IETF Celebrates 20th Anniversary

By Mirjam Kühne - Editor, IETF Journal

Congratulations, IETF, on 20 great years of Internet standards development!

To celebrate the 20th anniversary of the IETF, many activities took place at the 65th IETF in Dallas, Texas, US. The IETF community has come a long way since its first meeting on 16th January 1986 in San Diego, California.

At IETF 65 participants could test their inside knowledge by answering a number of trivia questions. Every day, small prizes were handed out to the winners.

Celebrations reached a high point during the Social event (co-sponsored by ISOC and Nokia) at the IETF 65. Many participants of the first hour were present, including a number of earlier IETF chairs.

One of the IETF@20 birthday cakes
photo: Ole Jacobsen

Lixia Zhang, professor at UCLA: "At the first IETF I was a graduate student. I felt that I had so much to contribute. I had lots of great ideas. As years go by, I have better appreciation of how much I can learn from this community. Each time I come to an IETF Meeting, I learn from others. Now, I feel how little I know. As a graduate student, I felt how much I know."

Dave Clark, a professor at MIT, gave a presentation, referring back to a speech he gave in 1992, pointing out issues the IETF was facing back then, namely Routing and Security.

The network has changed tremendously and much work has been done to get it to where it is today. However, these topics are still high on the agenda of the IETF today.

During the meeting, many enthusiastic attendees recorded their congratulations on video. You can view these on http://ietf20.isoc.org/videos/

Throughout this issue of the IETF Journal, you will find reflections on the past and the future of the IETF from IETF participants, some of them involved since IETF 1, others that were Newcomers at IETF 65. The full interviews can be found at http://ietfjournal.isoc.org/

ISOC has declared 2006 the "Year of the IETF" and activities are planned throughout the year to celebrate the IETF@20. Check back often for activities which will be announced throughout the year on http://ietf20.isoc.org/

News from the IETF Chair
By Brian Carpenter, IETF Chair

As you will surely know, even if you didn't experience it, IETF 65 in Dallas got off to something of a wet start, with flooding up to, and inside, the hotel on Sunday afternoon and evening. Thanks and congratulations are due to the NOC crew for relocating the NOC equipment to get away from the waterfalls from the light fixtures, with only a few minutes's interruption to DHCP service. Nevertheless, a total of 1264 participants from about 36 countries attended despite the weather, for a busy week of WG meetings, birds-of-a-feather sessions, plenaries, and many other meetings and discussions, as well as a fine social event. I want to thank Nokia, the principal host, and other sponsors for helping to make the meeting such a success.

Unfortunately, a serious problem was encountered by some participants in obtaining the necessary business visas in good time. The Internet Society made a welcome urgent intervention with the US State Department, allowing a few more visas to be issued at the last moment, but this problem is damaging to the IETF's principle of openness.

In the year leading up to IETF 65, the IESG approved almost 400 Internet-Drafts for publication as RFCs, of which about half were Standards Track or Best Current Practice documents. During the same period, no fewer than 43 WGs completed their work and were closed down, and fourteen new ones were chartered, leaving more than 120 WGs in progress. Thus, the last year has been unusually productive for the IETF. Much of the credit for this, of course, belongs to the Area Directors, and in particular I want to recognise the work of the five who stepped down in Dallas:

 Scott Hollenbeck (Applications)

 Allison Mankin (Transport)

 Margaret Wasserman (Internet)

 Bert Wijnen (Operations and Management)

 Alex Zinin (Routing)

However, the real credit for such a productive year belongs to the various WG Chairs, document authors, and individual participants, who did all that needed to be done to deliver the goods. Now we will all focus on continuing the work in preparation for IETF 66 in Montreal, Canada from July 9-14.

