



ENUM Protocol Seen as Directory Lookup Tying Internet Telephony Services to PSTN

All Numbers in PSTN Can Be ENUM Provisioned to Identify What Services Their Owner Uses - ENUM Enables VOIP Services to Find Ordinary PSTN End Points - Is Seen as Driver of Convergence

Editor's Note: Richard **Shockey** has been a consultant in Internet application technologies in the St Louis area for many years. Before joining NeuStar earlier this year, he had worked on applications such as Internet fax in the Internet Print Protocol and about three years ago began to investigate applications involving voice over IP. **Shockey** is currently Senior Industry Technical Liaison with NeuStar and is the co-chair in the IETF of the ENUM Work Group. We interviewed **Shockey** on September 16 and added a brief update on October 15. .

COOK Report: For readers may not be terribly familiar with NeuStar and what it does. Would you provide some background?

Shockey: NeuStar is the former Lockheed Martin Communications Industry Services, based in Washington D.C. In November 1999 through a management-led buy out, it was spun off into a separate company called NeuStar. NeuStar's is a provider of neutral third-party services to the communications industry . NeuStar obtained the right to offer these services by winning a competitive bid put out by the FCC.

At the present time the most important thing that NeuStar does it is function as the North American Numbering Plan Administrator. By contract with the Federal Communications Commission we actually administer the distribution of telephone numbers to facilities based carriers throughout the North American region which includes Canada and the Caribbean countries that participate in the North American numbering plan. In addition we operate the Number Portability Administration Center that was mandated by the Telecom deregulation Act of 1996. We provide the centralized trusted database by means of which telephone subscribers can port their numbers between land line carriers.

This means and that if you are currently a customer of an incumbent local exchange carrier such as Verizon and you wish to switch to another carrier or CLEC, we manage the process by which your number goes from carrier a to carrier b. We finish the move by populating the service control points within PSTN with the new ported data.

COOK Report: How many people work for NeuStar?

Shockey: Approximately 200. The reason that NeuStar was created was that Lockheed Martin chose to buy ComSat . Because ComSat is a telecommunications provider, the FCC immediately ordered the divestiture of what became NeuStar. This was necessary because the functions that NeuStar performs are designed to be completely neutral to any and all telecommunications providers in North America . Now in addition we are currently offering the Number Pooling Administration for a number of states within the US. This has been done because the FCC, in cooperation with the public utilities commissions from a number of states, have mandated what is known as number pooling.

In the past telephone numbers have been issued to carriers in blocks of 10,000. These blocks are often referred to as Nxx's . Considerable problems within the industry had been created as new facilities based carriers came online required relatively large numbers of number blocks which they did not necessarily use them in an optimal fashion. Furthermore this was at the very time when the deregulation of the industry itself was accelerating requirements for new area codes in various localities. Consequently the FCC in an order last year required the industry to begin a process of what is known as number pooling by which numbers could be re-

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captured from carriers and issued to others as the need arose. This was done to help forestall the potential exhaustion of numbers within the North American Numbering Plan itself. The Number Pooling Administration, as it is currently established, should allow the continuation of the use of the existing numbering plan in North America - - out into the future without requiring the addition of a new digit to either area codes or 8 digit local call dialing.

Now in terms of number portability we are anticipating that by the end of 2002 by order the FCC we will not only be required to have portability between land line carriers but portability between land line and cellular carriers. This would mean that you could port your home phone number from a land-line to a cellular provider or from cellular provider to some other cellular provider. The essential technology for doing this is now in place.

COOK Report: From a security point of view how is all this carried out?

Shockey: NeuStar maintains two highly se-

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cure fully redundant "five nines reliable" transaction centers to fulfill its functions. The primary transactions center is based in Chicago and the secondary one is based in Terrytown New York. The Terry town center is to be moved to a brand new facility in Sterling Virginia sometime during the first quarter of 2001. Those two data centers contain a very very large Registry of every telephone number the United States, Canada and the Caribbean islands. The Registry is operated at extremely high service level agreements between us and our customers who are the carriers themselves. The centers are operated with five nines of reliability on a 24 by 7 basis with a 24 hour per day help desk open 365 days a year.

The Purpose of ENUM

COOK Report: I can well imagine then why NeuStar would be interested in ENUM but would you please begin to explain at a very basic level the purpose of the ENUM protocol?

Shockey: The core ENUM protocol is done and is now RFC2916. But lets step back a bit in time.. The concept by which a telephone number could be resolved to an Internet domain has been discussed in IETF circles in one form or the other for more than four years. The concept of the E. 164 resolution was actually part of the original charter of the IPtel working group.

COOK Report: And the Charter of IPTEL is?

Shockey: The Charter of IPtel has changed over time. <http://www.ietf.org/html.charters/iptel-charter.html> At the present point it has two tasks. One is to develop a methodology by which end point selection, based on a variety of options, may be made available to service providers which is called TRIP. And the other is to develop a "Call Progress Syntax " which can define how calls are managed by subscribers through their gateways or proxies.

COOK Report: End point selection means?

Shockey: Let me quote Jonathan Rosenberg here since there is constant confusion over what is the difference between ENUM and TRIP. "ENUM solves a NAME (telephone number) TO ADDRESS (URL) mapping problem, and TRIP solves an ADDRESS (telephone number) TO ROUTE (gateway) problem."

IN the IP telephony it is proposed that there may be multiple gateways available on a carrier network that can reach a single specific end point (a telephone connected to the PSTN). We will have multiple IP accessible gateways, each of which can reach or address an end point (a pots telephone) on the

public switched telephone network. What we want to do is create an algorithm and a routing protocol that would allow service providers (1) to see where the gateways are (2) understand what pots phones they're capable of accessing, and (3) facilitate call completion based upon that data. This work is been advancing for several years and right now Jonathan Rosenberg is the principal author of the TRIP draft. It is based on BGP 5

The other interesting task that IPtel has taken on is the development of CPL (Call Progress Language) which is XML based in syntax and used to describe called party preferences. See: <http://www.oasis-open.org/cover/cpl.html> By calling preferences is meant the preferences that the person called has for dealing with that call in any one of a number of different modes of operation. For example CPL might provide a syntax for things like "follow me" services or "do not disturb," or other forms of call screening capabilities which could be developed in order to be used by voice-over IP protocols such as SIP in the creation of new services. The CPL documents, authored by Jonathan Lennox of Columbia University are now RFC 2824.

ENUM 's origin goes back IETF L.A. (in the spring of 1997) and the beginning of the IP Tel work group. At that time it was the judgment of the Transport Area Director Scott Bradner that combining ENUM resolution with IPtel was biting off a little bit more than should be chosen for the IPtel work group. Bradner also thought that the desire to move forward on telephone number resolution should be put off a bit until more consensus was gained on how to go about it. By 1999 there was finally a move to bring ENUM forward as a fully chartered work group.

COOK Report: And the definition of the ENUM would be what? The mapping of a number from the public switched telephone network to some point of Internet functionality?

Shockey: Yes. Except to be more accurate you should describe it as the mapping to Internet functionalities. In other words plural rather than singular. Now let's return to the ENUM charter. Like most good IETF charters it was extremely narrowly constrained. See: <http://www.ietf.org/html.charters/enum-charter.html> One thing did happen that, within the IETF at least, was fairly unique. There were a number of people including myself who wanted to explore the possibilities of using other forms of resolution than the DNS in coming to an ENUM solution. Ann Brown of Nortel networks brought forward a rather extensive draft based on using a Federated X.500 system that endpoints would use LDAP to query with.

It was manifestly self evident that there were two basic ways of doing it. For those with a stronger Bell head or telephony background it seemed a fairly logical that a FederatedX.500 system using an LDAP (Light Directory Access Protocol) interface could provide a rather rich and robust and globally scalable system by which telephone numbers could be resolved to IP end points as well as permit a more secure query model and permit the return of much richer data sets than simply URL's etc. However it was the clear and unequivocal decision of the IESG that the DNS option be explored first. **[Editor's Note:** This happened in late October of 1999. See page 8 below for a summary of the issues as they were discussed on the IP to e164 mail list at time.]

While the IESG's key decision was that the first solution be DNS and DNS only, its insistence on that DNS was not to preclude in any way shape or form work being done on an alternative resolution models. However, the general thinking was that you had to prove a negative first. In other words the Work Group had to prove that DNS was unsuitable for telephone number resolution. Consequently those of us who had been looking at this problem space for some time agreed to move forward and look at the suitability of DNS as a solution.

Editor's Note: It seems that Scott Bradner may have known what he was doing after all when he insisted on DNS for ENUM in November 1999. For the conclusions that I arrived at, having completed this article, see Why DNS Was Arbitrarily Selected on page 8 below.

Telephone Number into DNS Domain

Almost from the very beginning there was essentially no other discussion except that surrounding the drafts produced by Patrik Falstrom. There have been essentially four iterations of Patrick's thinking about how phone number should be resolved in the DNS. From a historical perspective, if you read the Falstrom drafts, you will see that they are based on even more pioneering work by Marshall Rose and Carl Malamud who in 1993 did the work described in RFC 1527 and 1528. These RFCs contain the description of what is known as the TPC.INT experiment in Internet fax. They also contain the first good description of how to concatenate a number into a single and unique administrative domain.

The debate in the ENUM work group essentially centered on this methodology which is to take a globally unique e164 number and concatenate it in reverse order into a single unique administrative domain which was defined as e164.arpa.

COOK Report: And the reason this is called an e164 number?

Shockey: This is because all telephone numbers are organized throughout the world according to what is known as the e164 plan. E164 is the work product of the International Telecommunications Union Study Group Two, question one. Telephone numbering has always been a function and task of the ITU. E164 describes how phone numbers are assigned to PTTs around the world. The delegation of authority runs from the ITU to the numbering authorities of the nation states that actually administer the e164 plan for their respective countries.

COOK Report: Is it correct to say that there are national numbering authorities that are separate from the PTTs in each country?

Shockey: Yes. Telephone numbers are nationally regulated by governments. Classically the issuance of telephone numbers is a nation state issue. It may be managed by the respective governments or it may be contracted it out by those governments to some administrative agency such as NeuStar which manages the system by the authority of the appropriate regulator, in our case the FCC.

COOK Report: So does not to the current version of the ENUM work group date of from the October 1999 decision to have it mapped to DNS?

Shockey: Yes. And there was a lot of continuing debate. It was decided that the key to telephone number resolution was to be found in choosing exactly what kind of resource records would be returned back by the client DNS resolver query. Patrick's early versions had numerous examples of how the protocol might or might not work. Because these examples generated some degree of confusion and further iterations of the protocol resulted in an extremely minimalist document that describes what my co-chair Scott Petrack has called "Telephone number in URL out". That is ENUM in a nutshell. It is one of the simplest protocols imaginable. If you actually look at the core draft you will find that it is only 13 pages long and the description of the protocol itself is only five pages long.

Another key decision of the work group was that the application Environment that wished to use ENUM should specify its usage within their own environments. For example sip, H 323, SMTP, HTTP and so on. But it would use the newly developed NAPTR resource records to do so. See RFC 2915.

COOK Report: What would be an example of http using the protocol?

Shockey: Say, for example, you wanted a

personal web page associated with your telephone number. This way you could type in to the command line of the browser a fully qualified e164 number and boom, you would go to your web page. Needless to say the principal applications for ENUM have revolved around two areas. One is a voice-over IP and the other centers around some concepts coming out of the VPIM Group (Voice Protocol for Internet Mail).

Use of Resource Records

Before we cover these, let me walk you back to the questions on which the final debates over the ENUM protocol centered and where the decisions that we made in Pittsburgh in August of 2000 were quite definitive so to speak. Beyond the use of ENUM itself and the desire to construct a minimalist model for ENUM and allow application environments to define how the services would be used, the remaining issue was which DNS resource records would be returned back to provide service specific information.

DNS has a variety of resource records that used for any number of reasons. We have MX records for the discovery of SMTP host names. We have SRV records for the discovery of services. The central issue revolved around a debate of whether or not to use NAPTR records for service discovery. NAPTR stands for the Naming Authority Pointer Resource record. It is RFC 2915 written by Mike Meeling of Network Solutions and Ron Daniel of Data Fusion. Debate about what resource records had to be returned for ENUM service resolution was extremely contentious.

I would really encourage your readers who are very interested in protocol development to read RFC 2915 which is a profoundly elegant and powerful document for service resolution within a domain. For example it has an ability to list "n" number of services for a domain through the use of regular expressions and a variety of other features and functions. The importance of the use of NAPTR records in this environment cannot be stressed highly enough.

There was some debate about using simply SRV records. However what we finalized in Pittsburgh was that ENUM resolution is again to quote my co-chair Scott Petrack "telephone number in URL out using NAPTR". What one is trying to do for a ENUM specific domain, in other words the ENUM expression of a telephone number under a single unique administrative domain, is list any and all services available for that domain. NAPTR provides a uniquely powerful methodology for doing that. However it is a bit complicated and there was some debate about NAPTR being relatively new and not yet widely deployed or tested. Some people asked whether, given its newness,

selecting it was appropriate to for a protocol that has the global implications of ENUM.

COOK Report: And the advantage of using NAPTR was?

Shockey: It was the advantage was having a single resolution methodology for resources associated with a telephone number. If we did not use NAPTR for a resolution we would have issued a sort of directive to the Internet community saying that it was OK to resolve a telephone number to any resource record.

COOK Report: Would this have created a rather loose framework that would have made inter-operability somewhat less likely to occur all the time?

Shockey: Indeed. Possibly Therefore instead of resolving a phone number to any resource record that you chose, we decided that there would be one resolution methodology and one resolution methodology only. Namely resolving telephone number to URL using NAPTR resource records. This is ENUM in a single sentence. So now we have a single unique model defined for the resolution of a telephone number (telephone number to URL via NAPTR resource records).

Application Environments Using ENUM

The hope and promise of ENUM is that new services associated with a telephone number can be created. The specific application environments that can use this methodology today revolve around two areas. The first is voice-over IP and the second of is VPIM (voice profile for Internet Mail based wide area messaging) but it is clear that ENUM can be used for any number of applications including for example Internet Fax, and Instant Messaging

ENUM solves a horrific problem that the Voice-Over IP industry has had almost from its inception. Namely how can you identify a resource on the Internet that can connect a call if all you have is a telephone number? This is the problem that H 323 gateways have had and, SIP proxies have also had, and indeed some of the scenarios in the softswitch environment have had. If all I have is a telephone number, how do I find a gateway proxy or an end point that can connect a call?

Now what is striking here, at a sufficient level of abstraction, is it that you are actually solving a problem on the Internet that has been solved on the public switched network for a number of years. All you have to do is look at call model in the PSTN. You pick up the phone. You dial a number and

the number you dial goes through a lookup process.

As the call progresses is there is a look up to what is known as a service control point which has an LRN (a Local Routing Number). This local routing number is essentially the switch end point identifier that shows where the call is to be connected. On the basis of this the switch, through its own internal logic, routes the call to the end point. Even right now within the public switched telephone network and certainly within the local environment of telephone number portability a telephone number is essentially nothing more than a name. Based on that name there is a look up that decides where the call eventually goes.

There are other look up processes in the PSTN such as look up for 800 services and International call setup but the concept is the same. In the PSTN its called a "dip" in ENUM terms it's a look up in DNS. Until ENUM existed there was no similar process on the Internet.

COOK Report: Because if there wasn't a name and a look up process you could not have number portability could you?

Shockey: Correct. Consequently what we have in the North American PSTN is what is called "all call dip." What this means is that every call made dips into the service control point in order to find its end point location. For example, when you make an 800 number phone call, the network does a look up to what is known as the SMS (Service Management System) that establishes the end point to which the call is sent.

Consequently ENUM has a specific architectural model to it that is very close to the way in which we operate in the public switched telephone network. ENUM is attempting to create a global and distributed hierarchy of shared service control points within the Internet that allow you to dip into the DNS and define both the end point and the services available to potentially connect a call over a IP network . In other words you must dip into a directory somewhere either in the PSTN or the Internet in order to find out the location of the resource on the Internet that will enable call completion.

