? *** One would think the answer was obviously yes. But the fact is that most of us would say that here the government should stay away. We modern Democrats from our well-developed representative Democracy —we, you and I, we and the Irish I spoke of — we who otherwise sing of the virtues of Democracy and freedom and control by the citizen, we have no faith in what we might do. We are at a time when the most important judgments about how this new world will be made are being made. And yet, we are strangely disabled — immobilized by ourselves — from making choices about that new world. Laws are being written in the code that that space will be, yet we have no idea how we might participate in the writing of those laws, and little desire to do so.

We are disabled for two very different reasons. One is very lawyerly and, almost by definition, the less interesting of the two. That reason goes like this: In the main the net is private — thankfully so, thankfully built (i.e., not funded) by someone other than government — but whether thankfully or not, formally the net is not government's creation. And so because the Internet is not government's creation, constitutional values that restrict government need not restrict actors on the net.

This limitation in our thought — given to us by lawyers — drives me nuts in its silliness. We are building the most important jurisdiction since the Louisiana Purchase, yet we are building it wholly outside of our constitutional tradition. There's no reason for this limit — no reason compelled by our history, or compelled by reason itself.

We Should Focus on Liberty

If our objectives, as a society, are to protect ideals such as liberty, then my claim is that we should focus on liberty, and not so much on these obsessively legalistic distinctions about who or what is responsible for the absence of liberty.

This is a very old thought. John Stuart Mill, for example, was keenly concerned with liberty in Great Britain. But his primary concern was not the liberty threatened by government. Mill's concern was the threat posed by social norms, or stigma, to personal liberty. His book, On Liberty, was a corrective — not just to excessive government censorship of ideas and speech but to excessive private censorship of ideas and speech. He argued for a world where liberty was protected from the threats of both private and public action — from both laws and from norms. For him the value was liberty and his method directed him against threats against liberty, whatever the sources.

Mill's method should be our own. We should ask whether freedom is protected, not whether government threatens freedom. We should ask whether the architectures of cyberspace protect traditional values of liberty, and speech, and privacy, and access — not whether government is interfering with liberty, and speech, and privacy, and access. The primary good here is a set of values, not absence of governmental interference independent of those values. And quite often — more than the Libertarians seem keen to admit — these values are only protected by a government acting — acting against tyrannies imposed by individuals, and by groups.

But I said that there were two reasons that we were disabled from imposing collective values on this space — public values that we would otherwise think natural for a government to sustain. The first we can blame lawyers for; but it is the second that is the most significant. For this is the reason of the Irish. It is this skepticism that we all bring to the question of collective governance. It is our unwillingness to think about how "we" should influence this space; our preference just to let the space take care of itself; because we have so little faith in any structure of collective control. I share this skepticism; I am not a naïve New Dealer; I don't have a 100 day plan for regulating the Internet; most of the regulation that I have seen I abhor. But what I find interesting — and the point I think we should focus — is why we have such skepticism. What is its nature; what accounts for its source? Why are we, like the Irish, exhausted by government? Why does government seem like the solution to no problem that we now have?

I don't believe that our skepticism about governance is a point about principle. We are not, most of us, really Libertarians. We may be anti-government, but for the most part we do believe that there are collective values that ought to regulate private action. Our problem is that we don't know by whom, or how. We are weary with governments. We are profoundly skeptical about the product of democratic processes. We believe, whether rightly or not, that democratic processes have been captured by special interests more concerned with individual rather than collective value. While we believe that there is a role for collective judgments, we are repulsed by the idea of placing the design of something as important as the Internet into hands of governments.

The battle over domain names is a perfect example. The White Paper called for creation of a non-profit corporation, devoted to the collective interest of the net as an international whole, with a board to be composed of representatives of stakeholders on the net, and charged with making essentially the policy judgments that IANA had been making. In exchange, the government was to give up continuing control over the domain name system, and support its transition to an autonomous, separate entity.

But think for a second about the kinds of questions my Georgian friend might ask. A "non-profit corporation devoted to the collective interest"? Isn't that, he might ask, just what government is supposed to be? A board composed of representatives of stakeholders? Isn't that what a Congress is? Indeed, if he thought about it, my Georgian friend might observe that **this corporate structure differs from government in only one salient way — that there is no on-going requirement of elections. This is policy making,**

vested in what is in effect an independent agency, but an agency outside of the democratic process.

This is extremely odd behavior for democrats. That the idea that a governmental body, whether American or international, should set this governing policy was not even considered is profoundly interesting about us. It says something about us — about where we have come in this experiment with Democracy. It reflects a pathetic resignation that most of us feel about the product of ordinary government. And while I completely share the skepticism, and even disgust, I think it is important to notice how infectious it has become. We have lost faith in the idea that the product of representative government might be something more than mere interest. To steal the opening line from Justice Marshall's last opinion on the Supreme Court, we believe that power, not reason is the currency of deliberative democracy.2 We have lost the idea that ordinary government might work, and so deep is this thought that even the government doesn't consider the idea that government might actually have a role in governing cyberspace.

I say all this not to excuse. I am explaining how we got here, not justifying it. I understand the resignation, and the impatience, with governance. But it is an impatience that we must overcome. We must isolate its cause, and separate it from its effect. If we hate government, we hate it not because the idea of collective values is anathema; if we hate Government, we hate it because we have grown tired of the corruption of our government. We have grown weary of its betrayal, of its games, of the interests that control. We have grown weary, but we must find a way to get over it.

For we stand on the edge of an era when fundamental choices about what life in this space, and therefore, life in real space, will be like. These choices will be made; there is no nature here to discover. And when these choices are made, they will be made either with the values that we hold sacred held influencing the choices that are made, or they will be made ignoring these values. There are values that we have in this space — values of free speech, or privacy, values of due process, or equality, values that define who we are, and which should lead us to ask — if there is not government to insist upon them, then who? So think again about ICANN — about the product of this domain name debate, and about what we should do now.

I spent a lot of time at the start complaining about the process that gave rise to this new corporation. I cannot help that. I am a constitutionalist; I am also a democrat; democracy within a constitutional system is all about process.

But I don't think we should reject the ICANN proposal merely because of process. We should not forget that our own constitution was erected upon actions themselves plainly unconstitutional.3 Madison's counsel then is still true now: The test is what was produced, for only it can forgive how it was produced. Rather than history, it is the future that should be the test for this new corporation: does it, we should ask, protect the values that we think important. There are some who say that it does not. John Gilmore is a perfect example here. Gilmore has earned the respect of the net; his work, and his values, have earned him that respect. So consider his struggle here. No person better embraces the values of the early net — the values of openness and freedom that seemed wired into that early net. And much of Gilmore's work has been a celebration of the values of that early net — "the net treats censorship as damage, and routes around it," is one example; the power of the net to crack laws on crypto a second.4

Gilmore's natural inclination, I suspect, would be to embrace the creation of bodies such as IANA. His respect, and affection, for people such as Postel would make him naturally open to the product of such friends. But last week, Gilmore had to make a choice, about whether to support old friends, or fundamental values. And Gilmore, no friend of government generally, chose values.5 In a balanced but fundamentally correct statement, Gilmore declared that we should reject these new bylaws of the new ICANN. And we should reject them because they don't embrace in terms the values of due process, openness, and free speech.

Gilmore, however reluctantly, however sadly, has seen the reality of when the net hits earth. The code of the net will no longer guarantee the values that he, and I, think fundamental. And so however reluctantly, he chose. And he chose to reject this corporation. I like Gilmore's method; I like the values he teaches. But I don't yet share his response. For in this grand experiment in "self-government" — this pathological urge to rid self-rule of anything called "government" — there is a third way out. We are not limited to choices of the Commerce Department, or ICANN. We are not constrained to accept or reject what has been proposed. Instead, there is a role here for the government in deciding whether this new corporation lives up to the values that are our tradition.

The role is to insist. The government need not simply accept the corporation as it has been designed; it is not constrained simply to roll over in the face of a set of well-typed by-laws. It can say, we will acknowledge you only if you make the following modifications to your structure. It can insist on changes that would make the organization ours. And if the drafters accept these modifications, then the sins of its past notwithstanding, I believe this body could be a start.

What are its flaws? I count three, but it's only the first that I want to describe here.6 The first is accountability. The greatest danger of this emerging structure is the insulation it erects against influences from the outside. Not all influences; just those influences that don't express themselves in a technical organization. The corporation is a closed corporation; the board is potentially self-perpetuating.

This could be changed. As the Boston Working Group rightly insisted,7 the corporation could be constituted with a requirement entrenched in the articles of incorporation, pushing it into a membership organization. The government should insist upon this change.

Here is a role for government to play. Not

necessarily in the building of this self-governing body; not necessarily in the regulation of this self-governing body; but at least in the values of this self-governing body. And whether or not these values reach as broadly as Gilmore recommends, it is crucially important that the government play at least this role. We may not want government running things; but government must assure that the running runs according to the values that are ours. *** When this question about domain names is resolved, however, this problem won't go away. For the domain name dispute is but the first of a series. And it is the series that pushes us to resolve the more general problem.

In his rightly famous book,8 Senator John F. Kennedy tells the story of Daniel Webster, who in the midst of fighting a pact that he thought would divide the nation, said on the floor of the Senate, "Mr. President, I wish to speak today, not as a Massachusetts man, nor as a Northern man, but as an American." When Webster said this — in 1851 — the words "not as a Massachusetts man" had a significance that we are likely to miss. To us, Webster's statement seems perfectly ordinary. Who else would Webster be, except an American? How else would he speak? But Webster's words come on the cusp of a new time in America. They come just at the moment when the attention of citizens in the United States is shifting from their citizenship to a state, to the question of citizenship for the nation. Webster is speaking just when it becomes possible to identify oneself apart from one's state; as a member of a nation.

For at the founding, citizens of the United States (a contested concept itself) were really citizens of particular states first. They had loyalty and connection to their own states first, because that's where they lived, and their life was determined by where they lived. Other states were as remote to them as Tibet is to us — indeed, it is easier for us to go to Tibet that it was for a citizen of Georgia to visit Maine. Over time, of course, all this changed. In the struggle leading up to the civil war; in the battles over reconstruction after that war; in the revolution of industry that followed that — in all this, the sense of individual citizens as Americans grew. In all this, in all the exchanges and struggles which were really national, a national identity was born. When citizens were engaged with citizens from other states, only then was a nation created.

We stand today just a few years before where Webster stood in 1851. We stand just on this side of being able to say, "I speak as a citizen of the world," without the ordinary person thinking "What a nut." We stand just on the cusp of an existence where ordinary citizens come to know how the world regulates them. Where ordinary citizens begin to feel the effects of the regulations of other governments, as the citizens in Massachusetts came to feel the effects of slavery, and the citizens in Virginia came to feel the effects of a drive for freedom.

As we, citizens of the United States, spend more of our time, and spend more of our money, in this space that's not really part of any particular jurisdiction, but subject to the regulations of all jurisdictions — as we spend more time there, we will increasingly come to ask questions about our status there. We will increasingly feel the entitlement that Webster felt, as an American, to speak about life in another part of America. But for us, it will be the entitlement to speak about life in another part of the world. What will we do then? What will we do when we feel that we are part of a world, and that the world regulates us? What will we do when we need to make a choice about how the world regulates us, and how we regulate this space?

My sense is that we will do is just what we are beginning to do now. We will create private, nonprofit corporations dedicated to the public interest. We will, that is, create bodies to govern. And when we do this, we will only do it well if we have abandoned this selfindulgent anti-governmentalism. We will only do it well if we develop again a capacity to choose. We will need the capacity to say what values this space is to have. And we will need to govern ourselves there. The single unifying force should be that we govern ourselves there. Whether government runs things or not, we should govern ourselves. Right now, we cannot. This much about us must change.

Footnotes:

1 Bloomberg Business News, "Internet Control Compromise Could Keep US Regulators At Bay," September 30, 1998.

2 See Payne v. Tennessee, http://supct.law.cornell.edu/supct/html/90- 5721.ZD1.html , Marshall, dissenting.

3 See discussion in Akhil Amar, Philadelphia Revisited: Amending the Constitution Outside Article V, 55 U. Chi. L. Rev. 1043 (1988).

4 See Electronic Freedom Foundation , Cracking DES (1998). 5See< http://www.eff.org/pub/GII_NII/DNS_control/HTML/19980929 _gil more_new_iana.html>

6 I describe the three in http://cyber.law.harvard.edu/works/lessig/c.pdf .

7 See http://www.mama-tech.com/boston/merged-bwg-bylaws.html .

8 Profiles of Courage (Memorial Edition, 1989).

A Further But Not Unexpected Disgrace on the Part of NTIA & the US Government

Editor's Note Published by Rick Wesson to the IETF mail list as we we going to press on Feb 3rd, 2003

US Grants ICANN Extension of Global Domain Powers

By Kevin Murphy

ICANN, which manages policy aspects of the internet's domain name system, is to be granted a three-year extension of its powers to manage the world's country-code domain names, ComputerWire has learned. The US Department of Commerce last week quietly published a document detailing its decision to "sole-source" the contract for the so-called IANAfunction to ICANN, as opposed to opening the contract for competitive bidding.

ICANN and a spokesperson for the DoC's National Telecommunications and Information Administration both confirmed the extension, although ICANN general counsel Louis Touton added that no contract has yet been signed. IANA is responsible for maintaining the definitive list of which organizations, individuals, and domain servers are associated with approximately 240 country-code top-level domains (ccTLDs), such as .uk, .us, and .fr.

The decision will cause concern to some in the international community, particularly those concerned in the policy aspects of the ccTLD industry. Some ccTLD operators had considered a counter-bid for the IANA contract before its March expiration. A statement buried six clicks into a Federal web site heavily suggests that the ICANN-DoC Memorandum of Understanding (MoU) and the IANA contract are essentially inseparable, and that ICANN is the only party fit to run IANA.

The NTIA document said that ICANN, having assumed "key resources and associated privatization responsibilities under the MoU" is therefore the "only responsible entity that can continue to provide seamless performance of the IANA functions". As a further link, the three-year IANA contract will come up for renewal at periods of six months, one year, one year, and six months - paced to coincide exactly with the times the MoU comes up for renewal, Touton and the NTIA said.

[Snip]

Highlights of Don Mitchell's Nearly 30 Years at NSF Including Internet Infrastructure Projects

Don Mitchell entered civilian federal service in 1970 as a management intern at the Department of Agriculture. In 1972, he moved to NSF, and began a career in contracting. In the mid-70s, he developed a system for motion picture production which was adopted in 1977 for government-wide use, pioneered the use of support contracting (before) and cooperative agreements (after) the inception of the Grant and Cooperative Agreement Act and managed the first civilian agency SBIR solicitation, as well as the first procurement which put a microcomputer on the desk of every employee in a federal agency. In 1987, he left NSF's Division of Grants and Contracts to join the newly formed division of Networking and Communications Research and Infrastructure (NCRI) shortly before the beginning of the NSFNET Program.