COOK Report: Or vice versa? If I'm on the Internet and I want to call out into the PSTN and ring an ordinary POTS phone I can do it yes?

Shockey: If you are on the IP network and trying to connect to the PSTN, that is a different methodology and a different set of protocols. Now you are talking about PINT and SPIRIT, the reverse model. With ENUM we're trying to create the abstract model of going from IP end point to IP end point.

Namely how do you resolve a telephone number at one end point on the Internet and get back directions to another end point, in this case a URL? If you want to gateway between the IP network in the PSTN, you have to use other protocols and methodologies. If you are on a SIP phone and wish to connect to a PSTN end point, the methodology of call setup is obviously somewhat different. Or if you are on a Web browser doing a click-to-dial phone, that is somewhat different as well.

The ENUM meta-model is essentially IP to IP although other IP network elements such as proxies or softswitches can use the ENUM data for its own purposes. But this is PSTN and IP interworking. Putting the two together complicates the model considerably. Say for example that I have plugged a SIP phone into my wall and you Gordon Cook have plugged SIP phone into your wall. At this point my SIP phone would register itself to my SIP proxy. I would be sip:Rich.Shockey@NeuStar.com. You would register your SIP phone to your SIP proxy and be sip:cook@cookreport.com.

However, SIP phones have nothing but 12 digit keypads. Indeed SIP phones usually do not have keyboards associated with them. Therefore in the abstract ENUM model for SIP you pick up the phone and you dial me 12025332811. Your SIP client at your phone does an ENUM look up on my 202 number and says " oh you're trying to reach SIP: Rich.Shockey @ NeuStar.com." and if I am trying to call you, my SIP client, does a DNS look up which ultimately returns the URL sip:cook@COOKReport.com.

Done this way it is a mapping of a phone number to URL necessary for the call completion via the NAPTR resource record which contains that SIP URL. At this particular point you have set up a voice-over IP phone call end-to-end using nothing but telephone numbers. And you have crossed administrative domains (from cookreport.com to NeuStar.com) doing it. You have been able to find a SIP URL at NeuStar.com based on nothing but a phone number.

And that begs the question: why use PSTN telephone numbers? The answer is because they are there. Why should Internet Telephony be any more complicated to use than PSTN telephony. Why should everyone have to use a different telephony naming scheme when the one we have works very nicely? If Internet Telephony is to work and deploy on a global it needs to be simple and stupid proof.

COOK Report: And in looking at NeuStar.com, I'm really looking up the IP number to which it is mapped. Yes?

Shockey: Yes. It would take successive recursions of DNS to first find NeuStar.com and then the SIP proxy within the domain but DNS is so fast that there will be little if any delay in call setup vs what we know of today in the PSTN. The problem in a voice-over IP industry has been how do you set up calls across domains using nothing but telephone numbers? You have to be able to do this because telephones and cell phones do not have QWERTY keyboards on him. It is one thing to setup a SIP call PC to PC but the vast majority of us do not make phone calls that way. We make phone calls with handsets having twelve key pads on them. So the problem that VOIP industry has had practically since its inception, namely how you connect people over the Internet using nothing but telephone numbers, has been solved. The solution simplifies the concept of Internet telephony to the point where Internet telephony can become transparent to the end user. You pick up the phone and dial and connect a call. You could get to a cell phone by ENUM but only if you went through the proper kind of the gateway. Remember that ENUM is not about call routing. It is only a look up to an end point identifier, a URL. Only when ENUM has brought you to the URL is the call setup, routed, and processed.

COOK Report: Perhaps you could say it's like having switch engine in a roundhouse. If your going to send that switch engine somewhere you need to know its destination to most efficiently remove it from the Round House and get it started.

Shockey: That's a fair analogy. So this is an extremely powerful tool for the voice-over IP industry. Now the problem that exists in a SIP environment also exists in an H.323 environment. Namely gateways as opposed to SIP proxies cannot find each other based on phone numbers.

Pickup the phone and dial a number and connect. Granted there are many things that remain to be gone in voice-over IP. ENUM however injects of simplicity and user friendliness that has not been there before. It is reasonable to make some assumptions that this has some interest and value both to the SIP community and ultimately to the softswitch community.

COOK Report: Where you're going and how you get there can be achieved by any number of methods or different protocols. Right?

Shockey: Right. And again ENUM it is not involved in the actual routing of the call or in the call processing itself. Say for example things like " follow me " or "do not disturb" or other forms of service creation become a function of SIP. CPL or call progress language is really imbedded within the SIP proxy environment itself and is programmed

from your SIP proxy. Say for example you wanted to block all incoming calls from telemarketers. You would go to the web page of your SIP provider. You could enter, on the web page, commands to block all calls that do not pass a specified for caller identification parameter through the SIP headers, and bingo you have created a service. That service is a function of your relationship to your SIP provider and not a function of ENUM.

Voice Profile for Internet Mail

The voice-mail industry has been seriously considering ENUM for its own reasons. VPIM (Voice Profile for Internet mail) work has been going on in the IETF for almost four years. They have done much good working in creating a platform for inter-operability between voice mail systems that are both carrier and enterprise based.

COOK Report: If my voice mail is in Washington and handled by your company and I'm on travel in Hong Kong this would be a case of where I would want to be able to call a local number in Hong Kong to retrieve my Washington D.C. based voice mail?

Shockey: That's exactly what they would be doing. Or suppose I were in a major enterprise or Fortune 500 company and I was traveling from my home office in Washington D.C. to my local office in Concord California. If this service were available I could just pick up the phone in California and retrieve my voice mail locally without having to make a long-distance call. You would accomplish this by keying your phone number. And the transport of that voice mail message would be over IP networks and not the PSTN.

COOK Report: But I would have to know that I was at a VPIM provisioned phone, would I not?

Shockey: Yes but what is important to remember is that the goal of the VPIM work group is to create globally interoperable voicemail systems. This would mean that you could pick up your voicemail theoretically from any phone wherever you happen to be and it do so even on a global basis. This system would be able to operate independently of whether your voice mail was enterprise based or carrier based. Doing it globally in any other form would require making toll calls.

COOK Report: Moreover if I am hearing you correctly, you would have to be doing these activities over the Internet otherwise you would be enriching the carriers with toll calls.

Shockey: Well I would say that VPIM is saving the carriers considerable expense by routing voice mail messages over IP networks and not over PSTN networks. Voice Mail is perfect for ENUM since Voice mail is not subject to the latency problems realtime voice or video is on IP networks.

COOK Report: So this is an enormously valuable service. You are attaching the world's telephones to a connectionless network and are doing it by giving them nothing more than a set of routing instructions?

Shockey: That's not quite the way I would put it. Rather you are connecting telephones to a series of services one of which may be the retrieval of your voice mail and the transport is over IP networks. Remember that if you want an ENUM enabled service, something other than ENUM must take you there, because ENUM gives only the location of a URL that will provide you with the service that you desire.

COOK Report: In other words ENUM has to work in tandem with other protocols?

Shockey: Yes. In the case of VPIM the look up would be different. Instead of telephone number to SIP URL, this would be a look up to an LDAP directory where voice-mail messages and other data like spoken words are actually stored.

COOK Report: am I hearing you right? VPIM would mean taking voice mail out of the circuit switched network digitizing and and putting its end storage locations on the Internet in packetized retrievable form using the IP protocol? A lesson in PSTN deconstruction?

Shockey: Yes. Another lesson in PSTN deconstruction. The power in value of this I think is manifestly self evident. Here is the scenario: Gordon Cook is in New York City and wants to pick up his carrier based voice mail. You are in Verizon territory and let's assume you have a voice mail service provided by Verizon as part of your telephone service. Next you travel to California and what you want to do when you get there is pick up your voicemail from New York. So you either go to a local telephone or pick up your cell phone and you dial an access number. Once you are connected to the access number you, will be prompted for your telephone number and a password. Based on your telephone number, you will have an ENUM look up to an LDAP that has your voice mail stored in it.

COOK Report: At this point will the voice-mail still exist out there on the circuit switched network?

Shockey: It can be retrieved on the circuit switched network as well. But this way, in an IP environment, the value of the local

retrieval of is that it essentially it does not traverse a time division multiplexing networking environment otherwise known as the incumbent local exchange carrier. As far as to who contacts whom to make the transfer, it likely would be the IP network going through a gateway requesting the transfer from the circuit switched network. Again ..The value to the voice-mail industry and carrier industry is that instead of playing back the voice-mail over long distance, it is essentially retrieved and played back locally having been transported to the locality by an IP network. Of course this process represents enormous efficiencies, not to mention cost savings over competing transport methodologies. This process also has applicability in terms of fax. Say for example that I am a manufacturer of IP based fax machines. There are new classes of fax machines out there conforming to RFC 2305 as well as T37 in ITU standards language. If I had an Internet aware fax machine conforming to this standard, I could put my paper in the machine and dial a number. The device would first do an ENUM look up to see if there were an equivalent SMTP address associated with my fax number. If it found such an address, instead of sending this fax over the PSTN, it would make the decision to avoid the PSTN in send it to a "mail to" URL. So therefore you are associating your fax number with a universal messaging e-mail box.

COOK Report: OK. If you look at the provisioning service that attaches my phone number to such a URL, such a provisioning service presumably would be able to sell or provision not only this one service but many other services? Furthermore, because of the complexity of relationships involved, I presumably will not want there to be more than one provisioning entity that is permitted to attach ENUM services to my phone number.

The Administrative Model - Subscriber Control

Shockey: In saying what you just said you have gone to the core of the administrative model which is IMHO subscriber control of service provisioning. At a sufficient level of abstraction you could have the DNS server in your basement and you could configure the NAPTR resource records yourself. That is administratively possible. However, we have always known in the ENUM work group that protocol is the easiest thing to do. The difficult challenge is to create a global delegation model and an administrative model with in the global delegation that allows for subscriber control of service provisioning.

Ideas about what the global delegation model will look like are currently in the midst of

delicate discussions between the ITU and the IAB representing the IETF. Until some general agreements are reached I cannot go into this issue with more specificity. Results should be achieved before the end of this year. I believe it is fair to say that since E164 numbers have always been under nation-state control that governments and National Regulatory Authorities are going to have a role in this process and I believe that that role will be a positive one.

The second level Internet domain e164.arpa

has been chosen by the IETF-IAB as the global delegation domain for ENUM. Furthermore e164.arpa has been placed by the IANA the authoritative route servers. Now there is the issue both of Administration on multiple levels and on the question of how this will be administered specifically in the North American environment as well as among other nationstates. These issues are under active discussion in several forums.

Some very good work has come from ENUM working group members. Penn

Pfautz of AT&T and my colleague James Yu of NeuStar are writing an Internet draft titled administrative requirements for ENUM deployment in North America. In my judgment it is an excellent first cut at what the problem statements really are. It also begins to point to where the solutions may ultimately lie.

The key to understanding of what is going on is realizing that we have enumerated within the work group a layered a model. At the very top layer of the ENUM administrative model for each country is what we call the delegation of National Authority based on E.164 country code .below that are the Name Servers that actually store and control the NAPTR records that provision services associated with a particular telephone . Some government agency will delegate this to someone.

COOK Report: So what you are talking about is that some entity in the U.S. government will have the power to choose some other entity presumably within the private sector to develop and run an ENUM Registry for the United States?

Shockey: Yes and I believe that is the best and indeed only way this can work. **COOK Report:** And to some one who didn't know much about this it might also be analogous to operating something like the North American numbering and all the stuff that NeuStar already does.

Shockey: You might say that .<grin> but I couldn't possibly comment. <grin>

Who Controls What

Shockey: That's true. IMHO ENUM is a key element in the real convergence of IP and PSTN networks. ENUM by itself is not particularly unique or special, but put together with all of the work in the IETF on SIP, Quality of Service and PSTN-IP interworking ENUM takes on an very important role. we in the telephony world have gone through a lot of processes about these things. We have seen lots and lots of problems arise that we do not wish to duplicate in the IP world which is what you have companies out there with a significant telephony experience that are very deeply looking at how to prevent from the beginning any of these potential problems.

COOK Report: Could one infer that because IP people have never had to deal with precisely these kinds security, those coming from telephony point of view and in this case have a significant edge?

Shockey: Yes and the issues involving hijacking and slamming are well known and well understood issues within the world of the PSTN and one which in the IP world no

Politics of Enum Administration Will Be Tricky Some Excerpts from Penn Pfautz's Internet Draft

1. . . . In North America, several sovereign states share the country code "1". Administration of the numbering plan rests with an organization known as the North American Numbering Plan Administrator (NANPA)[5]. . . . Determining the authority for a number is made much more complicated by Service Provider Number Portability. As part of a mandate to provide for competition in the telephone service marketplace, customers may retain their telephone numbers, even when switching to another provider of local telephone service. That is, customers may port their telephone number from the provider to which it was originally assigned (as part of a Central Office code) to a different provider. For this reason, there is, within a country code, ultimately no hierarchical correspondence between the telephone number and the service provider or the administrative authority for a number.

Although the NANPA is responsible for number assignments, a different entity, The Number Portability Administration Center (NPAC) provides the industry database of record for ported geographic telephone numbers.

3. Establishment of a practical ENUM service for numbers in the North American Numbering Plan will require some entity, whether new or existing, to be chartered to perform the administrative function of maintaining DNS records. There will also have to be an arrangement for this entity to recover its costs.

The ENUM portability entity will need to maintain records for individual customer numbers or number blocks; because of number portability, it cannot simply delegate following the patterns of number block (NPA-NXX or NPA-NXX-X) delegation for number assignment.

The entity will have to establish relationships and interfaces with NPAC and 800 SMS to obtain information on ported numbers.

It is anticipated that the records maintained by this entity will be pointers to the service registrar for a particular number rather than containing the URLs required for actual services. The service registrar might be either the number user's current telephony provider (whether original or ported-to) or some other party designated by the number holder. The service registrar's DNS contains the actual NAPTR records that point to URLs for particular services.

There will need to be some specification of the operational procedures for carriers and number users to specify or change the record containing their service registrar.

As with selection of local exchange and inter exchange (long distance) carriers in the PSTN, these procedures will require adequate authentication or verification mechanisms to prevent unauthorized changes.

8. Conclusion

In order for ENUM to be implemented in North America some entity, whether new or existing, must be empowered by the competent regulatory authorities to run the DNS for the 1.e164.arpa zone. This entity would, in the default case, maintain NS records delegating authority for numbers or number blocks to the service provider to which the numbering plan administrator delegated the numbers for assignment to customers. If a number was ported to a different service provider, the 1.e164 level entity's NS records would change to show delegation to the new service provider. In either case, the end users to which numbers were assigned would have the option of designating a third party to be the service registrar for their numbers and that party would then be the one shown in the 1.e164 level DNS NS records. Portable toll-free numbers would be delegated to their RESPORG in the absence of an alternative request on the part of the end user.

one, least of all the regulators, wants to duplicate. When I am trying to say is that now that everyone understands that convergence is going on, there are things in the telephony body of experience that are and will remain useful in this new world. This is especially true with problems involving the security and integrity of the system itself, as well as the rights of subscribers because this is a really now a consumer protection issue.

COOK Report: Does the fact that you (NeuStar) have all these trusted Systems (these highly secure systems) involved to prevent nasty things happening to consumers cut down significantly on the number of companies that could put in credible bids to operate an ENUM Registry?

Shockey: Yes and no. There certainly are companies out there that have experience in dealing with trusted systems and trusted administrative models that have 99.999 reliability, 24 by 7, 365 days a year and that organized for the protection of consumers. A lot of these companies happen to be in the telephony world.

COOK Report Except that in comparison to just porting telephone numbers the amount of functionality and perhaps complexity that can be addressed with ENUM provisioning in the Internet is going up radically in comparison with merely making sure a telephone number is portable from one carrier to another.

Shockey: Let me put it this way. Among those of us in the ENUM community there is increasing recognition that there are necessary tools within the DNS and other operational tools available to make this thing work. They just have to be structured, outlined, and implemented.