After joining NCRI in 1987, he applied the experience gained from his previous activities to the networking infrastructure programs in that organization. His personal experience includes broad involvement in the programs and projects of that activity (which many credit with changing data networking from an arcane technology used by a small research community to the global Internet we know today). He is also coauthor, with Kimberley Claffy and Scott Bradner, of "In whose domain:name service in adolescence", which may be found at http://ksg-www.harvard.edu/iip/cai/bradner.html

In addition to his role in NSFs major infrastructure activities, he was personally responsible for the Global Schoolhouse Project, Cornell University's (CU-SeeMe) Conferencing Software development and Cells-in-Frames projects, the InterNIC, the Internet Scout Project (http://scout.cs.wisc.edu), Dave Hughes Wireless Field tests (http://wireless.oldcolo.com), the National Laboratory for Applied Networking Research (http://www.nlanr.net), the Internet Caching Project (http://ircache.nlanr.net), the Cooperative Association for Internet Data Analysis (http://www/caida.org), the National Center for Data Mining (http://www.ncdm.uic.edu),the very high performance Backbone Network Service (http://www.vbns.net) and the High Performance Wireless Research and Education Network (http://hp-wren.ucsd.edu).

Interview, Discussion, and Article Highlights

Tools for Edge Control - pp. 1-4

Full Article - Summary

page 2 The stark fact is that the blades of the VoIP scissors are closing in on the telco's cash flow. On the one hand one blade is the result of large corporations withdrawing voice traffic from the PSTN and running it over their corporate IPnetworks. On the other hand the other blade is derived from international VoIP wholesaling by companies like ITXC and activities by thousands of phone card middle-men hammering long distance rates ever downward. The ability of the phone companies to charge more for a minute of voice traffic than they could for a minute of data traffic is rapidly diminishing. Recently the difference has been as high as seven to one. That is if a telco could ake a penny for a minute of data transfer, it could make seven cents for each minute of voice transmission.

For the most part the seven-cent differential is no longer there. Bits are bits. One cannot really distinguish voice from data bits. That any price difference exists at all is increasingly a regulatory artifact. In two or three years market and technology pressures will have driven the differential to zero. When this point is reached, the telcos could find their revenues slashed by two thirds. They will than have all the relevance of Zap Mail.

page. 4 The center is dead. Forward movement is at the edges. The major focal point for this issue is IPv6. Farooq Hussain shows why its chance for significant deployment in backbones at the core of the Internet is effectively zero. However in a discussion with David Reed, Bob Frankston, Francois Menard and Farooq we are introduced to the concept of V6 at the edge of the network. We begin to understand how V6, in the hands of end users at the edges of the network, could redress the shift toward the center that has taken place in the balance of control within the internet. Indeed we have begun a fairly in depth exploration. It is not yet really clear what Microsoft will offer in order to make edge based IP v6 applications plug and play. Standards would help enormously. Five to ten years ago the IETF would have been the place to turn. Or maybe the IEEE.

At this point the answer appears to possibly be the Consumer Electronic Association.

Hussain on IPv6, pp. 5 - 10

Full Article

page 5 Some critics now would say that part of the problem is that the whole goal of expanded address space is just propping up the established concept that every device reachable from the Internet needs at least one permanent layer-three address.

Ten years ago this was actually not such an unsound approach. We then had this idea that the car would have its IP address and that within the car maybe the air conditioning system and carburetor also needed their own IP addresses. Just as every house has a phone number, everything was to have its own IP address. But things have turned out rather differently. We are much more sensitive to devices and uses being session oriented. And having, as a result, temporary addresses.

p. 6 In Europe it is very strange to see that the European Commission is hugely in support of v6. They have quite a few initiatives, including a couple of major ones, on-going to push forward the protocol. Meanwhile Japan has long been in favor of v6 and indeed has become the one government to actually mandate v6. You have then a significant portion of the OECD countries in terms of their respective economic power who are in favor of v6. But looking at the over all situation, you must say that the US is not quite there. That Japan, from the government perspective, is totally pushing it. Europe is trying to push it and, in fact, there is an international alliance between the European Commission and Japan to endorse and promote IPv6.

But looking at all this official support you need to ask what is going on here? Is it not good enough to get adopted on the face of things? It is rather unusual to look at a protocol and proclaim that somehow it is the key to some economic power. Or that it will lead to some terrific economic advantage. It seems to me that this outlook is one that fights the last battle. It says that the US gained great advantage from IP v4 so let's try to gain comparable advantage from being the first with a replacement for v4.

p. 6 In this context the most important paper that I would direct your readers to is one that they really should read before getting absorbed into the detail and finer issues of why v6 is in my view unlikely to be anything more than a niche protocol. This paper was published by Glocom in January of 2002. Its title is "Is IPv6 Necessary?" It is by Nobuo Ikeda and Hajime Yamada. See http://www.glocom.org/tech_reviews/tech_bulle/20020227_s2/ The paper is well put together with a very balanced argument. But note also that it is from Japan!

p. 7 Projected pull that is 3 to five years distant is something that is too uncertain to be a reason for us to commit to capital expenditure now. In short I think it quite safe to assert that currently, there is no reason to deploy v6 because of market pull.

There are ways to implement v6 as tunneled within v4 within a backbone network. You might consider doing this as

a means of gaining experience with it as a protocol. Most players out there who say they have v6 are implementing it in this sort of marginalized way. When you look at what operational benefits are to be gained by turning a backbone network at the Internet core into an IPv6 network, there are really precious few. To turn a backbone network into a v6 network, there are actually quite a few levels of complexity to undergo. To arrive at v6 you will need to do serious levels of protocol translation at the edges because obviously all but a negligible fraction of your traffic will be originating and terminating as v4. From an operational standpoint, as a large network, saying v6 does this and that better than v4 for me makes no sense because no such a network lives in isolation from the Internet. You have to be dealing with v4 anyway and what you end up with therefore is in effect a dual direction that is now being pursued.

p. 7 The other issue is why does every device need an IP address and the conclusion is that it probably doesn't. So put these two things aside and look at what you have. You have networks that are carrying IPv6, IP SEC, MPLS and Ipv4. My contention is that in the future IPv6 will be the smallest niche component of this traffic.

p. 8 ***COOK Report***: But once upon a time wireless devices were going to need fixed addresses. Do we now have the equivalent of DHCP for wireless?

Hussain: I think the situation about wireless is fundamentally unclear and quite contentious. 3GPP, which is the third generation mobile project, adopted IPv6 as their protocol of choice in 1999 In doing so they probably gave v6 the strongest endorsement that it has ever received. It claimed that each cell phone would have its own IP address and that there would be billions of handsets. The requirement for using IPv6 to handle such addressing issues seemed to make a lot of sense. But there were a couple of problems.

COOK Report: For one until a cell phone becomes totally digital it doesn't need an IP address. Right?

Hussain: Correct.

p. 9 Hussain: Yes. In a couple of years you will see all the major core routers with dual v6 and v4 stacks. You will be able to serve customers by setting up v6 tunnels inside of v4 for those customers which for some reason or other just have to have v6. You could also use MPLS to set up a native v6 PVC. But the aggravation to do this is extensive and even if it were cheap, the idea that your engineering team will be eager to rush out and embrace v6 just isn't likely.

We may well be faced with quite an irony if we are faced with the need to run two versions of IP on the internet – v4 which will likely never go away and v6 for which there may be a few niche markets? IPv6 was intended to replace v4. It is unlikely that it will ever achieve this goal. But it certainly has its advocates and its niche applications. Given the current direction in which we are going we will not have a permanent address for every device as envisioned in v6. There could be some circumstances that include the possibility of a global 3GPP network that insists on having fixed IP addresses for every device dependency. So instead of one IP protocol to be managed you will now have two.

One has to ask whether the purported benefits – address space, security and auto-configuration are worth it. Do these benefits outweigh the aggravation of having to manage two versions of IP in the network? In other words IP Sec would be nice, but if the cost of getting it on a meaningful scale is a multi billion dollar global reconfiguration program, are there other less expensive ways of ensuring security? The answer is very likely yes.

Edge v6 p. 11 - 16

Full Article

Bob Frankston replied: It's very important to distinguish between V6 at the edges and V6 in the backbone. The reason that V6 is not currently available is that those who are the guardians of the net -- the backbone people are just worrying about their internal issues and there is no concept hereof actually using the network.

Here is what I wrote last summer: Edge Protocol (EPv6) rather than IPv6 http://www.satn.org/archive/2002_06_30_archive.html#85208157

I recently (June 21st, 2002) spoke at the IPv6 (Internet Protocol version 6) summit (http://www.ipv6summit.com/ipv6-program.html). I was invited to speak about the issues raised in my essay on the Importance of Encrypted IPv6. In that essay I pointed out we need to assure that every system connected to the Internet has its own (IP) address so that it can be a full peer participant. Encryption is important because the separation of the application layer (TCP) and the transport layer (IP) has been weakened by providers who are second-guessing the traffic on the network.

Despite the urgency there are many who wonder if we'll ever be able to make the transition from IPv4 to IPv6.

The answer is "no" because that is the wrong question. The idea of transitioning the entire Internet to a new protocol represents a failure to understand that the Internet has thrived because it is defined by its users rather than a central authority. IPv6 has been designed as a protocol that tries to meet the needs of the user (application) layer and the transport layer at the same time. While IPv6 does a reasonable job at meeting both requirements, the deployment model is seriously flawed because it ignores the dynamics of the Internet as a marketplace driven by the needs of each user. [snip]

IPv4 (or just "IP") represented the birth of the Internet by shifting the power to define the network to the users at the edges.

The Internet has thrived because supply is driven by demand. New application services are supported by simply providing more transport (or IP) capacity. Rather than wait for new capabilities to be defined, users will create their own

solutions. (When I say "users" I don't mean all users create applications. It only takes one motivated, creative individual with some time on their hands to create an application that will be adopted by millions of others. We just don't know which user that will be.)

p. 12 On January 20 **Bob Frankston** reminded us in response to the IPv6-in-the-backbone focus of our interview with Farooq:

The purposes of V6 in the backbone and V6 at the edges do not have any relationship whatsoever. Period. No qualifications. This has lead to the tragedy of the misperception of a commons. The backbone has indeed accommodated itself to V4 since trying to address each atom on the net individually is a very big problem and unnecessary. The IP "address" is like the circuit ID in the phone network and it encodes a routing though not necessarily a precise one.

V6 in the backbone has become a feeding frenzy for those who miss the PSTN and want to bring back QoS (AKA discrimination in favor of legacy traffic and to justify maintaining scarcity) and MPLS (circuits are forever). There's also the bad idea of providing mobility at the IP layers. (Yes, saying this is in conflict with complaining about temporary IPaddresses but that's a longer discussion).

pp. 12-13 David P Reed: Bob doesn't need me to agree with him. His points above are dead on, and in many ways put more succinctly than I would be able to..

My only amplification would be that those of us who see no need for BV6 or a twisty convoluted web of walled gardens with trolls at all the gates may need to revolt, and do an end-to-end overlay network of our own (just as the original Internet was an end-to-end overlay network). When is a revolution necessary? When the current market leaders keep building instruments of control -- like NATs, like usage policies that bar certain kinds of uses, and like attempts to charge merchants a percentage on every transaction on the net -- rather than what the users really want.

p. 14 Francois Menard: Bob's dead on.

I'm trying very hard to get [Canadian] municipalities to implement IPv6 open access across municipal FTTH networks so that MPLS doesn't squeeze-in and end-users become required to run PE`s. I'm seeing ISP's provide value added services by offering commercial access to tunneling servers on their premises which bridge to the good old legacy Internet. For as long as two service providers across two different municipal FTTH system would want to interconnect with IPv6, there would then be a parallel Internet.

This is in my view a (the) killer app for IPv6 ... I'm not sure why it seems so difficult for people to believe in this ... And if its true in North America, it'll be even more so once open access is properly provided in Japan.

I guess that, rather than debating this philosophically once again, I'd rather throw everything I Have into regulatory interventions,

p. 15 One way to think about EV6 is as a common subroutine library just like TCP. TCP gives us those despised circuits but at the application level where they provide some convenience but are still not intrinsic. The advantage of Ev6 is that it leverages the intellectual energy that has gone into the Internet protocols and gives us a minimal commonality that happens to parallel the minimalness of the basic IPv4 Internet.

I compare Edge v6 with MIME which became the common way to extend email rather than having to choose between a lot of different ways to transport binary and multipart messages. We didn't transition email to MIME, we just made it available first to those who understood the need and later to those who just like pretty stuff. The mistake is to try to transition the existing Internet to V6. The real need is for enabling the applications that don't work well though the existing protocols. Depending on how deep their V4 assumptions are, we will find that existing applications can be re-implemented atop V6 with modest effort.

p. 16 We should build EV6 on the specifications for BV6 to the extent we can. Doing so will give us an extended address structure. In deployment the most important step will be to use the IPV4 address as a routing prefix. We may need an additional option for a form of routing that is able to get past older NATs.

p. 17 With V6 I'll have to tone this down to be taken seriously. But think about being able to take your computer anywhere and it would just be connected. But why not? Especially if I could just drop an access point anywhere and connect simply and securely. What might not be obvious is that the kind of "Moore's Law" price/performance improvements that have made email free (once one has paid for a pipe to the rest of the Internet) would operate to make these access points act as part of a common good in the same way that we generally allow others to benefit from porch light or a restaurant doesn't charge for tap water. These aren't free either but it would seem counter-productive to try to charge a passerby who uses that light to read a map. The key to driving this cycle is simplicity. This is not the post-Internet era. We haven't even started to explore the possibilities.

Customer Owned Networks & ZapMail

Full Article

p. 18 The business Fred Smith imagined being in -- build a network that's cheap to run but charge customers as it if were expensive -- is the business the telephone companies are in today. They are selling us a kind of ZapPhone service, where they've digitized their entire network up to the last mile, but are still charging the high and confusing rates established when the network was analog.

p. 19 Voice over IPis another area where a service is becoming a product. Cisco now manufactures an analog telephone adapter (ATA) with a phone jack in the front and an ethernet jack in the back. The box couldn't be simpler, and does exactly what you'd expect a box with a phone jack in the front and an ethernet jack in the back to do. The big advantage

is that unlike the earlier generation of VoIP products -- "Now you can use your computer as a phone!" -- the ATA lets you use your phone as a phone, allowing new competitors to offer voice service over any high-speed internet connection.

Vonage.com, for example, is giving away ATAs and offering phone service for $40 a month. Unlike the complex billing structures of the existing telephone companies, Vonage prices the phone like an ISP subscription.

p. 20 And hardware symbiosis will further magnify the threat of WiFi and VoIP. The hardest part of setting up VoIP is simply getting a network hub in place. Once a hub is installed, adding an analog telephone adapter is literally a three-plug set-up: power, network, phone. Meanwhile, one of the side-effects of installing WiFi is getting a hub with open ethernet ports. The synergy is obvious: Installing WiFi? You've done most of the work towards adding VoIP. Want VoIP? Since you need to add a hub, why not get a WiFi-enabled hub? (There are obvious opportunities here for bundling, and later for integration -- a single box with WiFi, Ethernet ports, and phone jacks for VoIP.)

p. 20 WiFi hubs and VoIP adapters allow the users to build out the edges of the network without needing to ask the phone companies for either help or permission. Thanks to the move from analog to digital networks, the telephone companies' most significant competition is now their customers, because if the customer can buy a simple device that makes wireless connectivity or IP phone calls possible, then anything the phone companies offer by way of competition is nothing more than the latest version of ZapMail.

Discussion of Zap Mail pp. 21 - 24 Full Article

p. 21 *VoIP is indeed destroying the old business models, and in particular is leading to a flat-rate pricing regime.* However, VoIP by itself does not deal with the basic problem of providing connectivity. It does not lower the costs of the first mile, which dominate. WiFi potentially does (and I emphasize potentially, because we don't know yet how this will play out), since it may allow us to avoid the costs of wiring up every household.