COOK Report: Presumably there are people right now who have to be putting together specifications of what it means to do it right and agencies involved in selecting successful Registries will be thinking hard about evaluating the processes they use for selection.

Shockey: Well let me put it this way. Are people looking at the problem statements actively? Yes. Will these process is undoubtedly involve decisions by nation states? Again, unquestionably. It will happen in no small part because we are at the apex of some very significant convergence between the IP network and the public switched telephone network.

COOK Report: Will the carriers of the PSTN have no choice but to go along with this? For example, if one does not, another will and the one who doesn't will get its insides sucked out.

The Disconnect Issue

Shockey: There are some tricky administrative models here. Because again at the apex of this model you have a national ENUM delegation authority that essentially points via DNS to the authoritative name server for that telephone domain. Now the problem is that the phone number itself was issued by facilities based carrier. The authority for the existence of a phone number itself and the services associated with it comes from a facilities based carrier. Therefore you have to create a model for what I referred to as the disconnect issue. If for some reason the phone number is disconnected from the PSTN itself, it is imperative that any ENUM records associated with the phone number itself must be removed from the system at the same time.

COOK Report: Give me an example of what it means for a phone number to become disconnected.

Shockey: You move from one place to another. If you move to a new location outside of the coverage area of new or old area code, you must get a new phone number. You cannot port a phone number from one area code to another. Portability exists only in 800 numbers. If you moved from New Jersey to Minneapolis, you would disconnect your service from Verizon. In Minneapolis you would connect to Qwest with a new phone number. You would want to be assured that you could easily and successfully port the suite of ENUM services that you had used in New Jersey to your new location in Minneapolis. Your number New Jersey has to be released to give to someone else and you need to be absolutely certain, when that happens, your ENUM services are disconnected from it. (If they were not disconnected the new owner of your old number would acquire them and we would have a hijacking situation.)

Therefore one of the core problems in ENUM administration, at least in the North American model, is what I refer to as the problem of triangulation between (1) the national ENUM delegation administration which essentially points to the authoritative name server, (2) you as the subscriber, and (3) a facilities based carrier which is the authority from which your telephone number itself is derived. In short for a relationship between the authority, the carrier, and the subscriber. This triangulation exists in part because in the United States we do not have a situation in which you as subscriber are ever directly issued a phone number. Numbers are issued from the NANPA to facilities based carriers and from the facilities based carriers to subscribers. To do all of this in a secure reliable manner that protects the integrity of the numbering plan as well as the wishes of the subscriber is a succinct

definition of the understood the problem of ENUM administration in North American.

The Road Ahead

To sum up: here is where the process stands. We have a protocol which can be extremely useful for any one of a number of potential Internet based services. We have a global delegation model which is under active discussion and developments on that front are progressing with some resolution expected by the end of this year if not the first of next year. Beyond that there's certainly discussion going on in North America about how it might work here. But the overall structure locally will be decided by nation states in consultation with the communities involved. The delegation of authority will be to nation states. There's no debate about that any longer. Finally there is agreement that the e164 numbering Plan globally is not be altered the modified in any way shape or form.

COOK Report: But suppose I'm British Telecom or AT&T or France Telecom. These are companies, but by no means the only ones, that may be regarded as legacy, and as somewhat Bell headed players. Can you explain to them why they really have no choice but to open up their heretofore protected treasure chest to ENUM and let vast portions of the revenues be sucked out by the Internet?

Shockey: There is no doubt in my mind that progressive carriers all over the world have understood the meaning of convergence now for quite some time. Everything that **COOK Report** has been reporting about has indicated that that some of the best names and best brains in the business have been working these issues of very very diligently. I would alssay that convergence is becoming very very real. Convergence is no longer a thought piece on the OP-ED pages of the New York Times. This means that there are going to be real convergence products that will require some real convergence public policy at some level.

COOK Report: And in one sense this convergence is going on if only because you're talking about the very infrastructure on which this revolution (IP over DWDM fiber running connectionless networks) is orders of magnitude more powerful and less expensive than the old Bell headed copper networks were.

Shockey: I would expand on what you just said by going one level further. The feeling is widespread that the prospect of new services is driving convergence and voice-over IP just as much as the prospect of PSTN tariff bypass. Long distance has gotten so cheap now that almost no one cares. However the two-decade-old promise of deployment of new services by SS 7 switches has not been

met.

COOK Report: so all the wonderful things that were supposed to be done by the Advanced Intelligent Network at the center and which have failed to materialize are now going to be done at the edges by all the various things that we have been talking about in this interview?

Shockey: Exactly. That's the real promise of ENUM and related protocols. ENUM is only one small but very important element of the whole picture, which includes the work in SIP, which includes rapid fiber deployment and the bandwidth revolution — which includes all of that.

COOK Report: Still if you're going to be in the telecommunications business five to 10 years from now, even the dumbest circuit switched carrier can see that economically there is no way to go forward to except by way of IP-over-fiber and the associated protocol's that are being developed.

Shockey: Correct. The smartest global carriers understand this very well and are moving ahead as fast as they can. Of course there are retrogrades and these developments are picking away at some very deeply entrenched monopoly positions here.

COOK Report: What is your reaction to the September 27, 2000 announcement of a Verisign (network solutions) intention to invite companies to participate in a jointly sponsored ENUM trial.

Shockey: Oh yes ..I'm very well aware of it. I found it most interesting . For any number of reasons I wish the timing of the announcement would have been different but its just one more tangible piece of evidence of the interest in ENUM. These are two very big companies ..one with a long heritage in the PSTN and the other , through its Network Solutions Division is .COM itself. Their cooperation is another piece of evidence that convergence is becoming a reality.

That said there are going to be lot trials and Bake-Off's conducted here by a lot companies and organizations. There are numerous of unanswered technical questions on the proper configuration of DNS servers in the ENUM environment, Carriers and equipment suppliers want to test their resolvers etc.

COOK Report: Is NeuStar ready to make any product announcements here?

Shockey: Not at this time for reasons I would prefer not to elaborate. You can assume that we have a substantial interest in ENUM for any number of reasons. We are aggressively tracking ENUM developments . There are many reasons for this but one is NeuStar's

obligation as the NANPA to advise the industry and regulators on numbering issues.

Editor: For an excellent list of ENUM presentations, papers and other resources, see <http://www.enumworld.com/resources/index.html>

Why DNS Was Arbitrarily Selected for ENUM - A Look at the Politics of an Unusual Move

Scott Bradner may have known what he was doing after all when he insisted that DNS be used as the foundation for ENUM. (See discussion between Oct 13 and October 22, 1999 on e164-to-ip@vocaltec.com.) We have just discussed in detail how ENUM can act as service control points in Internet telephony related applications. However use of DNS broadens the applicability of ENUM. When ENUM is deployed and various patches are written for browsers, email clients and servers and the like, your phone number can replace your domain name and act as a domain name should you ever want it to do that. Just put your recipient's ENUM provisioned number in the "To:" field in your email client and send away. Voila, one phone number can send email to another and a phone number inserted in a browser will bring you to the associated web site. Without DNS for the foundation of ENUM it would not have this capability. Thank you Scott.

Now from the point of view of the analysis that DNS is the single point of failure for the Internet, one might get nervous to see yet another very important protocol use DNS. But let's look at the reality in which the decision was made. ICANN by the time of the DNS - ENUM decision, had been in existence a year and had given ample evidence of its intransigence and its ambitions. Moreover, despite the certification of nearly 100 registrars by ICANN, it was widely understood that Network Solutions monopoly on dot com had not been seriously challenged.

On the other hand while a single authoritative root was still a serious problem, as long as the US government kept control of the root and do things like order ICANN to add new tlds to the root, the use of DNS for ENUM could create a technology that could function parallel to but independently of domain names in identifying internet end points. Certainly the emergence of an end point identification alternative to DNS should be welcomed given concerns about

the forces controlling ICANN. In this case given ENUM's association with telephone numbers it would lie squarely in ITU territory. That would also explain the major increases in DoC, IETF, ITU contacts that have been going on since Karen Rose's visit to the ITU in Geneva, last January. See <http://www.itu.int/ITU-T/ip-telecoms/ip-telecoms.htm>

From the US government's point of view it could create a four legged table to balance control of this new infrastructure on, one independent of ICANN's technical charter and as long for access to the root was kept by DoC independent of ICANN entirely. The two legs in US are DoC and the FCC (given FCC's historical control of phone numbers). In Europe they are the ITU which has always sat at the APEX of global allocation policy for phone numbers, and RIPE to which e164.arpa has been delegated by the IETF. RIPE is expected to deal with the policies of ENUM distribution to national governments. So while DNS in domain names is one end point solution service, ENUM becomes a second independent and parallel service which can be used as leverage against ICANN gaining too much power. The establishment of an American ENUM registry separate and unrelated to Network Solutions domain name registry - registrar operation would serve to balance the power of the domain name giant

A final point is necessary to make what looks like an interesting balancing act work. National authorities that establish or grant authority to others to establish ENUM registries must take exceptional care to ensure that constraints, backed up by heavy penalties, are in place to ensure that, if the customer does not own the phone number, he or she is assured of ownership and control of a desired suite of ENUM services. When the subscriber changes numbers, he should have the guarantee of his nation state that his national registry will bring about the immediate, secure and seamless transfer of his ENUM services. Of course a single authoritative root is still a potential point of control that is cause for concern. Eventually we will likely have multiple roots. In the meantime the neutrality and independence from political pressure of the DoC's control over the root needs to be guaranteed.

In the meantime, although it will likely be late next year before ENUM is operational to any appreciable extent, the 'buzz' surrounding it is considerable. Consider Tony Rutkowski's assessment in *Communications Week International* on behalf of network solutions.

It is a potentially vast new Internet-based infrastructure known as ENUM - short for electronic numbering. ENUM seems destined ultimately to emerge as the most im-

portant new Internet platform since the World Wide Web - perhaps even eclipsing it in long-range importance. . . ."

"The core ENUM infrastructure will substantially reside within the Internet's Domain Name System. However, it elegantly spans the multiple integrating worlds of public telephone and telecommunication networks, wireless devices, home networks, digital certificates, geospatial systems, and just about anything and everything that is reachable through internetworking. . . ."

"Like the Internet itself, ENUM provides common value and buy-in incentives for everyone. It establishes a global, universal system for every individual, organization, and employee to integrate and manage all their myriad networked capabilities - from telephone to email, from digital certificates to geo location, from phone lines to cellular and wireless. . . ."

The DNS Decree for ENUM not Well Received at the Time

On October 13, 1999 **Scott Petrack** wrote to e164-to-ip@lserv.vocaltec.com under the subject: Wacht Auf! proposed WG charter and meeting for Washington: IETF-Announce list recently posted a working group review for ENUM. The proposed charter can be found at: <http://www.ietf.org/mail-archive/ietf-announce/msg05432.html>

In parallel, I have requested a single slot in Washington. It might help to underscore two facts: 1. Many people have expressed that it is vital for the Internet to provide the directory mechanism which will enable a client to map from a telephone number to a set of URLs to communicate with the device or "resource" associated to that telephone number. The ENUM WG proposes to produce an RFC to specify the protocol part of this service.

2. For well over a year now, there has been a single Internet Draft which has been continuously discussed and updated which presents an Internet friendly approach to the problem. The latest version of this draft is at: <http://www.ietf.org/internet-drafts/draft-faltstrom-e164-03.txt>. The working assumption is that the technology presented in this draft provides a basis for a solution to the problem. There are many ancillary questions which are not about protocol (and in fact not even directly technological), and these are not particularly within the scope of the proposed working group charter. After such a very long gestation period, my hope (feeble though it may be) is that we can get the technology closed and into an rfc within a small number of months. That is the nar-

rowly-scoped but obtainable work we have cut out for ourselves in the charter. Scott

Next on October 19, 1999 Area Directors **Scott Bradner** and **Vern Paxson** sent the following decree to the e164-to- IP mail list:

We would like to clarify the points raised in the recent discussion, as follows: 1) The ENUM working group is being chartered to produce a DNS-based solution to the E.164-to-URL need. 2) The area directors believe that having a working group focused on a single solution is the best way to make forward progress, given the basic contention about 3) design approaches

The area directors will support chartering an additional working group to pursue a different approach, if there's a constituency for the approach and a viable charter

Sometimes when there are competing approaches for solving a technical problem, the best way to move forward is to pursue each of them until one emerges as the winner. We believe that this holds in the present case.

Anne Brown replied: I, speaking for Nortel Networks and the EMA VPIM directory WG, do not agree with this DNS-only limitation. You (and those that are advising you) are selecting the protocol before the requirements are even met. In the interests of designing a solution that meets our as yet undefined requirements, I am requesting that this be limitation be stricken.

!!!! IF ANYONE ELSE on the list has similar objections, please raise them now, otherwise Scott is perfectly valid in continuing as planned. !!!! I also have comments below.

Scott Petrack: Perhaps the following will help clarify things. I can also hope that they will calm things too, but that may be less certain: 1. There are many possible "solutions" to this "problem" (whatever you think the problem may be). The ENUM WG has been charter more or less to produce the DNS-based solution to the problem. This does not mean that there are not other viable solutions. It does mean, however, that we are not going to discuss these other solutions in the ENUM WG. For this reason, if you actually do believe that it is I who have been pushing the DNS-based solution, then you should feel comfortable that I have been asked to chair such a narrowly defined effort.

Brown: This WG/BOF, while talked about in many groups, was originally initiated by Richard Shockey and myself as the groups that we are working in require a standards solution to telephone number mapping. Therefore I fail to see the validity in your comment that this WG has been chartered

to produce a DNS solution. I would like to have the feeling that you and the ADs are interested in representing the people who have been involved in the discussions from the beginning. That is not what I have observed. I really hope that no one takes offence to these statements, as I don't mean to question anyone's motives. I am merely attempting to get this work back on track as I see it.

Petrack: The ENUM work is indeed going to be DNS-based. The reasons for this are quite simple, and actually incontrovertible: a) there is rough consensus among IETF participants that it is worthwhile to produce a DNS-based solution to the E164 directory lookup problem.

Rich Shockey: Really ... I'm not aware of that "consensus". Certainly DNS is a viable option.

Brown: I am challenging the statement of consensus. There IS NOT a consensus, however rough, with the participants on this list. To appropriately represent the members of the list, you and the ADs must consider the objections that have been raised.

Petrack: b) there is enough expertise within the IETF to produce a technically correct RFC on the subject.

Shockey: IMHO there is enough expertise in the IETF to produce a solution .. period.. irrespective if it is DNS based or not.

Petrack: Once again, this does not mean that other work can not go on, both in and outside the IETF.

Shockey: Scott I am bothered by this. You are presupposing a solution before work is even chartered. Properly done we should develop a Goals and Requirements document first then decide on the solution. This issue is too central to the needs of Internet Telephony in the future to simply jump the gun and say: OK its DNS or nothing.

Petrack: The whole question of capabilities is something of a can of worms, and I suppose that we will have to at least peek into it. It is possible to put into a URL whatever you want (and believe me, many people do ;-)). But in general, capabilities need to be signalled, or even negotiated, and ENUM is not a signalling mechanism, it is a directory mechanism. Those capabilities which don't need to be negotiated in any way, but which can be simply "announced", can be put into the DNS scheme quite simply.

Shockey: IMHO the "announcement" of capabilities is a MUST.... and there are several ways to express capabilities. This is one of the central goals of the CONNEG WG. The end point may not be a "telephone" It

might be a “fax machine” or a video conferencing terminal.

Petrack: Finally, about my comment on “for well over a year now....” The key word is “updated”, and it is a simple fact. No other draft has been updated. Patrik’s draft was updated. This makes it possible to consider by the IETF.

Shockey: Oh Scott...this list has been quiet for some time now. I’m sensing a “rush to charter” here.

Petrack: Bottom line: ENUM is going to punt on the question of non-DNS-based solutions. If there is interest, do them outside of ENUM. ENUM is for people who think that there is an eminently nice, doable, powerful solution lurking inside the DNS architecture.

Shockey: You want to punt the issue of non-DNS solutions... I’m not sure that belief is held by everyone. I’m certainly willing to look at the DNS option. It has obvious benefits. I have even more questions should there be clear consensus that DNS is the most viable option... but I don’t think we are there yet. Isn’t this something we should discuss in DC?

Petrack: I guess that somehow I’m not being clear, although I’m really trying very hard. Let me try again:

No one has made any suggestion that the IETF is limiting the protocol to DNS only. I would be very sympathetic to an objection to such a limitation. What is true is that ENUM is being chartered to produce the DNS-based solution.

Shockey: I’m sorry Scott ...this is simply incorrect IETF process. The ORIGINAL problem statement was the resolution of E.164 numbers. This assumed that there was more than one solution to the problem _which might be DNS_ and at the last BOF on the subject there were several proposed solutions..of which one of them was DNS. There are clearly many ways to “skin this cat”. Nortel has some ideas ..so does Lucent... and the whole higher level of resolution services is under some discussion by Larry Masinter’s new group.. Common Names Resolution.... the second I saw Larry’s charter I thought to myself ...gee phone numbers are common names for endpoints!

Petrack: No one has suggested that there is consensus that only DNS can be used as a protocol. What is true that there is consensus that DNS is one “viable option”, as Richard put it. A working group, called ENUM, has been chartered to dig down and specify it, to determine its true viability.

Shockey: This is backwards process. If I

recall the way we generally do things in the IETF.

First we develop a problem statement. Then we develop Goals and Objectives... Then and only then are protocols selected or designed to meet the Goals and Objectives laid out. You are saying ENUM is chartered to see if DNS is appropriate.. But only if it is determined that DNS is INAPPROPRIATE should other protocol concepts be investigated????? This is nuts. I thought what we try to do is determine the _best_ solution possible.

The impact of what you are proposing to charter goes far beyond dealing with URL’s. Anne is correct in pointing out that the concept of 164 resolution is central to the VPIM directory concept which has caused them indeterminable grief since there is no 164 resolution service available.

You want to hear this from the fax perspective... that is easy. We have been beating ourselves silly in the FAX WG because we cannot determine the capabilities of IFAX device in advance of sending the file via MIME attached email. You have any idea what a 164 resolution service would mean just to that application alone? Videoconferencing accessed by nothing more than a phone number ..a TIPHON IP phone number?

Petrack: The IETF is doing what it has always done, and in the manner it has always done it — technical engineering work to specify an interoperable technically valid solution to a protocol problem.

The IESG seems to feel that it is worthwhile to see through what a DNS solution would look like. It is possible that we are going to do all this work for nothing, because we will discover that DNS misses some absolutely crucial feature. I have agreed to chair the group despite this risk.

Shockey: I have a serious problem then. If the IESG has determined that the solution to E.164 resolution should be limited to DNS or that option should be excluded first before all other options are considered than it has a obligation to state its reasons and state them clearly. It is IMHO incorrect to charter a WG to define a solution to a problem that limits it to only ONE protocol area.

Brown to Petrack: Are you telling me that the IESG has decided to create a WG to design a protocol and architecture where the protocol has already been decided upon? More importantly, is this an official direction that the IESG has formally given you? If so, I guess myself and Richard, should after one year has already passed, begin the process again to start a WG to design an E.164 mapping solution? Should we also

prescribe the protocol before we have a serious stab at the requirements? This is serious BS, pardon my language.

Petrack: As far as announcing capabilities goes, it sounds to me that if CONNEG is just perfect for your purpose, then you should use CONNEG. I myself am more interested in using DNS to resolve phone numbers into URLs, which is why I’m more active in ENUM. I think that I can get all the cap-announcement I need from the URL schemes listed in the answers. It’s pretty simple, really. I don’t plan to lobby to close down CONNEG just because it’s not doing what I want.

Shockey: I do not think you understand what I am stating. The problem of 164 resolution is very complex and cuts to the core of genuine end to end Internet Telephony. I believe it is essential that whatever service is developed MUST permit the caller to resolve the capabilities of the endpoint as well as the end point itself or the service provider (SLP) that can access that endpoint ...and excellent work is being done in CONNEG to define a syntax by which the capabilities of endpoints can be expressed before call setup. Fax, video, advanced voice CODECS’ whatever.

Brown to Petrack : Have you now decided what my purpose for caps is and what protocol fits it? That’s good. So now I don’t have to worry about caps for voice mail, or fax, or wireless, etc.. Either I can dump them all into my nameserver and not worry about TTL or admin or security and anything like that because I guess DNS does it all. Or I can use conneg and my voice mail, or fax, or wireless applications will be able to use it, without worrying about complimentary protocols, real-time response requirements or security. As for the cap-announcement being simple, you must be joking. Sure its easy to buy a ticket to fly on an airplane, but not when the airplane has not yet been built.

But more significantly, let’s not lobby anything yet, please. Let’s just decide our must have requirements and get on with it.

Petrack: Will it make y’all feel better if we change the name or something? Maybe we should call it DENIS - DNS for E.164 to IP mappings. You all may remember that I wanted to call it ENIMA. I am beginning to feel that this is the most appropriate name....

Shockey: I thought ENIMA had it merits.

Petrack: To be less facetious, the process lasting well over a year now has not converged on a way forward. So as a way to get some practical progress, the scope is being intentionally reduced, to get a look at what the DNS solution would look like. That’s all.

Instant Messaging Coordination of People and Devices Becomes Standards Track High Priority Serves as an Enabler for Many New Applications, New Uses of Bandwidth and Intelligent User Agents

Editor's Note: Since 1996 Henning Schulzrinne has been a faculty member at Columbia University in the Department of Computer Sciences and Electrical Engineering. From 1994 to mid 1996 he was previously at the German research institution called GMD Fokers in Berlin. In 1992 and 93 he worked at AT&T Bell Labs which from a legal perspective is now part of Lucent. He still maintains an office there and gets some of his students from there. His current interest is Internet protocols, multimedia and performance evaluation. He devotes most of this time at Columbia to running the Columbia University Internet Real Time Laboratory where he directs about a dozen a Master's and Ph.D. students. About 10 of his students are doctoral students. Some work there full-time and some part-time while employed by other research laboratories such as IBM. IBM, for example, pays their salary and their tuition while academically they're being supervised by Professor Schulzrinne. He is also a member of the Internet Architecture Board. The URL for the Internet Real Time Laboratory web page is <http://www.cs.columbia.edu/~hgs/research/IRT/>

COOK Report: Due in part to the instant messaging working group reorganization at the Pittsburgh IETF in August of 2000, instant messaging has acquired a bit of a buzz lately. I'm beginning to understand that it is a bit more than a significant service being fought over by Microsoft and AOL. Would you begin by explaining what instant messaging is all about from your point of view?

Schulzrinne: When one talks about instant messaging, one is really conflating two separate functions. The first is sometimes referred to as "buddy list" or presence, which is the ability to tell if a person happens to be currently on line. This is primarily relevant for people who use dialog services. It may be used to determine if someone is available to enter into real-time chat. The second and separate application is the message capability. This enables you to send mostly text messages to one or more people whom you have enabled to receive the message while they are online.

COOK Report: As you type it appears in real time on the recipient's screen?

Schulzrinne: Almost. Under the old UNIX

talk program, as I typed in each character, that character would appear on my recipient's screen in real time. Instant messaging is indeed a message service in that I type my entire message and only when I hit return does the message appear almost instantaneously on my recipient's screen.

COOK Report: Therefore I don't suffer the distraction of seeing your message gradually appear on my screen — especially if you're a slow typist?

Schulzrinne: Exactly. There is another somewhat related service. It's a rather old service, although it's still used in quite a bit. It is Internet Relay Chat (IRC). For many years IRC has been an open Internet protocol. It is used primarily in so-called Internet "chat rooms" where groups of people converse with each other. The primary application which makes instant messaging rather different from IRC is that instant messaging tends to be only from one person to another person where the people involved already know each other. So it's a bit different than email and it is not generally used to send a random note to someone from whom you may have gotten a business card.

Why the Interest in Instant Messaging

Instant Messaging seems to be very popular within corporations as a quickie coordination mechanism. For example when I was at a conference in Israel and my student and collaborator Jonathan Rosenberg was in Australia, I had a paper to present that afternoon. We had some last-minute things to do. The paper was in New York. He was in Austria and I was in Israel. By logging into the New York machine, we were able to use an instant messaging application to figure out what to change and how to fix things at the very last minute.

Instant messaging use in corporations now tends to replace a lot of one line e-mail messages. One disadvantage, or, depending on how you look at it, one advantage of the instant messaging exchanges is that no permanent record or archive is left. In this sense instant messaging is also more informal. It certainly is not suitable for message attachments. Also, it only works as long as the

person to whom you are sending remains online. You could spend five minutes composing an answer and should, in the meantime, that person log off, your carefully composed answer vanishes.

COOK Report: Other than being very popular on America Online and being of very intense interest to Microsoft, how would you characterize the reasons for strong interest in the development of protocols and standards elsewhere in the industry? What is driving all this?

Schulzrinne: Instant Messaging is apparently seen as a means of communication which is very important to the people who use it. From a consumer services perspective it likely ranks behind the Web and email as the third major reason by which people justify their Internet usage. Standardization matters because you now have a problem that there are isolated communities where people who use the Yahoo instant messaging client cannot send messages to people who use either the Microsoft or the AOL client. AOL appears to have 90 percent of instant messaging users while the remaining 10% are split between Microsoft, Yahoo, ICQ and Tribal Voice.

While this lack of standardization is not now especially daunting in the U.S., it will also begin to get much more important once more advanced wireless services come into play. You need to be aware of how popular the Short Messaging Service (SMS) is in Europe on the GSM mobile phone. Moreover this popularity exists despite the fact that you have to type in your message with the number keys. On completion these messages are sent instantaneously to another mobile phone with bridges to email also available.

I would not be surprised if these devices become more popular in the U.S. as well and I expect that there will be bridges — even on the just chatting side between mobile devices where composing a quickie one line instant message might be O.K. but where composing a formal email would be overkill. In Europe the Short Messaging Service sends billions and billions of messages — in part because doing so is less disruptive than making a mobile phone call especially since you don't have to worry about reaching the person by voice in the midst of inappropriate circumstances.

it is currently important as a consumer-to-consumer application and to some secondary extent it is starting to be used as a consumer-to-business application. I have heard of a number of technical-support places and a number of consumer mail-order operations which allow users to chat with their sales agents. For example on a Web site you might click on a link and have an instant messaging client pop-up. From the point of view of the provider of the consumer goods this it is more efficient than voice communications because they expect their customer service agents to handle about eight simultaneous chat sessions. To sum things up Instant Messaging is one of those strange sort of applications which is actually more popular with the nontechnical crowd than with your "techies." This has had some undesirable consequences because it meant that this issue did not appear on the radar screens of the IETF folks until very recently.

Possible Uses

COOK Report: Supposing I am the edge chief information officer of a Fortune 500 company and I want to offer Instant Messaging to my company's employees, how do I do this? Do I have to license it from AOL?

Schulzrinne: There seem to be different models out there. One model is that some corporations might just use the ICQ or Yahoo server. This has the implication that you better trust the server to be reasonably secure so that whatever private internal corporate information you exchange does not end up in the wrong place. This is also actually how many of the smaller companies tend to make money. From what I can tell their public chat servers are really an advertising shingle that they hang out there on the public Web and say: "oh by the way if you like this and want to run one internally on your Corporate Intranet, here is where you can send check for the server and we will set this up internally for you." Also it looks to me that Instant Messaging in corporations is not a service that is decided by the CIO. Instead it is something that employees tend to pick up on their own. Someone with in an engineering group says: "this is neat." I have used it at home, and now I can go back and tell all my colleagues about it and my group will begin to use it at work. This seems to be something that is more grassroots, bottom-up driven than something that arrives as the result of a corporate decree.

COOK Report: I've heard the belief expressed that geographically distributed corporate users are likely to be interested in Instant Messaging as a means of reaching out and pinging their colleagues to coordinate the start up of other bandwidth intensive activities such as video and or audio conferencing.

Schulzrinne: For sure this sort of thing will be an activity. This is why I was careful to separate my description into the part that signals presence or availability and the message part. The presence part simply indicates whether or not you're available without really doing anything. It uses heuristics to determine whether you're logged in and whether you have typed anything or not for a specified number of minutes.

Instant Messaging is primarily a first order mechanism. In other words you use it to set off other events. This explains where the interest of those of us on the multimedia side came in. What you can do is set up a number of simultaneous AOL, or whatever type, of presence sessions or messaging sessions. When your group is present, you can start up a completely unrelated application such as a voice-over IP conference call.

COOK Report: Suppose you were working in your Columbia University lab and you had three collaborators in three different parts United States. Could use the system so that the moment all four of you were on line simultaneously it would initiate a voice-over IP conference call between you? It would function like a trip wire to establish your meeting with out any of you having to be consciously aware of the need to do so.

Schulzrinne: I am not aware of software that currently has this capability. But this is exactly one of the services that we are putting into the tool which we are building here at the university as a prototype. Namely as soon as some specified condition is met, the system will call up these specified people. Currently these presence indicators tend to be approximations of reality. For example they generally don't know that someone else might be physically in my office and therefore I may not want to session started automatically. So you need a bit more mediation. The general idea, however, is exactly that. Once you have this kind of integration, it becomes much easier to set up multi-party telephone calls based on the simultaneous presence of a defined set of people.

COOK Report: Are you working on additional capabilities?

Schulzrinne: What we have currently is instant messaging as a text based application. Even if you don't think of it as a call model and view it more as a social kind of thing, it is replaceable by more multimedia oriented means of communication. For example instead of the text based messaging service, you could set up something that functioned in the background as a kind of walky talky service. This wouldn't be anything like a formal telephone call. Rather it would be a means of you saying something every now and then like your transmission on a CB radio to give a listener some idea of what

you're doing, and some sense of where the listener could respond to you.

COOK Report: How about having an instant system turn on Web cams in its users offices?

Schulzrinne: It's possible to do it. But it does raise privacy concerns. For example if you don't want to be able to turn on someone else's camera-at least not without the other person's knowledge of what you are doing.

COOK Report: Could you have a menu that in effect of functions as a protocol where users could specify under what circumstances or at what times they are willing to have their various devices activated?

Schulzrinne: The instant messaging protocol is certainly an enabler for most of these kinds of functionalities that are actually being differentiated on the end user's system. The protocols that are being discussed probably all facilitate this to some extent or other. We believe that when people discover the kind of integration available, they will do more than just send text messages around. For example in Sweden there is a service available for playing joint games like Quake and things of that nature when two would-be players find each other on-line.

COOK Report: In a corporate situation could you have it start a white board? Such that a remote person would also have a white board on his or her screen and could draw something and have it appear on the screen of the originator as well as on the screens of everyone else who had joined the session?

Schulzrinne: Absolutely you could start a white board or some other corporate specific applications such as a modeling program or a project planning application. Whatever application you came up with would be able to use an instant messaging system as a set approach for initiating and managing the interaction of people who need to participate at one time in a given project. It is true that the current expectation of instant messaging is that it tends to be text only and is of somewhat limited applicability. In reality even in the area of personal communication a fair amount of extension beyond just text is possible.

Messaging for Notification of Events

There is also another dimension which I think is interesting to look at. The presence of people is just a special case of a more generic problem — namely that of notifying someone else of the occurrence of an event. Presence is really a proper subset of what some people call event notification.

COOK Report: And some examples of this

would be?

Schulzrinne: There are a number of them. For example I'm working with some people at Telcordia who are interested in using SIP to control things like home appliances: toasters, or light bulbs, or heaters for example. They think of the events in this environment being something like the temperature dropping below 50 degrees Fahrenheit.

COOK Report: In other words I could use this event based spinoff of instant messaging to remotely control devices in my home and be notified when the furnace went on or the front door opened — having that notification appear on the screen of the CRT in my office?