COOK Report: What Andrew is calling for may already be on the verge of happening. On January 20, 2003 Guy Kewney, of Newswireless.net published an article, "Become a wireless ISP: for £300," at the Register web site. The article certainly gives a partial answer to Andrew's question.

Keweny wites: “While the learned are laughing at Negroponte's fantastic "futuristic" vision of a mesh of interconnected wireless LANs "like lilypads which you hop from one to another" a UK company has produced Mesh wireless technology which you can buy and install, today, for under £300. Fancy setting up as a rival to BT Openworld? Even in a remote village? Easy: buy a Locustworld MeshBox; half the price of a home PC. You're in business."

"The software is the key to Locustworld. Written by text-message pioneer Jon Anderson, it configures a group of wireless access points into a coherent "mesh" and connects them to any broadband Internet node available."

"Most experts regard the mesh approach as hugely complex, because of the effort needed to set up the mesh. The system used to be known as a "parasitic network" - although the fashionable term these days is "symbiotic" - the idea is that you turn a group of wireless nodes loose, and tell them to introduce themselves to each other. Then you set up routes through the mesh. It can be fiendishly complex, but Locustworld's mesh does this for you. You just buy the node from them: the current model is £250 plus VAT."

"The last legal obstacle, according to founder Richard Lander, was the decision by Oftel, allowing people to share their broadband with up to 20 others. The excitement in the UK hasn't been quite as high as it was in the US, but even there, it seems only "nerds" really picked up on it - probably due to an article by Anderson which was flagged on SlashDot in December. It should have hit the headlines big time, since it allows a street to share all their broadband nodes, at a huge cost saving. It would allow a vicar in a small village to hire a leased line, and share the costs with all his parishioners - without any technical expertise." Editor – Readers should without fail read to the rest of the article at http://www.theregister.co.uk/content/59/28972.html
.

p. 24 David Isenberg: You've clearly struck a chord with your ZapMail essay -- about a dozen SMART People have forwarded it to me. [snip] Who's going to run the connectivity network after telephony-classic and cable-TV-classic are dis-intermediated? This is the big unasked question, as Andrew Odlyzko pointed out. (Fortunately for Fedex, the runways are not owned by American, United, or the US Post Office.)

Googin: To address David's and Andrew's question as to who runs what when the incumbents get disintermediated. I have gotten that question since 2000. The answer is "who knows"? While technological trends are somewhat deterministic, human behavior is not. The best we can do is set "boundary conditions", as trying to pinpoint a "solution" tends to blind you to alternatives outside of our collective limited imagination. That is, in my opinion, the most productive line of reasoning is along the lines of: the next paradigm will most likely have these characteristics: (a)peering, (b)fiber backbones (c)low budgets (d) a way around greedy city governments, bla bla bla. How they are implemented beyond that will probably be determined by some wild-eyed 20 year-old with tatoos. CHAOS. GO FOR IT.

Farber Faulhaber Spectrum, pp. 25- 30 Full Article

The core of the Faulhaber/Farber argument is that all spectrum should be privatized using something like the FCC's Kwerel & Williams "Big Bang" auction.

[They] add that the private property would have "easements" that require the property owners to allow for spectrum "underlays" using wideband spread spectrum or Ultrawideband and maybe also allow for cognitive radios to utilize local unused, but allocated spectrum.

They claim that this would deliver the best of both worlds (the economist's desire for market forces to allocate narrowband, high power spectrum and the engineers desire for a spectrum commons.

They even claim with a straight face that because of the strength of the commons, that will force the price of spectrum property to near zero. If this is true, it seems to me to ask the question as to why bother making it private property in the first place.

My claim is that their approach is based on a false assumption that such a market would be open, unbiased and transparent. If history is any guide, the people who will get the spectrum as property are the top monopolists / oligopolists / lobbyists who will use their market, capital and political power to eliminate economic interference under the guise of eliminating technical interference.

p. 27 Kevin Werbach: For Farber and Faulhaber, easements are a hedge. I don't think they believe that prices will go to zero in a commons, or that the commons will work at all, but they can't rule it out. As good economists and engineers, they recognize that if the assumptions open spectrum advocates make are true, a commons is indeed a better ordering mechanism than a market for most spectrum.

The question at issue here is whether government can create them in a way that ensures they can be viable. The assumption is that, by defining the owner's property rights as stopping at the edge of the easement, a win-win solution will emerge. But that depends on real-world conditions. At the last open spectrum meeting at Harvard, Andy Lippman pointed out that the FCC's "interference temperature" might leave easements too narrow to be commercially viable for underlay uses. This becomes an empirical question. It's a narrower one than whether spectrum owners will try to poison competition in general.

p. 28 Ikeda: As usual, Prof. Faulhaber's theory is very unique in economics. What does "marginal price" mean? He must have invented it, because there are no such terms in any textbooks in economics.

And why does ownership make sense? Maybe because he believes that commons will bring about the "tragedy of the commons". It is a wrong application of Hardin's famous article. He emphasized that the "tragedy" takes place when there is no "technical solution".

http://dieoff.com/page95.htm

So we should investigate whether there is a technical solution before we discuss economic solutions. If we can supply more capacity than demand by opening spectrum, it makes no sense to "fill that need".

Timothy X Brown (University of Colorado) Consider what I'd call "The Disney Argument". Property values may not go anywhere close to zero even with competing alternatives and having large swaths set aside as a commons. Consider Disney who bought a big chunk of swampland and created value from nothing. Disney is able to extract high rents and nearby property values in Orlando are relatively high. This is despite a plethora of competeing theme parks and despite a big chunk of Florida being set aside as a free park.

By analogy, if someone with deep pockets locks consumers into a wireless service in a particular band, the value of that band could be held quite far from zero.

p. 29 Reed: I am greatly in favor of exploring alternative systems that might be scalable, and testing them in the real world. My favorite concept "societies of cognitive radios" is one such thing that is promising and ought to be tested - not because it is the only option, but because it is promising.

Theories tell you where to look. You've still got to test them. And in this case, our theories incorporate theories about economic behavior by future participants. Those can only be validated by tests in the real commercial world. (Remember 802.11 was a big surprise in terms of the economic behavior it has stimulated - so those who had a theory that 802.11 might be big news ended up proving it by putting it on the market. Prior to that it was NOT obvious what would happen with short-range unreliable unlicensed wireless).

For example, if we could only open up the software radios in today's 802.11a/b combo chips from Atheros, we could conduct lots of experiments at low cost. Not all important experiments, of course, but lots.

p. 30 Berger I did get to talk with Gerry and Dave for a while and even though there are obvious differences, primarily Gerry's strong support for a significant position for private property, I got the feeling that their approach is more of a way to make something happen that breaks the "GOSPLAN" style of spectrum allocation. My interpretation is that they also strongly support the commons and they believe that their proposal is a way to make it politically possible. There is probably more we have in common with them than with people who want a pure property rights.