Schulzrinne: Exactly. This is one example and a home-based environment where people do not generate events as to whether they're offline or online, but sensors notify you of events. What you have operating here is a very powerful mechanism for wide area access to your home appliances. These events could also be thought of in the sense of alarms. You might have a sensor that would turn on a Web cam in the event of movement and send a specified alarm to a remote computer screen. In an industrial setting an event that would trigger an instant message might be an increase in the pressure in a boiler beyond a specified level.

If you take the earlier instances of someone's presence and consider it as but another category in an overall catalog of events that can be signaled to a computer on a network as they occur, you end up being able to reuse a very significant amount of software infrastructure. You avoid having to invent say a new system for industrial alarms, a new system for a home events, a new system for finding game buddy's and the new system for finalizing a text drafts.

What I see here is a powerful new enablers. We have something here that fills a gap in the kind of communication capabilities that the Internet has heretofore been unable to offer. We have had instantaneous retrieval in web pages. We have had asynchronous messaging with no immediate feedback in electronic mail. But we have not had this type of more rapid asynchronous communication with time scales measured in seconds rather than in minutes. It is much more of a push mechanism than web page retrieval. And therefore it fills an important ecological niche in our overall group of protocols.

AOL, Microsoft and Instant Messaging

COOK Report: How does the dispute between America Online and Microsoft effect

what we've been talking about a so far with instant messaging? To what extent, if any, has it been responsible for the development of an IETF interest in the standardization of instant messaging?

Schulzrinne: The emergence of instant messaging as one of the primary Internet applications has certainly gotten a lot of people interested. This is very likely the largest Internet application which is strictly proprietary. The web and email are certainly reasonably standardized. Instant messaging suddenly came out of nowhere because its community of users was somewhat different than the technical community out of which the Internet sprung.

COOK Report: Has AOL not licensed the use of their messaging software to anyone?

Schulzrinne: I am not sure what their licensing policy is. They control it rather strictly because I believe it is an important ingredient in maintaining their customer base. You can actually get the software for free and I believe that under nondisclosure you can license the details of it. However AOL places strict restrictions on who can offer their instant messaging software. The result is that in not everyone can just walk up and say "I want to build an AOL compatible system."

The protocol apparently is not that difficult because Microsoft, for example, did not license the technology from AOL but simply reverse engineered it. In doing so Microsoft made their product look like the AOL software. They observed how it functioned on AOL. (There didn't seem to be a lot of encryption going on). In one sense it could be said they didn't really have to reverse engineer the code. Instead they observed how it functioned and built software that emulated its functions.

AOL, for its part, then looked at the Microsoft emulation and tried to figure out where it was less than perfect. These minor differences didn't really have functional implications, for example, I'm guessing now that there might have been an extra space somewhere or a small difference in timing. Nevertheless, they used the differences to examine a messaging package and determine that it was a Microsoft emulation and not a genuine AOL original. When it made such a determination, it then acted to turn off access to from the Microsoft product to it's own software.

However, from the AOL perspective this is not really workable in the long term because eventually they will find something that on the wire looks exactly like their product. As long as they are not using encryption they will be unable to prevent such a product from interconnecting with their own. Still as long as AOL does do explicit licensing, it gives

them some control as to who uses it. AOL is able to say their software is it the "real thing" and contrast it with what they present as an inferior imitation.

I don't know what AOL's revenue model for it is since it is available to people not on AOL and you don't have to be an AOL customer to use it and, as far as I know, it is not advertising driven. Moreover, it is easily available since Netscape, which is now part of AOL, comes with it.

COOK Report: So was it AOL that started it up in the form that it has taken now and got the critical mass going as everyone jumped on the bandwagon?

Schulzrinne: Yes. Except that I don't believe they invented the service. It was always a service that existed on the traditional BBS systems. Now AOL comes out of this heritage. When they went more Internet based, it could be argued that they took instant messaging along with them. It seems to have come very much out of the nonacademic and non technical community.

The IETF Standards Process

COOK Report: What then really happened within about the past year the got it moved into the IETF?

Schulzrinne: A working group was formed within the IMPP group to look at a standards-based protocol for this. The group was so diverse, because in this field people come from very different backgrounds, that effectively no technical progress was made. Realizing this, at the Adelaide IETF we essentially set up a design competition where the first working group and others were or challenged essentially to put up or shut up.

COOK Report: But what else happened? I understand there were two groups set up one led by Marshall Rose and Dave Crocker using Rose's "blocks" proposal and the other led by yourself and Christian Huitema from Microsoft and involving Sip.

Schulzrinne: That is correct. But unfortunately it's even more messy than that. The working group did produce a requirements document that was kind of a motherhood and apple pie compilation of what instant messaging systems should do. That was RFC 2779.

COOK Report: How exactly did you wind up with the design competition? Was this Scott Bradner's idea?

Schulzrinne: Basically the outcome was that the chairs of the working group were informed that their effort wasn't going any-

where. They were told: "Let's see if we can make progress by having a design competition." With the deadline set this channeled new blood into the effort. There was a flurry of activity. By the date of the deadline we had a least seven or eight proposals submitted with it some form of documentation. AOL was among them and submitted an over all architectural wish list. However, they never submitted an actual set of protocol specifications. The other groups submitted something close to complete specifications.

COOK Report: Was there a late June deadline for submitting the proposals with enough time to sort out the ramifications by the Pittsburgh IETF?

Schulzrinne: Yes. A small set of people was chosen to evaluate the proposals. What they came up with was effectively we really don't like any of them but we can't make a choice either. Really a non verdict. After some discussion in order to try to make things more manageable the group found that the proposals fell into three categories: the XPP or blocks-based proposal and then the SIP based proposal which a number of us including Christian Huitema worked on. Within this one, the primary work had started much earlier with a proposal within the SIP working group which Jonathan Rosenberg and I had been working on for some time. Finally there was a whole set of proposals which was called "group two", and which was characterized by a more limited single set of functions for text based presence indication and instant messaging. Since there was nothing basically incompatible in this group of proposals, they were combined into one. As a result, after this winnowing exercise there were three proposals left available for consideration.

I believe that all three proposals would be able to deliver a service that is roughly equivalent to the existing chat and other instant message services that we have today. The three groups have somewhat different design assumptions or starting point. The first one, the blocks proposal, starts out with a lower level infrastructure which they see as a generic mechanism for a number of as-yet-unspecified messaging type applications. They saw instant messaging and presence as a group that they could use for the evaluation of their model. My perception is that this is an attempt to provide a generalized messaging framework which basically allows you to send messages in a way which is roughly (and at a very high level) similar to how email works — just with more expeditious delivery and with no notion that a human is necessarily at the other end.

The proposal is an attempt to take the same model of service, namely a message that is delivered to one or more recipients asynchronously, and apply it to a set of applications

rather than just layering it on top of email. The approach is interested in taking the messaging services and making them available as an integral part of our infrastructure to other applications. The framework itself is very much still being defined and far from being finished.

From what I can tell there are a number of details as well as a number of more fundamental issues being worked upon simultaneously. The working group for XPP meant only for the second time in Pittsburgh. The underlying infrastructure is still very much being defined as to whether it will run on TCP, which is the initial target, or to see whether it should also run on UDP. In that sense much of the underlying infrastructure still has scaffolding on it and I don't think anyone would claim that it is either finished, ready, or tested. They still view it largely as a standing application and are not too concerned about integrating it with anything else. They say in effect we have this emerging blocks tool set which may be useful and let's see what things look like when we apply it to instant messaging.

The SIP Instant Messaging Approach

COOK Report: What then is the SIP approach being taken by yourself and Christian Huitema?

Schulzrinne: Our approach came from a notion that we see messaging in the more generic sense of event notification and that we see a signaling system consisting of a push part and a pull part if you like. The push part comes in where you call me on the phone to find out if I'm available. The phone rings and either I pick up or I don't. The pull part would be when I tell you, just in case you wanted to know, whether I'm available to talk or not. These two are mirror images of each other and thus it makes sense for them to be provided within a similar overall signaling framework that includes the ability to reach end systems.

COOK Report: Presumably this is where SIP comes in?

Schulzrinne: Exactly. This is where SIP comes in because it already provides functionality which we consider useful in this context.

COOK Report: So the intent would be to bring new functionality in where the old way of doing it would be merely to find out whether someone was on line or not? And in contrast, what you are developing goes well beyond the issue of whether you are on line or not. If it finds it that you are not, it will reach out and talk to your machine in order to try to get more information as to

where you are?

Schulzrinne: Yes. One of the abilities that SIP has is this finding ability. And unlike traditional messaging protocol's it is designed to have entities in the network which are needed to locate you in the event of a telephone call. In locating you it will ask that you send me a message as to when you will be available. The person asking to be notified (the subscriber) and the person or object doing the notifying (the notifier) can effectively move around. So you would not subscribe effectively to a piece of hardware or an IP address. Rather you subscribe to a person. As long as the network knows through some registration system where the person might be, it will find you, that is as long as you are willing to allow yourself to be found.

COOK Report: So this would allow potential users to do what? Register the machines that they use? Put in a schedule? When you say it can reach out and find someone just exactly how would it do this?

Schulzrinne: Let me give me an example. Say that you are described as cook@cookreport.com. That would be your published e-mail address for example. In SIP we use e-mail addresses so that your telephone, instant messaging presence, and e-mail identifier would, in almost all cases, be the same. The idea here would be that you would register to receive calls or notifications or to be subscribed to mail, messaging and telephone. All of this works pretty much through the same infrastructure. That is regardless of which ISP you happen to be using, I would register with my designated externally visible address — in your case cook@cookreport.com. Your registration would be held on a server that would be the definitive repository of your whereabouts. Doing this would allow you to be in several places logically speaking at once. For example you could both have your home phone and your office phone registered with your identifier. When you had an incoming call the server would see that both office phone and home phone rang simultaneously and whichever phone was picked up first would receive the actual call.

COOK Report: So might this be something like a GUI interface on a Web browser where a user might fill in, a month in advance, what he thinks is scheduled to be?

Call Processing Language

Schulzrinne: Almost. This would be handled not by our SIP instant messaging client but rather by our Call Processing Language (CPL) which would enable you to do precisely that sort of thing. This works as a

language that you upload to the server. Although as a user you would not know you were doing this. It would be exported from your calendar and would pick up from the calendar the necessary e-mail addresses and telephone numbers. It would work so that if you are staying with a friend, you could put in your calendar an entry that: on Saturday I am going to be at such and such a place. You would give your friend's phone number in the IP address of the phone. Using the call processing language you would apply the results to the server. Then when a request comes into server to talk to cook@cookreport it would check its listing for you and say: oh today he can be found at such and such IP address. It would forward the incoming call to your friend's house and, just in case you weren't there, it would ring your home phone as well. Thus either manually or by some logic that is generated by some explicit specification or derived from things like calendars, you are routing incoming calls, or the incoming messages in general to a variety of places. In the case of voice communication, if there are gateways available, this can be regular telephone numbers or advanced telephone devices.

So the power of using SIP not for a just an "I call you up mode" but also for an "I notify you when I'm available mode," and an "I want to find out when you are available in order to subscribe to" mode means that all of these messages are handled by the same infrastructure.

COOK Report: What do you mean by the same infrastructure?

Schulzrinne: We mean the same set of software or so-called proxy servers. You can think of those as being cousins of your SMTP server. They are similar in where they are likely to be installed. For example at ISPs and at large institutions and in some departments of large corporations and so on. They have a similar functionality in that they do a form of generic message routing. In a sense they're more dynamic than a mail server where your mail ends up and forces you to go to the server to pick it up from wherever you might be. The idea in our work on instant messaging using SIP is that the message routing can be much more dynamic and follow you around in the sense that you can tell messages to go dynamically to your and system rather than waiting to be picked up. With e-mail you pick up whenever you want to.

The work that we are doing is designed for messages that are meant to be picked up in close to real time in the sense that you're actually there when it happens. You want to get the phone call now and not be told about an hour after it comes in. The model is related to email but functionality and require-

ments are somewhat different. The speed of delivery is measured in hundreds of milliseconds instead of minutes. It is instant with the idea that the other side is already there rather than asynchronous and that I send a message and you may pick it up two minutes or two days later.

COOK Report: So you have some functionality in here that would be very attractive to people in commercial environments and, because not everyone uses the same hardware and software, standardization becomes important if this technology is to be universally usable.

Infrastructure with a Billion Users

Schulzrinne: That's true and we're also interested in the integration possibilities since SIP is likely to be used as the system for call setup (finding a person) in the third generation wireless systems. We see this as a central functionality which we want to leverage across related activities (call setup, subscription, and modifications). We see having a central infrastructure as being much easier to manage and provision than having separate infrastructures for different tasks. This is where we're coming from. We said we will have a very large set of infrastructures, especially, if as we expect, the next generation wireless systems will all use SIP internally, we will have an infrastructure with a billion users on it. We might as well leverage this infrastructure since the proxies do not have to be upgraded in all in order to have this functionality.

Consequently a proxy does not even have to be aware that instant messaging or presence is going on. Therefore a proxy built today will be a perfectly capable router of subscriptions and notifications regardless of what happens to its details in the future. To us, this capability opens up an avenue for integration which hopefully will lead to lots of interesting new services.

COOK Report: A question about the Microsoft environment. I understand it has instant messaging and something called Net Meeting as well that is used for setting up a voice-over IP sessions. I understand that Christian Huitema moved from Telcordia to Microsoft about six or nine months with the objective of taking control of Microsoft's Net Meeting and Instant Messaging and getting them ready to be replaced by what ever comes out of standardization effort. Are you willing to comment on this?

Schulzrinne: While I am obviously not a party to internal Microsoft product discussions, I can say that indeed Christian moved to Microsoft with that topic area as part of his portfolio. And Microsoft has publicly

stated at a Voice on the Net conference that took place earlier this summer that it will be supporting SIP in various different ways without however making any specific product announcements.

COOK Report: If these capabilities are being developed, is it reasonable conclusion that Microsoft would benefit by incorporating them?

Schulzrinne: Yes. There are a number of companies going in that direction. There is a company called "Hear me" which is, at this point, engaging more in the traditional voice-chat environment. It is implementing a SIP-based non proprietary mechanism. So SIP is clearly happening not just in the voice-over IP area or in the traditional conferencing area that is encompassed by Net Meeting, but it is also happening in the voice-chat area which is a somewhat separate small sub area that is a more informal, more walkie talkie style if you like, kind of application. This is definitely occurring and one can only imagine that major software vendors would have an interest in participating in that. Everyone benefits in the end by not having isolated communities and having users have to download half a dozen different applications to participate, even if the applications are free. Benefits will come not by trying to keep the pipe sizes different but by adding services to a uniform "pipe" or standard.

Progress of the Standards Process

COOK Report: If you're looking at the future, can you give me an idea of what your schedule looks like to conclude your activities? Do you think things will go smoothly, or are there any significant areas where you have important problems to surmount?

Schulzrinne: I believe that we have now a basic infrastructure in place to provide capable instant messaging services. Areas of future work include extending to non personal presence for home appliances or industrial applications the type of the events which we have just discussed. But this is really not so much of protocol issue. Rather it is more a case of deciding that these are going to be expressed as XML GTLDs which are going to be specific to particular domain of application. For example chemical factories will have different needs than most households. They will probably have different descriptions of their states and events, but they can be carried in the same protocol and therefore some amount of effort needs to be put into describing possibly nonhuman events.

There is also an effort to describe how the Call Processing Language can be extended

to handle subscriptions and notifications that are more specific to the service itself. For example you might allow someone to subscribe to your presence in order to be able to ascertain it, but you may not allow that person to call you at midnight. You might therefore want to be able to distinguish between two such actions. This is the type of thing that the Call Processing Language is supposed to be doing and that still needs to be worked out.

The basic instant messaging mechanism is complete and are a number of implementation methods on going. At the last bake off there were two independent implementations. We are working in the third one. I am sure there are others who are working on it without necessarily telling everyone about it. We found we can build workable systems and, as always, there will be extensions to these systems as people find out what new services are wanted.

COOK Report: So is it accurate to say now that you have a completed specification and what you are doing is really working on implementations?

Schulzrinne: Yes. I would say there's not really much of an issue about a maturity of a specification. We really don't have a whole lot of open issues. It is really more a question of deciding where this whole effort is on going inside the IETF. SIP based instant messaging depends, as to whether it can go to proposed standard and first implementation step, on what actions the IETF area directors and the IESG decides internally to take. One suggestion has been to decide whether it makes sense to form separate working groups to basically finalize two or three of the proposals. And then basically let the market decide which one to use.

Now there has been a joint draft put out by the representatives of each one of these proposals explaining how interworking between these proposals could work in the marketplace. Even under the worst case assumption that all three proposals progress, we will be a much better situation than we are today. This will be true because, even though people use different protocols which is somewhat inconvenient, they still can use, across the protocol communities, at least the common intersection of the services between the three which will be basic instant messaging and presence. So this is work which still needs to be fleshed out in some of its nitty gritty details. This is one possible outcome.

Therefore it is a little bit early to speak about the standardization schedule for any one proposal because this schedule depends a bit more on the macro level discussions as to where things are supposed to be going — all of which seems to be less than clear at this point.

What is happening is that the leadership of the Instant Messaging and Presence Protocol (IMPP) working group will likely change. This was the original chartered working group. Different leadership for this group will hopefully lead to a resolution on which way to progress. There are a number of conceivable avenues, one of which is to have the Area Director deputize representatives and a bang together a sufficient number of heads until to the proposals give up or merge somehow. Let me say this outcome is purely hypothetical. What I see as more realistic is that since the assumptions underlying the three proposals are very different, two or three of the proposals move forward as independent working groups. What will then happen is that, after some time, it will become clear whether anyone outside the working groups actually cares about the output of the working group. In other words it is possible that one or more of the working groups will wither from actual lack of outside input. Or we might find that the working group can produce a spec in a reasonable amount of time and had people actually began to implement it. So if it turns out to be a full-fledged battle in the marketplace, it may simply be a matter of finding out who is most efficiently motivated to push the work forward.

ENUM Continued from page 10

Shockey: Well I don't think the scope should be reduced without proper discussion or debate. This is just too damn important. Scott... you have delayed firing up ENUM for perfectly logical reasons. Many other WG's were developing tangential work that directly impacted this work. You are quite correct in bringing this forward now. It's just that I do not like the proposed charter restrictions you suggest.... BTW I trust you are going to post a new revised charter that reflects your current position????

Brown to Petrack: Instead of railroading a protocol, which I pretty sure has been obvious to everyone on this list from the very beginning, why have you not focused on the first step, requirements? Now that consensus could not be met to use DNS, it being made as THE charter. Good due process. And the IESG backs you up on this.

Petrack: BTW, I do not consider debating requirements for another year to be a way forward either. Please feel free to pursue this activity in another mailing list, however. When you are done, it may be that the ENUM solution fits those requirements, or it may be that it does not.

Shockey: Scott ... I'm not going to let that pass. You delayed the discussion of this issue. It has not been put forward properly. You are perfectly aware of how WG are chartered and how their operations should progress. You are defining the solution before the problem has been correctly stated.

Petrack: Directories are a hard hard problem to deal with. It may be that the solution that comes out of ENUM will not be a complete replacement for X.500. I am willing to take this risk. The question is: what is the telephone-number resolution service that we can get out of the DNS? That is what we are being chartered to discover. Other questions are interesting, but they are not ENUM.

Shockey: The WG will determine that.

Brown to Petrack: Who the heck is talking about replacing X.500? And why the heck are we taking DNS at all? Oh right, I forget. The IESG has decided that the protocol shall be DNS. Only for this WG, you say? Perhaps the IESG will allow us to set up another WG to develop requirements? And since we would want to do it right, we would HAVE TO include DNS. Do you suppose the IESG will allow two WGs working on the same solution? Or would we be then at a point where we would just re-use what ENUM comes up with, even if it does not meet our requirements (requirements that did not exclude other protocols beside DNS).

Petrack: I think that there is every hope from the IESG that all interested experts will come and discuss the use of DNS for telephone number resolution. Who knows, maybe we will benefit from such a technical discussion?

Brown: It is my hope that the IESG will allow this WG to properly develop a set of requirements. If DNS is the solution, excellent. But I have a problem with this process.

Petrack: Unless I am contradicted by higher authorities, I consider that I have been really clear on this subject. I don't intend to try to explain myself again.

Shockey: Scott I'm not trying to be an ass about this but I have some serious process problems here and I want to see them fully resolved before this work moves forward.

Brown to Petrack: If you are supported by higher authorities, then I'll continue to attend your group and contribute to the work towards a DNS solution. Do you, however, see the problem here? If we start another group, we will be working on the same problem and may come up with divergent solutions. If the IESG makes us wait for ENUM work to finish before we can begin the non-partisan component, well, time-to-market aside, the IESG will have effectively railroaded a DNS solution. If the IESG prevents us from starting up another group altogether, then DNS is definitely being pushed. Are you, as the group leader, OK with this? Are you content that we are doing the RIGHT THING? Are you happy to not have to work on a non-biased requirements document in case something other than DNS is required? If the IESG thinks that DNS is the right solution, why not put it to test in a requirements document? Do you have a suggestion on how we could progress an honest-to-goodness non-religious solution to mapping E.164 for Internet-based applications in the IETF?

Commerce Department Formation of ICANN Seen as Illegal End Run Around the Administrative Procedures Act and the United States Constitution

Michael Froomkin's Findings to Be Published in Duke Law Journal - Lawrence Lessig Lauds Froomkin's Creation of Framework that Could Force Reform

Since the Internet is decentralized and controlled at the edge, the only tool offering the hope of affecting control of the entire Internet has been the DNS. Without a fully functional DNS the Internet is unusable. Control of the DNS hierarchy starts with control single global root relied upon by the 13 global root servers to enable users to get to the globally unique destinations they wish to reach. Control over the sole authoritative root is the only thing that in a broadly misunderstood effort to privatize the DNS, that the US government has not yet given to ICANN.

For almost four years the *COOK Report* has chronicled the unfolding struggle for control of the DNS and the root. A struggle that for the last two years has been focused on ICANN. The rise of ICANN is a story of hideous complexity. Most people without vested interests in ICANN's success have turned away in dismay as they observe its arbitrary acts, arrogant behavior and Byzantine structure. It leaves the lay person with a gut level sense that something is horribly wrong. But it is difficult for such a person to articulate with clarity precisely what is wrong and why it is wrong. The reason is that until now there has been no road map that identifies with precision what went wrong. At long last, University of Miami law professor Michael Froomkin has provided this road map in a landmark paper: "Wrong Turn in Cyperspace: Using ICANN to Route Around the APA and the Constitution" to be published by the *Duke University Law Journal*, October 2000, Volume 50, No. 1. The printer is expected to deliver the physical copies themselves before December 1, 2000. The article will be available of the Law Review web pages. The penultimate draft was placed at <http://www.law.miami.edu/~froomkin/articles/icann1.pdf> on October 16, 2000.

What follows is our attempt to distill the essential chain or arguments in this mammoth 166 page and 711 footnote long paper. We do so because we believe that the question of what happens to ICANN will be possibly the most important legal issue of the new decade. If this ICANN succeeds, there will be others to follow. Therefore we suggest that the determination of ICANN's fate is a decision that will impact whether we live in a nation state with a legal system ac-

countable to individual citizens or a corporatist state that is run on behalf of the private profits of global corporations. If it is the latter we will find that we have given up the critical philosophical foundation on which our nation was built. That our government exists first and foremost to preserve and protect the rights of each of its citizens.

Instead of holding these rights sacred, our government has taken the example set by Esther Dyson and Mike Roberts in their "leadership" of ICANN to make clear the insidious nature of the attraction of the Clinton WTO mantra of self-regulation for those internet players involved in content and intellectual property. Here self-regulation is self-dealing and constant conflict of interest. Here the purpose of the self-regulation is to avoid government responsibility for the due process rights of the little guy. Self-regulation of the physical network has so far worked adequately. However, ICANN's self-regulation of the DNS on behalf of trademark holders is a self-serving attempt to pretend that conflict of interest can be wished away and that a century or more of American administrative law is no longer meaningful. The administration's self-regulation propaganda will continue to prevail only if the legal system of the United

The October issue of the Law Journal is devoted to the law school's thirtieth annual symposium on administrative law. This symposium was dedicated to understanding the issues presented by ICANN. In addition to the Froomkin article it contains an Introduction by Professor James Boyle of Duke University School of Law and a second article "ICANN and the Problem of Legitimacy by Professor Jonathan Weinberg of Wayne State University. When we asked Professor Weinberg for a very brief summary of his article he responded: "The article examines three ways in which ICANN has sought to establish its own legitimacy. It concludes that neither ICANN's adoption of the trappings of an administrative agency, nor its adoption of structures that make it resemble a representative (that is to say, elective) government body, nor its invocation of "Internet consensus," are successful in supplying legitimacy."

States begins to enfranchise only corporations and confiscates what used to be rights of citizens.

Froomkin has looked at the creation of ICANN and has carefully crafted an explanation of why the creation of ICANN by the Department of Commerce violates American law. This article will summarize his chain of reasoning. In so doing it will seek to disseminate more widely an articulation of why ICANN's ascendancy can and should be challenged. We believe that it is very important to use Froomkin's compelling insights to educate both citizens and the executive and legislative branches of the US government. We need to understand quickly what has happened and why we should "be afraid." Out of such education it is to be hoped that legal or legislative redress may be found.

ICANN is preparing to grant new gTLD franchises to powerful corporate and international agency applications. Once these are in place it is difficult to imagine a successful challenge to what has been done on ICANN's behalf. Individual and small business users of the internet need to be grateful to Professor Froomkin for his research and to the Duke University Law Review for its publication of this extraordinarily important article.

Editor's Note: This article is based on the draft of September 27, 2000. The article has been under going continuous revision since then. A check of most of our quoted passages shows no significant change between the draft of September 27 and that of October 16, which except for some cross correlation of footnotes to be done by the Duke Law Journal editors is final.]

DoC ICANN Violates Either APA Or the Constitution

Froomkin's indictment in his opening paragraph is succinct: "*The United States government is managing a critical portion of the Internet's infrastructure in violation of the Administrative Procedures Act (APA) and the Constitution. For almost two years the*

Internet Corporation for Assigned Names and Numbers (ICANN) has been making domain name policy under contract with the Department of Commerce (DoC). ICANN is formally a private non-profit California corporation created, in response to a summoning by U.S. government officials, to take regulatory actions that the Department of Commerce was unable or unwilling to take directly. If the U.S. government is laundering its policy making through ICANN, it violates the APA; if ICANN is in fact independent, then the federal government's decision to have ICANN manage a public resource of such importance, and to allow - indeed, require - it to enforce regulatory conditions on users of that resource, violates the non-delegation doctrine of the U.S. Constitution. In either case, the relationship violates basic norms of due process and public policy designed to ensure that federal power is exercised responsibly."

He assumes that the Department of Commerce was serious when, in response to presidential directive in the summer of 1997, it talked about rule making. However when the Green Paper of late January 1998 was poorly received in Europe the Department of Commerce changed its course and authored what became known as the White Paper policy statement in early June 1998. Froomkin correctly characterizes this White Paper policy as: "Abandoning earlier hopes of issuing a substantive rule, which requires statutory authorization and is subject to judicial review, the policy statement instead set out goals that the administration thought could be achieved without rulemaking."

At the end of November of 1998, the Department of Commerce signed a Memorandum of Understanding with ICANN indicating the two would seek to work together to carry out the goals of the White Paper.

Evading Notice, Comment, Due Process and Judicial Review

One of ICANN's most significant acts has been its imposition of the Uniform Dispute Resolution Policy (UDRP). Froomkin points out that DoC has in some cases covered up what he later shows to be policy making by ICANN as if "they were matters of contract" falling "outside the rulemaking strictures of the Administrative Procedure Act." In other cases he finds that the DoC treats ICANN as "an arm's-length private body exercising autonomous choices that could take effect spontaneously, without DoC's participation or responsibility. DoC has thus made, or acquiesced in ICANN's making, via research contracts rather than agency adjudication or rulemaking, some of the most important decisions relating to the near-term future of

the Internet thus evading notice, comment, due process, and judicial review."

Froomkin suggests that arguments for privatization are often made on grounds of economic efficiency. In this case however "rather than privatizing a revenue-generating function, the government is privatizing a policy-generating function and because the privatization is subject to sufficient strings to make ICANN's actions fairly chargeable to the government." He correctly points out that not enough is known about the details of how much authority the DoC exerts to enable one to ascertain whether DoC tells ICANN what it must do in deciding matters of policy. If this is the case Froomkin finds that "DoC's use of ICANN to make rules violates the APA."

There follows a powerful paragraph that deserves quotation in full: "There is substantial evidence, discussed below, that DoC has directly instructed ICANN on policy matters. Furthermore, as ICANN is utterly dependent on DoC for ICANN's continuing authority, funding, and indeed its reason for being, it would be reasonable to conclude that the corporation is currently so captive that all of ICANN's decisions can fairly be charged to the government. If so, the DNS has not in fact been privatized at all, even temporarily. At least in cases where ICANN does what DoC tells it, and arguably in all cases, DoC's use of a private corporation to implement policy decisions represents an end run around the APA and the Constitution. To the extent that DoC launders its policy choices through a catspaw, the public's right to notice and meaningful comment, to accountable decision-making, to due process, and to protection against arbitrary and capricious policy choices, self-dealing or ex parte proceedings are all attenuated or eliminated; so too is the prospect of any meaningful judicial review. The result is precisely the type of illegitimate agency decision-making that modern administrative law claims to be most anxious to prevent."

Delegation of Public Power to Private Groups Ensures No Accountability

The only logical choice to make if one believes that DoC does not dictate policy decisions to ICANN is that it has decided to allow ICANN to make its own decisions. If this is the case Froomkin finds that DoC "violates an even more fundamental public policy against the arbitrary exercise of public power, the constitutional doctrine prohibiting the delegation of public power to private groups. Most famously expounded in two pre New Deal cases, *Carter v. Carter Coal Co.* and *A.L.A. Schechter Poultry Corp.*

v. United States, the private non-delegation doctrine focuses on the dangers of arbitrariness, lack of due process, and self-dealing when private parties are given the use unaccountable private body that many feel has already abused its authority in at least small ways and is indisputably capable of abusing it in big ways, and nearly (but, as argued below, not quite) eliminated the possibilities for judicial review of critical decisions regarding the DNS. So far, ICANN appears to be accountable to no one except the DoC itself, a department with a strong vested interest in declaring its DNS 'privatization' policy to be a success."

ICANN suffers virtually no constraints in what it does. It is not constrained by the due process, public review and comment procedures designed to ensure the accountability of government administrative agencies. While the actions of corporations are restrained by competitors and shareholders, ICANN has no competitors and because it is non profit, no shareholders. While many non profits have members who can challenge misbehavior, ICANN has gone to great lengths to deny its members the redress that they would normally have available to them under the California public benefits corporation statute by which they are incorporated. While most non profits are restrained in their ability to raise funds, ICANN has turned its DNS registration franchises into sources of substantial income and with ICANN's recent fund-raising tactic of charging substantial fees for reviewing new top level domain applications, ICANN is getting even more funding.

Froomkin concludes: "The result is a body that to date has been subject to minimal accountability. Only the Department of Commerce (and in one special set of cases NSI or its registry) currently has the power to hold ICANN to account. NSI currently has no incentive to use its limited power and DoC has nothing to complain of so long as ICANN is executing the instructions set out in the White Paper. The accountability gap will get worse if DoC gives full control of the DNS to ICANN."

Froomkin examines in detail the question of whether ICANN is engaged in rule making in carrying out its DNS policy. He finds that "if ICANN is engaged in policy-making, and if DoC is reviewing these decisions, and retains the authority to countermand them, then DoC's adoption of or approval of ICANN's regulatory and policy decisions are subject the APA."