NSF & ICANN, pp. 31-33

Full Article

p. 31 Although during the past year ICANN has become almost universally reviled, it is unfortunately not yet dead. One reason is that the fundamental questions of Internet governance posed by ICANN are not yet solved. Six years ago the primary question was the institutionalization of the IANA function. Today IANA works but the question of who pays for it and who controls it is still critical. It is important to understand how ICANN was created, if we are to avoid similar miscarriages of justice in the future. ICANN was to be all

about the glories of industry self–regulation. Instead it has given us an excellent demonstration of what happens when you let the fox regulate life in the hen house. Or as another observer commented: ICANN isn't really about "industry self-regulation." Rather ICANN is an example of large-industry government collusion to safeguard mutual self-interests and lock out newer and smaller stakeholders.

p. 31 ICANN was the aborted "child" of the privatization process. Some observers looking at the 1996 period have recently wondered why the "feds" just didn't walk away and avoid further involvement. I point out below that it was government policy to do just this until the ICANN clique found out and executed a veritable coup d'etat.

p. 31 I have railed against ICANN from the very beginning. I can report now that I did so because Don Mitchell had been a key inside source on matters of Internet governance since January of 1995. Don has given me his permission to be publicly identified. Don should be justly proud of his career at NSF where from 1987 on he had a hand in virtually every important project on which the commercial Internet was founded. [See text box on page 39 below.] To the extent I have been "right" about ICANN, I owe my rightness to the education that he provided.

p. 32 In a January 6, 2003 phone conversation Don reiterated what he had told me in February 1997. Namely, that The Science Board Committee on Programs and Plans accepted that approach.

Don notes that this memorandum should now be available from the NSF public affairs office.

An early draft of the memo now in my possession states: "NSF has determined that the best course is to disengage from our involvement in and oversight of the registration activity. This action will be taken March 31, 1997, the end on the 4th year of the present award, as the date for our formal disengagement . . ." However because a number of things like the formation of ARIN in order to handle the distribution of IP and ASN numbers had to be completed, the memo informed the Board that no public announcement of the planned withdrawal would be made. As the draft put it "it is important that our plan to withdraw from this activity not be prematurely divulged to the general public" in order that the necessary coordination between Network Solutions and "the appropriate Internet governing bodies" be achieved.

p. 32 -33 Had the NSB disagreed with what was presented in the memo, it would have objected and NSF efforts to disengage would have ended. It did not object. Consequently participants carried away from that meeting news that would have substantial impact on the continued development of the commercial Internet. Planning at the NSF went forward for some 90 days when suddenly on March 2, 1997 it was cut off at the knees. Policy control was effectively removed very suddenly from the hands of NSF and taken over by Kahin, Burr and Magaziner. What happened?

I suspect I know. James Duderstadt, the President of the University of Michigan was also President of the Science Board. Doug van Howelling was the VP of IT at the University and a fervent supporter of IBM. The NSFnet backbone had been built at Michigan by MERIT with joint study partners IBM and MCI. Duderstadt himself has an association with IBM going back to the days of project Andrew at Carnegie Mellon. It would have been very easy for Duderstadt to leak word about the highly sensitive plans at NSF through van Howelling to Cerf and Patrick who could then very quickly pull the necessary strings to get to Magaziner. Right now this is only a hypothesis. I have no proof. I suggest though that since the existence of the NSB memo is now known those doing formal research could use it to find out.

One thing is certain. The would be controllers of the Internet moved with great speed after the NSF determined that the DNS should be in effect declared fully mature and commercialized. Such a decision would have left IANA in the person of Jon Postel as the sole outside authority over Network Solutions Operation of the DNS. Either the movement on the part of those behind ICANN occurred as a complete coincidence or it occurred because word of the coming policy change had leaked. Circumstantial evidence points to a leak. Judging by what happened it seems likely that the IBM, MCI, ATT, ISOC group decided that they had to put a brake on the process approved by the Science Board in order to give themselves time to put ICANN in place.

p. 33 Since NSF wanted out, an interim manager had to be created. By April 1997 Brian Kahin and Burr were moved to NTIA in the Department of Commerce and put in charge of such a "manager" the Interagency Task Force on Domain Names. The announced goal was to develop a coordinated DNS policy for the US government. The reality was that Burr and her associates at the Department of Commerce were making the decisions and giving orders to NSF (which was still the legal point of authority over NSI) that the Cooperative agreement not allowed to expire. The chance to extricate government from the process was lost. We maintain that it was lost because the levers of ICANN control were not yet ready.

Had the cooperative agreement concluded in spring of 1997, as the NSF intended, the problem of institutionalizing the IANA function would have been forced out on an open table (or, possibly made moot) by the demand for (and creation of) additional TLDs. It might also have been forced into the courts. It certainly would have become more clear to many more people that one of the most critical underpinnings of the Internet, the IANA function, had no basis in law. Neither domestic nor international. If the play had been open, the high stakes mania that festered into the Internet bubble might well have not reached such a fever pitch. The industry might not have ridden so high and fallen so hard.

The over ruling of NSF plans for termination by Burr and her ISOC clique and the resulting extension of that agreement

allowed a small number of high stakes players to keep the game closed. The game was still closed in June of 1999 when in the ICANN board emails we published Esther Dyson, IBM, Vint Cerf and Mike Roberts hatched a strategy to get money for ICANN from the venture capitalists of Sand Hill Road by warning them that their investment were in danger if ICANN did not succeed and by meeting with Tom Kalil in the White House to seek support. Today the investments of the Sand Hill VCs have largely vanished, the IANA function is still not institutionalized. Indeed today February 3, 2003 the IANAfunction was just handed back to the same closed group of high stakes players who profess to operate ICANN with openness with authority. In reality the game is still closed.

Lessig on Governance, p. 34 - 39 Full Article

Editor's Note: Larry Lessig in the document that follows gives the best overview that we have seen of the details under girding ICANN's construction in the year 1998. In the talk that we republish with his permission, he shows how the GIP ISOC Clique found in Joe Sims an attorney who enabled them to take advantage of libertarian distrust of government to create an ICANN that they could use for their own narrow ends and brought on four years feuding and distrust. ICANN from the very beginning was broken. Such was the distrust of government that no one would own up to seeing the brokenness. Lessig saw it however and his analysis of what could be expected from ICANN from the position of hindsight more than four years later reads like prophecy.

pp. 34- 35 "The single unifying force is that we don't want the government running things."

When the IFWP process was over, the steering committee of the IFWP wanted to transform the set of principles around which consensus had been formed into a document—a document that would form the basis of a new corporation, consistent with the principles of the White Paper. And so the IFWP invited Harvard's Berkman Center to host a final drafting session, where the work of the international meeting could be transformed into a final document. The aim of IFWP was that this final meeting draw together a representative group from the previous process, as well as representatives from IANA. IFWP's presupposition was that it would proceed only if these representatives would attend.

But here, the process stalled. For as Berkman scurried to see whether a meeting was possible, and spent hours on the phone with potential representatives, IANA made it increasingly clear that they would work to subvert any such final meeting. At first they were willing to talk about the idea of a meeting, so long as the meeting was not announced; and then, as time passed, and hence as time grew short, they became increasingly insistent that no meeting be held. Then just at the moment when Berkman could wait no longer, IANA's representative [**Editor**: Joe Sims] announced that he had secured from the major interests on the net — the corporate interests, the technical community, and some segment of the Steering Committee of IFWP — an agreement to resist any such final meeting. With his triumph, IANA's lawyer [**Editor**: Joe Sims] announced that Berkman and IFWPcould hold their final drafting meeting if they wanted, but no one would come. **No one would come because through private negotiations, the content of which no one really knows, IANA had cut a deal with enough people to stop the IFWP process.**

Now, I don't mean to idolize what the IFWPhad produced. And I don't mean to pretend that the consensus it had generated was perfect, or thick, or even consistent. There were problems with its process, not the least of which the economic problem of assuring representativeness. Only those with money could afford to fly to the most expensive cities in the world; and many with too much money, and too little to say, seemed eager to fly.

But I do think there is something significant about this difference in process, especially as we become enamored of stakeholder government again. For while ideas in the IFWP process gained currency through public debate and public recognition, ideas in the IANA process gained currency in part at least through deals.