"If, on the other hand, ICANN is engaged in policy-making and DoC does not retain the power to countermand ICANN's decisions, then DoC has delegated rulemaking and policymaking power to ICANN. This probably violates the APA since it was done without a proper rulemaking; regardless of

the applicability of the APA, it violates the Due Process Clause and the non-delegation doctrine of the U.S. Constitution, as well as basic public policy norms designed to hold agencies and officials accountable for their use of public power.”

Froomkin finds that “since ICANN’s Board and staff operate largely in secret, it is difficult for outsiders to know how much influence the DoC has over ICANN’s decision making. As a result, the statutory and constitutional arguments in this paper are presented in the alternative. The two arguments are very closely related, however, in that both rely on legal doctrines designed to promote accountability and prevent the arbitrary exercise of government power.”

The DoC ICANN Defence: Private Party

Froomkin explains how DoC and ICANN defend themselves against his charges: DoC claims that ICANN is a private party operating at arm’s length removal from DoC and that ICANN is a standards setting rather than a policy making body. Government agencies are forced by the Administrative Procedure Act to pay attention to due process concerns designed to see that citizens do not suffer from the arbitrary use of government power. DoC argues that because ICANN is a private corporation it is not bound by the APA.

Froomkin’s rebuttal is vigorous and correct: “In fact, as detailed below, ICANN’s relationship to DoC is nothing like the arm’s length relationship suggested by the private party story. Although ICANN is private, it is no ordinary corporation, and its relationship with DoC is highly unusual. ICANN is totally beholden to DoC for its creation, its initial policies, and especially DoC’s loan of control over the root. This control over the root is the sole basis of ICANN’s relevance, power and financing, and DoC can take it away on 120 days notice. More than anything, ICANN seeks to achieve permanent and perhaps irrevocable control of the root when the current MoU expires. DoC has some control over ICANN through the stick of the MoU, but the real control comes from the carrot. ICANN’s ability to retain or expand its control over the root is entirely at DoC’s discretion.”

Froomkin explains three reasons why DoC cannot be considered to have an arm’s length relationship with ICANN. First ICANN does not have the authority to create a new TLD without DoC approval. Neither NSI may change the content of the root without written DoC approval. “Second, DoC’s retention of the power to take control of the root away from ICANN is of enormous significance, as it forces ICANN to be exquis-

itely conscious of DoC’s requirements. If ICANN fails to meet DoC’s expectations, DoC can choose another body to replace ICANN. All of the relevant agreements provide that if DoC recognizes another entity as ‘NewCo’ in ICANN’s place, then the obligations to ICANN in those agreements immediately terminate. “Froomkin continues “ICANN’s only reason for existence, and the sole source of its power over the DNS is that the thirteen root servers treat it as authoritative, and that the government instructed NSI, another contractor, to both defer to ICANN’s policy and to pay it money. The root servers recognize ICANN only because DoC signed an MoU with ICANN and announced that ICANN is the relevant authority. Were the U.S. government to transfer its recognition to another authority, the root servers would be under no more legal obligation to recognize that new authority than they were to recognize ICANN, but their move is all but certain. So long as the root servers recognize ICANN’s authority, ICANN is able to dictate contractual terms to registries and registrars who wish to be included in the legacy root. By dictating terms to registrars, ICANN can also enforce terms on registrants, since ICANN can (and does) require that registrars include standard terms in contracts with registrants.”

“Third, DoC and ICANN have a warm and cooperative relationship, although whether that relationship is best characterized as a partnership, master-servant, or self-regulatory body and supervising agency is hard to discern. Whatever the precise nature of the relationship, it certainly is not arm’s-length. In particular, it cannot reasonably be characterized as DoC calling ICANN into being, signing an MoU with it to give it authority, and letting it go off on its own.”

Standards Making

Since ICANN is not a private arm’s length entity free to adopt its own policy, Froomkin next explains why Dyson, Roberts and Sims always go to such lengths to claim that ICANN does nothing more than technical coordination. If this were true then ICANN would be only a standards setting body and Froomkin points out that there is substantial legal precedent for the federal government to grant standards setting authority to private corporations. As Froomkin puts it those who defend ICANN say: “ICANN does not do ‘policy’; if there was any policy to be done (DoC is a little vague on this), it was done in the White Paper—a statement of policy. And ICANN most certainly does not do ‘regulation’ or ‘governance’. ICANN is at most implementing the key pieces of the White Paper policy - privatization, Internet stability, increasing competition, bottom-up coordination.” He continues: “if it were true that ICANN was limited to “technical coordination” that would rebut the claim of an

unconstitutional delegation of power. In fact, as detailed below, the standard setting story ignores reality. While some of what ICANN does can fairly be characterized as standard-setting, key decisions would certainly have been rule making if done directly by DoC, and remain regulatory even when conducted by its proxy [ICANN].”

Avoiding All Accountability

Later in his paper Froomkin finds that “DoC is not the first agency to seek to use the corporate form or to create a private corporation to achieve desired ends. The Government Corporation Control Act (GCCA) is Congresses most comprehensive modern attempt to define when and how federal officials may use private corporations for public purposes.” He then notes that corporations by the executive branch ‘to act as an agency’ without specific legal authorization.” A page later Froomkin notes that the GAO’s General Counsel in its examination of the FCC’s creation of the Schools and Libraries Corporation and the Rural Health Care Corporation dismissed the idea that either organization was independent of the FCC by stating that the GCCA “prohibits an agency from creating or causing the creator of a corporation to carry out government programs without explicit statutory authorization.” In short one way that ICANN could be created outside the constraints placed by the Government Corporation Control Act was for the DoC to decide to publish the White Paper as a “formally non-binding policy statement.” Doing this appeared “to be a successful end-run around the GCCA - which suggests that the GCCA may need amendment.” For Froomkin concludes: “By calling for NewCo to form ‘spontaneously’ government officials avoided directly creating the corporation.” In doing so they avoided the accountability that the GCCA would have brought to ICANN.

Under a heading called “Structural Failures / self-dealing” and a sub heading of “Time” the Froomkin draft states: “ICANN’s structure taxes time as well as money. The profusion of constituencies, working groups, ad hoc committees and the like means that only those with an enormous amount of time to devote to ICANN issues can stay abreast of every developing ‘consensus’ policy. In practice, those who can afford to pay someone to represent them - predominantly commercial interests who hire lawyers or delegate managers to be their spokespersons - are able to dominate. Un-organized groups such as users or small businesses must rely on volunteers, and tend to be outnumbered in committee.”

On the following page Froomkin adds: “For

an entity designed to make rules relating to the Internet, ICANN and its subsidiaries seem oddly dependant on attendance at physical meetings. Because ICANN sees itself as global, its meetings are peripatetic. This policy, which has the advantage of making it more possible for geographically disparate groups to attend the occasional Board meeting also makes consistent participation by those without substantial expense accounts impossible. People who cannot attend meetings of the Board are able to take part in debates in only the most limited and derivative way - the few remote comments read to the meeting are filtered and edited by the readers, as contrasted to attendees who queue for a microphone and can say whatever they like." So much for the public notice and comment rule-making procedures of the APA.

Beware— More ICANNs to Come

"The issue then is whether an attempt to vest power in an agency or a private body is constitutional. In the case of ICANN, there is no statute. Congress at no time determined that the DNS should be privatized, or indeed legislated anything about national DNS policy. Instead, DoC itself chose to delegate the DNS functions to ICANN, relying on its general authority to enter into contracts. ICANN is also a very unusual corporation. There are many government contractors, both profit-making and non-profit. But it is unusual for a nonprofit corporation to be created for the express purpose of taking over a government policy-making function."

"There is a danger, however, that ICANN may not be unique for long. One administration spokesman has already suggested that ICANN should be a model for regulation of other Internet-related issues such as accreditation standards for distance learning, and e-commerce over business-to-business "closed" networks." [Froomkin cites: DoC General Counsel Andrew Pincus, Remarks at the Meeting of the Bar of the District of Columbia (Apr. 25, 2000); see also Brian Krebs, Regulators Would Do Well To Mimic ICANN - White House (visited Aug. 18, 2000) <<http://www.newsbytes.com/pubNews/00/148011.html>>] Froomkin continues; "The specter of a series of ICANN clones in the U.S. or in cyberspace should give one pause, because ICANN is a very bad model, one that undermines the process values that motivate both the APA and the due process clause of the Constitution."

Toward the end of his paper Froomkin returns to this theme: "For all of its problems, ICANN commands substantial support, and not all of it from the stakeholders who dominate it. Many believe that the need for some

sort of management of the DNS is so pressing that, until they see a viable alternative, ICANN is the only game in town (others, who wish to preserve the status quo as long as possible, may see ICANN as the least bad way of blocking change). To many of the participants in the DNS wars, especially old ICANN hands imbued with the libertarian traditions of the founders of the Internet, anything that takes power away from government is presumptively, and sometimes irrebuttably, better than a governmental solution."

"These views are mistaken, if only because there is more at stake here than the Internet. Even if ICANN were thought to be a good thing, [seeing it just in the context of] a narrow focus on the Internet ignores the pernicious effect of ICANN on the U.S. government itself and on our democracy for there is a real danger that ICANN will not be a fluke, but will be used a model for additional erosions of responsible government. DoC's use of ICANN undermines accountability. Every government power must be exercised in accordance with law and with the Constitution. But ICANN is a private non-profit California corporation; unless it is a government actor or advisory committee, neither the APA nor the Constitution apply to it.

The APA and the Constitution apply to DoC, however, and this is where the main violation of law is to be found. Allowing DoC to use ICANN to make non-technical policy decisions violates basic norms of governance and accountability. DoC cannot quasi-privatize the DNS in a manner that allows the US to retain ultimate control of the root zone file but achieve deniability about everything that its agent or delegate does with day to day control. Depending on one's view of the DoC-ICANN relationship, the violation may be a failure to make a general and prospective rule in conformity with the APA's procedural requirements, or it may be the delegation of so much control to ICANN that it violates the Carter Coal doctrine [of non-delegation of public functions without congressional authorization] under the guise of technical standard setting." Additionally, the DoC-ICANN alliance is an endrun by the federal executive branch which circumvents the role and oversight of the federal congressional and federal judiciary functions.

ICANN's Choice of New TLD's Not a Technical Matter

Given that ICANN has received 47 applications for more than 100 new TLDs ICANN is likely to find that as Froomkin says "there are more technically qualified applicants for new gTLDs than ICANN wishes to create, and ICANN chooses among them based on some idea of the 'quality' or 'usefulness' of

the proposed gTLD, or the extent to which the applicant promises to enact social policies such as privacy or trademark protection, then ICANN will have clearly crossed the line into making social rather than technical policy. It cannot seriously be suggested that choosing whether the world is better served by ".banc," ".shop," or ".xxx" is an issue with any "technical" content whatsoever. This is a question of social and political import only, the technical issues are identical whatever a TLD happens to be called. As such, the selection among technically qualified applicants on social merit is an adjudication that DoC cannot delegate to ICANN so long as the DNS remains in DoC's ultimate control."

Froomkin shows some approaches that might be made toward correcting the travesty of justice that ICANN has become. He concludes: "If the current quasi-privatization of the DNS is illegal, then DoC needs a new policy to deal with the DNS. (Indeed, I am certain that uncertainty as to how to answer the question, "If not ICANN, then what?" is an important part of the reason why opposition to ICANN has yet to reach critical mass.) DoC has at least four options."

Having promised Professor Froomkin that we'd stop here we refer our readers to the concluding pages of his article - available we hope in about 30 days.

Froomkin's final call is appropriately eloquent. We can only wonder who will hear it? "The ultimate problem with DoC's reliance on ICANN is not the corporation's secretiveness, or its decisions, or its fight against accountability. Rather the problem is that DoC's reliance on ICANN, and endorsement of its activities, undermines basic elements of accountability and due process on which the administrative state is based. By lending ICANN its control over the DNS, DoC created a system in which social policy is made not by due process of law, but by something that begins to resemble government-sponsored extortion."

Lawrence Lessig Comments

In a brief interview on October 17, 2000 Stanford Law School Professor and ex candidate for the ICANN board Larry Lessig complimented Professor Foomkin for having drawn a well argued road map of grounds for legal action against the US Department of Commerce for its actions in creating ICANN. Lessig said that with the legal research solidly done it would now be much easier to convince those opposed to ICANN to unite around a legal challenge that would most likely be class action in form.

Lessig said that he would prefer an ICANN done right, namely one that did only techni-

cal coordination and not policy, to a Department of Commerce entity that did make policy subject to what he regards as a cumbersome, bureaucratic and expensive Administrative Procedure Act. The question of course becomes how to convince ICANN and DoC to change their agenda.. To this end a group ready to bring suit could approach with demands. If the demands were not met, the group could file suit. One way of obtaining a change in DoC ICANN behavior could be a settlement that is put in place as a condition for dropping the suit. Faced with an unambiguous certainty of up to three years of litigation, the forces behind DoC's and ICANN's position would listen to reason rather than have the suit go forward, or so Lessig hopes.

ICANN Member at Large Elections

On October 11, it was heartening to see Kal Auerbach and Andy Müller-Maguhn win member at Large board seats. Also on October 11 a BWG member wrote: "There were 3 different elections:

1) The marginals: Africa & Latin America: Players ride. 130 votes cast in Africa; 1,402 in L.A. In both ICANN nominated candidates got over 80% of the votes.

Note however that the person elected from Africa, although not an ICANN critic at all, is very fair minded and supports the GA's role and the role of individuals. I don't know much about Campos, but his replies on the forms suggest he thinks ICANN is basically ok, not too many new TLDs needed, but UDRP and other reforms are.

2) The rich West: Not happy with ICANN.

N.A. Almost a marginal. Only 3,449 votes cast. Only 32% for ICANN nominated candidates, including Lessig. Almost 3/4 voted to repudiate current icann policy if you just count count Simons, Lessig & Auerbach. The anti-icann crowd beat the pro-icann crowd. Auerbach and Lessig were ALLIES and cooperated in slating with Simons; together they got 75% of the first choice ballots in N.America.

Europe. A third of the total ballots. Only about 1/4 for ICANN nominated candidates. Both victors are ICANN critics. Expect fireworks.

3) Asia. The big one: A vote for ICANN status quo. 17,745 votes - more than half the total cast. 95% for ICANN nomination. The winner says "In my opinion, ICANN has interpreted its mission in a cautious but still proper manner. ICANN has a coordination function to perform to ensure the seamless operations of the Internet. In exercising its

coordination function, ICANN must take into account the legal and policy impacts of its management decisions, and therefore its scope of mission is not limited to purely technical issues." Thinks the UDRP is at least OK, maybe great.

Winner is resident in DC area! Number one goal listed at <http://www.mkatoh.net/FAQ.htm#Goals> is: "To make ICANN a 21st Century model for international organizations" See also http://www.mkatoh.net/speech/icann_katoh072000-e.ppt (arguing ICANN should be model for 21st century organizations). More than half the voters are in the Asia/Pacific region. And they picked a DC IP lawyer [who is a Japanese citizen and an employee of Fujitsu]."

From NANOG Some Insights on Network Service Level Agreements

On September 29 **Sean Donelan** answered a thread on service level agreements on NANOG: Whenever providers start throwing numbers around, you've lost the battle.

I always suggest people should talk to their insurance agents, not their technical people. Insurance agents are very good at understanding risk, and how much to spend mitigating that risk. Sometimes it is cheaper to buy a new computer every few years than trying to build the perfect protection around it.

The used car dealer is almost never the best source of information about car insurance. Don't expect any better from a sales person at a provider. You are going to end up with expensive undercoat and fabric protection package.

As far as I know, the system with the highest publicly stated reliability and availability is FEDWIRE. Fedwire exceeds everything I've seen at NORAD, NASA, or any service provider (carrier, internet, web hosting, etc). Fedwire has five-way redundancy of some systems. It also has the full faith and credit of the US Treasury backing up its service guarantee. A software error in 1985 resulted in a \$23 billion (with a "B") accounting imbalance.