This was not IETF. It was not the product of a disparate collection of genius geeks, thinking through the engineering problem that Internet faced. It was a draft crafted by a lawyer — hired to represent his interests, and serving a complex set of interests, he hacked out his deal. It was a deal, a deal done by a very good lawyer, meeting in with many interests, and negotiating, to find an agreement. Doors closed. **This was the process that produced the ICANN draft.** It produced something else as well. For this lawyer who succeeded in striking the deal that was the ICANN draft—this Washington lawyer, skilled, one presumes, in making such deals—is also the author of something else of note to us. He is also the author of this phrase that I have recurred to so often in my talk. It was this lawyer who said, "The single unifying force is that we don't want the government running things." And in light of the process, and the freedom it allowed from the sorts of constraints that government might effect, we can begin to see why.

Executive Summary :

The Action IS Taking Place at the Edge, pp. 1-4

Full Article

At the same time that AOL and the phone companies are trying to staunch the flow of blood (cash) from the center innovation is taking place at the edges. The US has built a bankrupt national fiber system. Under Michael Powell who zigs and zags faster than a speeding bullet between innovative spectrum policy and a retrograde insistence that if just allowed the walking dead of last centuries telecom, the LECs and Cable Cos will invest in building meaningful infrastructure.

Powell it seems isn't much interested in getting the details correct. Rather than taking the trouble to understand the dynamics of the technology on the market place as demonstrated by Clay Shirkey in his ZapMail essay republished in this issue Powell goes on to insist that it was unfair regulation imposed by his democratic predecessors that has bankrupted the industry.

According to an article in the February second New York Times http://www.nytimes.com/2003/02/02/business/yourmoney/02FCCC.html?ex=1045173242&ei=1&en=c807a35b91f72fd1, Powell has asserted that deregulation "should not be like a dessert that you serve after people have fed on their vegetables and is a reward for the creation of competition." Rather, he said, deregulation is "a critical ingredient to facilitating competition." Powell is talking the same naive faith in industry self-regulation that put the ICANN fox in charge of the hen house. The phone companies would be acting against the interests of their stockholders, if given a chance they did not charge the most extortionate rent for the use of their monopoly possible.

The times writes: Mr. Powell and his supporters say a change in the rules will stimulate the economy by encouraging the largest phone companies and their rivals to build more networks and spend more at equipment makers like Lucent, Corning, Cisco and Intel." If this is what Powell truly believes he is living in a dream world and ought to be removed from his position by the Congress for incompetence. The fact is the phone companies cannot under any circumstances save those of government enforced monopoly high prices use the networks they already have. Given their debt they have no money to buy new equipment for new networks. The equipment makes that Powell rattles off as companies that would allegedly benefit further demonstrate his ignorance. Cisco yes, Intel perhaps. But Lucent has gone from 10 billion a year in revenue to two billion because it doesn't make equipment that sane management would buy were it too invest in a new network. With all the fiber in the ground the only new market in fiber for Corning is fiber to the home and if Powell gets his way and gives the telcos a monopoly on that no sane homeowner would buy it.

But Powell, it seems, is interested much more in ideology than in accurately figuring out where the technology is going. Dave Hughes caught Powell giving Senator Brownback of Kansas in correct information about Wi-Fi in his testimony on January 20 as Powell stated that the radios used would transmit at best 300 feet on an 802.11b network.." Hughes skewered Powell in public as well he should have. Within 24 hours Hughes heard back from a Powell assistant. "Thank you for your comments. In the passage you reference below the Chairman simply made a mistake." One wonders how many "mistakes" Michael Powell is making these days?

The Canadians are not making mistakes. They are building a working national fiber system. They are investing 200 million dollars in linking all public schools throughout Quebec with fiber and are doing it such away that all municipal governments with be on the same fiber. This includes northern Quebec where only the most remote villages will rely instead on broadband radio.

Robert Proulx President of XIT telecom in Quebec told us in a February third conversation that his small company has all the business that it can handle including major fiber community network builds in Hungary and in Jordan.

The Canadian CRTC is taking a very different tack from the American FCC. Telecom in Canada is understood as a major national infrastructure resource in the same way the US understood the interstate highway system 50 years ago. Now our dominant ideology permits investment only in private corporate resources. Already 17th among the global users of telecom services according to a recent OECD study the United States economy will suffer in coming years because of our current ideological shortsightedness.

The future is in asset-based and customer-owned networks. We have installed cable modem service in order to move our long distance calls to Vonage. Suddenly unlimited long distance in the US is flat rate. All of Canada is 5 cents a minute and most of Europe and much of Asia is not much more.

Innovation at the edge is possible and as prices continue to fall the huge companies that Powell want to serve will become more and more unwieldy. Fiber to the home is worth having only if the homeowner can control it.

Meanwhile the edges continue to cannibalize the center - like a million termites chewing on the soggy log of the PSTN. BellSouth was the first ILEC to acknowledge the inevitable and at the end of January announced that it would begin to resell Vonage to its DSL customers. See http://news.com.com/2100-1033-982606.html And from a trusted source we are told that in Japan NTT has

effectively ceased development in its circuited switched landline network.

Backbone v6 going no where pp. 5 - 11

Highlights, Full Article

Farooq Hussain explains how reasonable uses for IPv6 in Internet backbones have evaporated. DHCP and Nats acting as firewalls have gotten the need for v6 as a sources of extra address space well under control. The idea of universal addressability across the internet for all devices has receded in importance.

He cites very interestingly that in the United States almost all the support for v6 comes from the defense department. In Europe it comes from the European Commission and in Japan from a mandate by the Japanese government.

Mandate or not there no longer seems to be any market pull. End to end applications like voice over IP that once were thought to be dependent on v6 are being re-engineered to work with NATs in the v4 world.

3GPP, which is the third generation mobile project, adopted IPv6 as their protocol of choice in 1999. In doing so it gave v6 the strongest endorsement it has ever had. Yet because at the height of the bubble the 3GPP people decided to build their own internet parallel to the global v4 internet, their plans now seem rather silly. With the slowdown in wireless growth has come a slowdown in wireless demand for IP numbers. If we assume that with the arrival of software defined radios over the next few years radios will communicate with each other on the basis of IP rather than geography this is likely to delay indefinitely the need for v6 in wireless devices.

SONY has announced that all of its devices will speak v6. However in the absence of widespread v6 deployment SONYs products will also have to communicate in a v4 world, The problem is that if the communicate well in v4 there is likely to be no use for their v6 capabilities. It seems that even Jun Murai is no longer promoting v6 wholeheartedly in Japan. Farooq concludes that we will likely have the worst of all worlds with most of the internet running v4 and few isolated instances of v6.

When we asked Farooq about the January 22 announcement by Telehouse of an IPv6 peering exchange in New York, he responded PAIX has had the ability to support v6 for at least two years, The more interesting announcement was the one for the exclusively v6 exchange set up in France as part of the EC initiative. Also has hardly any takers except those who are compelled by politics to go there by virtue of being participants in the EC initiative. It's fine for Telehouse to make this kind of announcement but the capability is of little commercial interest either to enterprise or service provider networks. There's simply not enough traffic volume with v6 and there are so few native v6 networks that none of them need to go to Telehouse or any other IX to exchange traffic. The IX's used for v6 have been established primarily to foster R&E projects and are sustained primarily on non-commercial rationales.

Edge based v6, pp. 11 - 17 Highlights, Full Article

v6 in the backbone. Farooq agrees. It seems that v6 at the edge can be used by end users to establish their own applications and perhaps even routing by using v4 addresses in the v6 packet headers.

Frankston has written: IPv4 (or just "IP") represented the birth of the Internet by shifting the power to define the network to the users at the edges.

The Internet has thrived because supply is driven by demand. New application services are supported by simply providing more transport (or IP) capacity. Rather than wait for new capabilities to be defined, users will create their own solutions. (When I say "users" I don't mean all users create applications. It only takes one motivated, creative individual with some time on their hands to create an application that will be adopted by millions of others. We just don't know which user that will be.)