If I take Fedwire as the upper limit, I need to ask what about providers whose claims exceed those delivered by Fedwire? They aren't lying, but you need to understand

the numbers. And if any provider does think their system exceeds Fedwire, I would love a tour of your facility.

Due to their history as a regulated monopoly, telephone companies have developed interesting ways to calculate reliability. For example, some telephone companies ignore events which exceed the design parameters of the network. Or in other words, they don't include Mother's Day in their calculations. Some telephone companies also don't include disruptions due to Acts Of God or Force Majeure in their reported numbers. I chuckle whenever I hear someone say "carrier-grade."

Availability statistics are much like flood and storm statistics. A once in 100 year flood does not mean it will flood only once in any 100 year period. You can have back to back floods. And you can have back to back computer failures. Nor does it limit the length of an outage. You could have a 43 minute failure in Year 1, and no failures in Years 2-5. Or an 86 minute failure in Year 1 and no failures in Years 2-10. Or even a 86 minute failure in Year 1, and a 86 minute failure in Year 2, and no failures in Years 3-20. Remember in statistics when you calculated the series to infinity. If you are still around in Year Infinity, then you can discuss X 9's of availability.

Asking a provider how many 9's of reliability they provide, or the MTBF of their systems is really a red herring. What you really want to know, and what you should ask is

When a failure does occur (and it will): (1) how will you respond? (2) how will you keep me informed? (3) what do I need to do? After you understand those answers (4) how often would I expect this?

No matter how many 9's you have, there is always a .1, .01, .001, .0001, etc chance. Murphy is exceedingly good at his job.

Ok, if you are still reading, and you still want to build a system as reliable as Fedwire, lets talk. Fedwire has shown it can be done, however expect to pay as much as Fedwire. On the other hand, if you are willing to settle for just a little less, the price drops dramatically. Its a lot cheaper to build a system to meet a certain level of design risk, and buying insurance to cover the excess. It may double the price to add another "9" of reliability, but only 10% to cover the risk with insurance.

I am not a lawyer, banker, insurance agent, doctor, or Indian chief. You should always

consult a licensed professional for advice.

Alex Bligh on September 30: Excluding force-majeure from availability is not totally unuseful (provided you can still compare apples with apples), on the basis that (historically at least) many other things are likely to cause more worry than failure of your internet/telecoms service in the event of war/asteroid strike etc.

Donelan: I also think its reasonable to exclude force majeure in a SLA. When I wrote SLA's I excluded all sorts of stuff in the force majeure clause. My point wasn't to suggest it is unreasonable to do so, but customers should understand a provider includes only certain risks in their SLA. Insurance companies are very good for covering the other risks.

What drove me crazy was I couldn't get the information I needed to do my job from providers. Fiber cuts happen. I don't want a 99.999% network guarantee, I want an accurate map of my circuits on your network so I can plan where to put my backup circuits. If I could outsource the reliability of my network, it would be great. But the fact is, I was the one who had to live with fallout when my network failed; not the provider. At most large providers, my "dedicated account team" rarely lasted a fiscal quarter let alone a fiscal year.

I sometimes think folks, and I was once one of them, are just looking for the provider which promises the highest availability number (100% service guarantee) without realizing some providers are achieving such high numbers by excluding a lot of disruptive events. If everyone included and excluded the same things, you could compare the numbers. But everyone doesn't. So customers need to understand what the numbers mean. It is possible for a provider with a 98% availability guarantee to have better actual performance than a provider promising 100% availability.

Bligh: Finally, the availability number is meaningless unless there is a clear way of measuring what period it applies to. Five nines availability over a day is completely different to five nines availability over a year, if there is a fixed MTTR (think about it).

Donelan: Ah, Mean Time To Repair. For availability purposes, MTTR is frequently a bigger contributor than MTBF (Mean Time Between Failure). Can you repair one half of a redundant system before the second half fails.

Bligh: IE availability numbers are *not* useless - but they generally aren't comparable without looking at the contract, and system in depth.

Donelan: If you look at what happened in the disk drive market, for a while Seagate and the others waged the battle of MTBF. You could buy a 400,000 hour MTBF drive or a 800,000 hour MTBF drive or a 1.2 million hour MTBF drive. Was there a difference between the drives, in some cases yes. In most cases, you were actually buying the same drive with different extended warranties.

Did the difference in MTBF's mean the disk drives never failed? No. If the drive did fail, did you get data back because it was a 1.2 million hour MTBF drive? No. If you didn't have a backup, did Seagate lose their job, or did the computer operator lose theirs? Does RAID held? Yes. Does RAID completely eliminate disk failures? No.

If you look at network backbones, almost everyone uses the same vendors, supplying essentially the same equipment, and nearly the same network design. So why would different providers have different availability numbers? Is it just an accident of the statistical series, some providers had their failures earlier but everyone will end up the same in Year Infinity? Or are there real differences, besides price, between providers?

Vijay Gill: There appear to be two major and some minor variants in backbone engineering and architecture. The major ones being the UUNET design and the Sprint/Qwest design for circuit layout and aggregation/hierarchy. There are a lot more variants regarding the routing architecture (IGP setup, bgp setup, et al), and depending on various failure modes, some are better than others for a subset of failures and vice versa.

The hierarchical UUNET design for example, is fairly dense in terms of volume, with a small time diameter per region for a network of that size, which allows for some local optimizations. And if you get two circuits into two regions, some failures in one region can be isolated and compartmentalized, without a major spillover into the neighboring regions, which would not be the case in a large flat network.

As always, with good engineering, comparable reliability can be established, given appropriate amounts of money being thrown at the problem.

Donelan: True, but in the end does it end up being a zero-sum game? Or are there real differences in performance? I'll pick on a couple of different providers, but we could use anyone.

In my experience AT&T has a huge MTBF, over 7 years when I bought circuits. But when the two natural disasters struck at the same time, it would take AT&T several days to get the circuits working again. On the other hand, Sprint had a problem every month or two, but they usually had them fixed in about 20 minutes. What's the trade-off. Over 10 years, the availability numbers weren't that different between AT&T and Sprint.

Sprint hypes their SONET fiber network, AT&T hypes their FASTAR network restoration. Is it strictly a question of cost? Although a lot of advertising and sales emphasis is placed on the technology, I haven't found the technical differences between providers affecting the delivered performance. Non-technical factors seem to have a bigger affect.

Executive Summary

Shockey on ENUM, pp. 1- 10, 16

ENUM is the new IETF protocol designed to function like a directory services feature that links PSTN phone numbers to Internet telephony oriented services. We interview Rich Shockey who was co-chair of the ENUM working group.

E164 refers to the international telephone number protocol established by the International Telecommunication Union. E164 resolution means the use of the ENUM protocol (RFC2916) to connect any number in the globally switched telephone network to whatever Internet services it has been provisioned for. Such services may range from a personal web page look up to the ability to retrieve your voice mail from anywhere in the world with a local phone call. ENUM makes it possible for the first time to connect a voice over IP service to any POTs phone whose number has been ENUM provisioned.

Currently one SIP provisioned phone can find another only if the owners of each number are aware of the others existence. Before the web to FTP a file from a directory you had to know it existed or you had to browse directories and stumble by chance on anything interesting. The web became a means of finding and indexing such files and eventually of stitching them together so they could be intelligently located with great ease. ENUM will offer a way for a VOIP service like SIP to transparently find every PSTN phone on the globe whose owner has ENUM provisioned it through national registries to be

set up late next year. When a PSTN phone is ENUM provisioned much of its use will begin to flow over the Internet. If ENUM services become as popular as expected, they will be a means by which huge amounts of PSTN traffic will be sucked out of the PSTN and onto the Internet. ENUM has sometimes been referred to as the service control point for the deconstruction of the PSTN by the Internet.

ENUM in a single sentence has been defined as "telephone number in URL out using NAPTR". An ENUM specific domain, in other words the ENUM expression of a telephone number under a single unique administrative DNS domain, must list any and all services available for that domain. The new ENUM GTLD is e164.arpa. It was added to the Root late last month.

ENUM itself is a simple protocol taking only five pages to describe. Shockey reports that the central development issue revolved around a debate of whether or not to use NAPTR records for service discovery. "NAPTR stands for the Naming Authority Pointer Resource record. It is RFC 2915 written by Mike Meeling of Network Solutions and Ron Daniel of Data Fusion. Debate about what resource records had to be returned for ENUM service resolution was extremely contentious."

Shockey describes RFC 2915 as a profoundly elegant and powerful document for service resolution within a domain. For example it has an ability to list "n" number of services for a domain through the use of regular expressions and a variety of other features and functions. The importance of the use of NAPTR records in this environment cannot be stressed highly enough. Shockey states that the advantage in the use of NAPTR was having a single resolution methodology for resources associated with a telephone number. "If we did not use NAPTR for a resolution we would have issued a sort of directive to the Internet community saying that it was OK to resolve a telephone number to any resource record." (Tony Rutkowski in a short article of his own in *Communications Week International* also lauds the importance of NAPTR as the glueballs holding ENUM together.)

It seems to the Editor that the intent of use of NAPTR for resource records may be to ensure that the customer has in effect only a single key chain for use in tying together all advanced services to which he subscribes in what is regarded as the most important enabling technology of convergence between telephony and computers as represented by the Internet.

Shockey acknowledges that since ENUM becomes a single point of control and also a single point of failure that the way in which services are provisioned will be absolutely critical. The consumer must be given absolute and total control over his ENUM services which may become the single tool set by which he controls his business and personal communications.

Under this ENUM business model there will be only a single ENUM provisioning authority for each nation state. The IETF and ITU have agreed not to break the e164 mould which means that

each national telephone numbering authority will be asked to decide who will provision ENUM services within its borders.

In the US it is likely that an early decision of the new administration will be to choose whether the Department of Commerce or the FCC will issue a solicitation for a national ENUM administrator. Some think that giving the task to the FCC would be both Bell head friendly and ensure a slower role out than an assignment to the Net head friendly Department of Commerce. In any case it is assumed that a successful bidder will have to provide assurances that customer control over the selection of ENUM services and over the privacy issues involved in having what may become a single identifier for all one's telecommunications activity will have to be very carefully respected. It will also be critical to guarantee that when a business or individual changes phone numbers, that all ENUM services attached to an old number are severed from that number immediately on customer disconnect and attached to the new phone number as soon as it becomes live. Critical issues with ENUM are thought to be far more political in nature than technical.

Instant Messaging, pp. 11-16

We interview Henning Schulzrinne, member of the Internet Architecture Board and Director of the Columbia University Internet Real Time Laboratory. Our subject is a tutorial on Instant Messaging and its applications and on recent high priority IETF instant messaging protocol standardization efforts.

While the ability to send short messages that appear in real time on the screen of the recipient was a feature of most computer bulletin board software, it was AOL's adaptation of this capability that put it one the map of the Internet. From a consumer services perspective it likely ranks behind the Web and email as the third major reason by which people justify their Internet usage. Standardization matters because you now have a problem that there are isolated communities where people who use the Yahoo instant messaging client cannot send messages to people who use either the Microsoft or the AOL client. AOL is appears to have 90 percent of instant messaging users while the remaining 10% are split between Microsoft, Yahoo, ICQ and Tribal Voice.

While this lack of standardization is not now especially daunting in the U.S., it will also begin to get much more important once more advanced wireless services come into play. The popularity of the Short Messaging Service (SMS) in Europe on the GSM mobile phone is huge. Moreover this popularity exists despite the fact that you have to type in your message with the number keys. On completion these messages are sent instantaneously to another mobile phone with bridges to email also available. We can expect that this popularity will migrate with GSM devices to the United States.

Schulzrinne explains that "Instant Messaging is

primarily a first order mechanism. In other words you use it to set off other events. This explains where the interest of those of us on the multimedia side came in. What you can do is set up a number of simultaneous AOL, or whatever type, of presence sessions or messaging sessions. When your group is present, you can start up a completely unrelated application such as a voice-over IP conference call."

He also explains how standardization efforts were ramped up earlier this year in the IETF with the decision in the spring in Adelaide to "set up a design competition where the first working group and others were or challenged essentially to put up or shut up." the result was seven or eight submissions that were winnowed into three groups: the XPP or blocks-based proposal of Marshall Rose and Dave Crocker and then "the SIP based proposal which a number of us including Christian Huitema worked on. Within this one, the primary work had started much earlier with a proposal within the SIP working group which Jonathan Rosenberg and I had been working on for some time. Finally there was a whole set of proposals which was called "group two", and which was characterized by a more limited single set of functions for text-based presence indication and instant messaging."

The Schulzrinne Huitema SIP based approach came from a notion of seeing messaging in the more generic sense of event notification. "We see a signaling system consisting of a push part and a pull part if you like. The push part comes in where you call me on the phone to find out if I'm available. The phone rings and either I pick up or I don't. The pull apart would be when I tell you, just in case you wanted to know, whether I'm available to talk or not. These two are mirror images of each other and thus it makes sense for them to be provided within a similar overall signaling framework that includes the ability to reach end systems."

He explains the power of using SIP not for a just an "I call you up mode" but also for an "I notify you when I'm available mode," and an "I want to find out when you are available in order to subscribe to" mode means that all of these messages are handled by the same set of software or so-called proxy servers. "You can think of those as being cousins of your SMTP server. If as we expect, the next generation wireless systems will all use SIP internally, we will have an infrastructure with a billion users on it. We might as well leverage this infrastructure since the proxies do not have to be upgraded in all in order to have this functionality."

"Consequently a proxy does not even have to be aware that instant messaging or presence is going on. Therefore a proxy built today will be a perfectly capable router of subscriptions and notifications regardless of what happens to its details in the future. To us, this capability opens up an avenue for integration which hopefully will lead to lots of interesting new services." Among these will be SIP based notification or execution of events. An instant message may turn on a remote white board or web cam while it may also notify someone of a remote event such as change

Continued from page 23

in the condition of an on going process.

ICANN Deemed Illegal, pp. 17 - 21

We summarize and comment on Michael Froomkin's 166 page 711 footnote long landmark paper: "Wrong Turn in Cyberspace: Using ICANN to Route Around the APA and the Constitution" to be published by the *Duke University Law Journal*, October 2000, Volume 50, No. 1. Froomkin's indictment in his opening paragraph is succinct: "*The United States government is managing a critical portion of the Internet's infrastructure in violation of the Administrative Procedures Act (APA) and the Constitution. For almost two years the Internet Corporation for Assigned Names and Numbers (ICANN) has been making domain name policy under contract with the Department of Commerce (DoC). ICANN is formally a private non-profit California corporation created, in response to a summoning by U.S. government officials, to take regulatory actions that the Department of Commerce was unable or unwilling to take directly. If the U.S. government is laundering its policy making through ICANN, it violates the APA; if ICANN is in fact independent, then the federal government's decision to have ICANN manage a public resource of such importance, and to allow - indeed, require - it to enforce regulatory conditions on users of that resource, violates the non-delegation doctrine of the U.S. Constitution. In either case, the rela-*

tionship violates basic norms of due process and public policy designed to ensure that federal power is exercised responsibly."

We believe that it is very important to use Froomkin's compelling insights to educate both citizens and the executive and legislative branches of the US government. We need to understand quickly what has happened and why we should "be afraid." Out of such education it is to be hoped that legal or legislative redress may be found. In a brief interview with us Larry Lessig explains that Froomkin has provided a road map for legal that under the right circumstances could be used to compel ICANN to change its ways. The almost final draft of the Froomkin paper is a 1.1 meg pdf file at <http://www.law.miami.edu/~froomkin/articles/icann1.pdf> We also offer comments on the recently concluded ICANN membership at large elections. We suggest that the determination of ICANN's fate is a decision that will impact whether we live in a nation state with a legal system accountable to individual citizens or a corporatist state that is run on behalf of the private profits of global corporations. If it is the latter we will find that we have given up the critical philosophical foundation on which our nation was built. That our government exists first and foremost to preserve and protect the rights of each of its citizens.

Provider Quality, pp. 22-23

We publish a NANOG discussion on issues to consider in evaluating quality of service agreement with upstream providers.

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