Francois Menard commented: I'm trying very hard to get [Canadian] municipalities to implement IPv6 open access across municipal FTTH networks so that MPLS doesn't squeeze-in and end-users become required to run PE`s. I'm seeing ISP's provide value added services by offering commercial access to tunneling servers on their premises which bridge to the good old legacy Internet. For as long as two service providers across two different municipal FTTH system would want to interconnect with IPv6, there would then be a parallel Internet.

A current problem is the absence of a good v6 tool set for end users. Right now it is not clear where one will come from. Standards development would prove useful. But by whom? The IETF is very unlikely. The IEEE perhaps. The Consumer Electronics Association claims to be doing work in the area. Unfortunately, we have not had enough contact to evaluate them.

ZapMail pp.18 -20

Highlights, Full Article

When does a service become just another product that the phone company's customers can deliver best and at lowest cost for themselves?

Clay Shirkey has written a powerful essay that likens the Local Exchange Carriers' world view to that of Fed-Ex when it though it needed to build a fax network to gain an advantage that other overnight carriers didn't have to offer their customers only to find that the customer could deliver information by fax much more cost effectively themselves.

The business Fred Smith imagined being in -- build a network that's cheap to run but charge customers as it if were expensive -- is the business the telephone companies are in today. They are selling us a kind of ZapPhone service, where they've digitized their entire network up to the last mile, but are still charging the high and confusing rates established when the network was analog.

Discussion of ZapMail, pp. 21-24 Highlights, Full Article

Adrew Odlyzko agrees that VoIP will lead to the flat rate commoditization of long distance phone service. but he them wonders about wireless being able to create a substantial enough infrastructure for voice communication.

A product known as Locustworld may have the answer. "A UK company has produced Mesh wireless technology which you can buy and install, today, for under £300. Fancy setting up as a rival to BT Openworld? Even in a remote village? Easy: buy a Locustworld MeshBox; half the price of a home PC. You're in business."

"The software is the key to Locustworld. Written by text-message pioneer Jon Anderson, it configures a group of wireless access points into a coherent "mesh" and connects them to any broadband Internet node available."

"Most experts regard the mesh approach as hugely complex, because of the effort needed to set up the mesh. The system used to be known as a "parasitic network" - although the fashionable term these days is "symbiotic" - the idea is that you turn a group of wireless nodes loose, and tell them to introduce themselves to each other. Then you set up routes through the mesh. It can be fiendishly complex, but Locustworld's mesh does this for you. You just buy the node from them: the current model is £250 plus VAT."

"The last legal obstacle, according to founder Richard Lander, was the decision by Oftel, allowing people to share their broadband with up to 20 others.

Farber Faulhaber versus Open Spectrum pp. 25 - 30 Highlights, Full Article

A discussion of the problems created by the presentation of a paper that looks to the past encourages spectrum auctions and their maintenance of property rights in spectrum while saying oh by the way you open spectrum folk may be given so called "easements" since your magical radio technologies will not get in the way of our much more rational corporate approach.

How NSF Was Prevented from Removing the government from domain names? pp. 31 -34

Highlights, Full Article

Don Mitchell explains that a major policy change by the National Science foundation was aborted. The change would have ended government involvement in the DNS. It could have nipped ICANN in the bud. But this was not to be..

Had the cooperative agreement concluded in spring of 1997, as the NSF intended, the problem of institutionalizing the IANA function would have been forced out on an open table (or, possibly made moot) by the demand for (and creation of) additional TLDs. It might also have been forced into the courts. It certainly would have become more clear to many more people that one of the most critical underpinnings of the Internet, the IANA function, had no basis in law. Neither domestic nor international. If the play had been open, the high stakes mania that festered into the Internet bubble might well have not reached such a fever pitch. The industry might not have ridden so high and fallen so hard.

The over ruling of NSF plans for termination by Burr and her ISOC clique and the resulting extension of that agreement allowed a small number of high stakes players to keep the game closed. The game was still closed in June of 1999 when in the ICANN board emails we published Esther Dyson, IBM, Vint Cerf and Mike Roberts hatched a strategy to get money for ICANN from the venture capitalists of Sand Hill Road by warning them that their investment were in danger if ICANN did not succeed and by meeting with Tom Kalil in the White House to seek support. Today the investments of the Sand Hill VCs have largely vanished, the IANA function is still not institutionalized. Indeed today February 3, 2003 the IANAfunction was just handed back to the same closed group of high stakes players who profess to operate ICANN with openness with authority. In reality the game is still closed.

Lessig on Governance pp. 35-40 Highlights, Full Article

Larry Lessig in the document that follows gives the best overview that we have seen of the details under girding ICANN's construction in the year 1998. In the talk that we republish with his permission, he shows how the GIP ISOC Clique found in Joe Sims an attorney who enabled them to take advantage of libertarian distrust of government to create an ICANN that they could use for their own narrow ends and brought on four years feuding and distrust. ICANN from the very beginning was broken. Such was the distrust of government that no one would own up to seeing the brokenness. Lessig saw it however and his analysis of what could be expected from ICANN from the position of hindsight more than four years later reads like prophecy.

News Item Dave Hughes to Chairman Powell - Jan 22, 2003

FCC Chairman Powell in testimony to the US Senate. "That's the way that current technology is configured and deployed. Right now the leading standard of 802.11 a b and g in their very first have a limit in their range. At best 300 feet on an 802.11b network.. " THAT IS AN ABSOLUTELY FALSE STATEMENT!!!!! 'at best 300 feet' WHY DID HE MAKE IT?

1. There are over 10,000,000 Wi-Fi systems out there. 1.5 million more each month. 2. There are over 2,500 and probably over 4,000 Wireless ISPs using Wi-Fi radios doing business across the United States as I speak. Largely RURAL. I will wager not ONE of them is serving customers 300 feet or less. Most are from 1

mile to 10 MILES using off the shelf equipment certified by the FCC and within the power limits - 36dBm EIRP - prescribed as the maximum for 802.11b radios. 3. Cisco sells tens of thousands of 802.11b 'Aironet' radios which are ADVERTISED as reaching 18 miles at 11mbps or 25 miles at 2mbps! http://cisco.com/univercd/cc/td/doc/pcat/350wlbr.htm#fea 4. Young Designs Inc sells COMPLETE 'Wi-Pop In A Box' system for communities advertised at 12 miles! Standard, certified, systems. 5. Well funded companies are ramping up to deploy Wi-Fi across cities all over the US. One announced today it was targeting 80% of the Front Range Colorado population. And yes, they will backhaul over broadband wired networks, to answer your question accurately, Senator Brownback. 6. I have spent the last 3 YEARS buying, deploying, testing Wi-Fi 2.4ghz as well as other Wi-Fi Bands (915mhz, 5.7Ghz) radios for 4 more years from half a mile to 15 and more miles. And I AM a Wireless ISP ALL of whose customers are Wi-Fi 2.4ghz at ranges from a third of a mile to 2 miles!

I KNOW what I am talking about. Why doesn't the Chairman of the FCC? Or his Staff, who prepared him for this Hearing? Or is there a hidden agenda there? That kind of completely false and misleading statement before Congress angers me! For in effect he was telling Senator Brownback, whose 'colleagues' and constituents CORRECTLY identify Wi-Fi as ONE technology which can bridge the 'last broadband mile' until whole new generations of radios are invented, that Wi-Fi is of NO REAL VALUE for Broadband. I KNOW what I am talking about. Why doesn't the Chairman of the FCC? Or his Staff, who prepared him for this Hearing? Or is there a hidden agenda there?

That kind of completely false and misleading statement before Congress angers me! For in effect he was telling Senator Brownback, whose 'colleagues' and constituents CORRECTLY identify Wi-Fi as ONE technology which can bridge the 'last broadband mile' until whole new generations of radios are invented, that Wi-Fi is of NO REAL VALUE for Broadband.

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