Brian Carpenter
IETF Chair

IETF 65 Facts and Figures

1264 registered attendees

from 36 countries

7 new WGs

18 WGs closed

531 new Internet-Drafts

995 updated Internet-Drafts

106 IETF Last Calls

150 approvals

around 184 published RFCs (96 standards and BCPs)

2 appeals

Flooding in Dallas
photo: Ole Jacobsen

Leslie Daigle
IAB Chair

News from the IAB
By Leslie Daigle, IAB Chair

The first IETF meeting of each calendar year marks the transition between two "IAB years", as some IAB members finish their terms and step down, and new IAB members join the group. On behalf of all the IAB, I'd like to thank the departing IAB members for their contributions and hard work:

> Patrik Fältström
>
> Bob Hinden
>
> Pekka Nikander (stepping down mid-term)
>
> Pete Resnick
>
> Jonathan Rosenberg

And I'd like to welcome the new folks who take their place:

> Elwyn Davies
>
> Kevin Fall
>
> Olaf Kolkman
>
> Dave Oran
>
> Dave Thaler

As I elaborated during the Thursday plenary session (and as reported here on page 9), the IAB is bringing a busy year to a close. For the IAB, a "busy year" involves acquitting its various administrative and oversight roles, as well as being active in key areas of technical contribution.

Early on in the year, the IAB identified 3 primary areas of focus, in which it planned to make a difference: IPv6 (remaining issues to deployment), general Architectural perspectives and Unwanted Traffic.   These three areas capture many of the things that are currently challenging Internet evolution.

The IAB opted to move beyond the discussion of "what if IPv6" -- no matter which set of numbers one believes, it is clear that IPv4 will not last forever. The IAB focused instead on identifying impediments to deployment of IPv6, with a view to filtering that back into any architectural issues that need to be resolved (if any), or architectural guidance that would be helpful to compile and share.

While it's increasingly clear that a large portion of the Internet's traffic is unintended, unwanted, or downright malicious, it is also apparent that "unwanted traffic" is a proverbial "elephant" -- different people have a very clear understanding of one or more individual parts of the problem, but we need to get a better sense of the overall picture, as well. Hopefully, the report from the IAB's March workshop on this topic will help provide a starting point for building that perspective.

The challenge is now set for the IAB's new year -- to review what we learned and achieved through the last year, and determine priorities for the coming year.

Architecture never sleeps -- stay tuned!

Leslie Daigle, Chair, IAB.

More information about past and present IAB members

can be found here: http://www.iab.org/about/history.html

IETF 65 Review: Plenary Sessions
By Mirjam Kühne

Administrative Plenary

IETF chair opening

Brian Carpenter, the chair of IETF, welcomed everyone to the plenary. He presented attendees and document statistics (see Fact & Figures on page 2). This time some people had problems receiving their visa in time. Thanks to ISOC's urgent intervention with the US State Department, this could be solved in most cases. It is still damaging to the IETF's openness as Brian pointed out.

NOC and Host Report

Rich Osman, in charge for the NOC at the IETF this time, showed some network statistics. He thanked the many volunteers who helped during the week and did an especially good job, when the NOC had to be moved within 20 minutes on Sunday due to rain in the NOC.

Paul Murdock, representing Nokia, the host for IETF 65, gave a presentation showing some of Nokia's latest multimedia developments.

IASA Report

The IASA Report consisted of four presentations:

- RFC Editor report (Bob Braden)
- IANA report (David Conrad)
- IASA operations report by the IAD (Ray Pelletier)
- IAOC general report: IAOC Chair (Lucy Lynch)

RFC Report

Bob Braden reported that the RFC Editor has made significant progress towards reducing the publications backlog reported at the last few IETF meetings. At current rate the backlog will be completely gone before June 2006.

IANA Report

David Conrad, the General Manager of IANA, reported that at the last meeting a number of issues were identified, mostly related to the lack of consistent management, understaffing and too complicated processes. Many of these issues have been addressed which is visible in the improved IANA performance.

Before the next meeting, IANA is planning on clearing up the current backlog and hiring two additional staff, one of them fully dedicated to IETF liaison. IANA will also work on improved tools and will publish IETF-related processes and data on IANA performance.

David thanked Michelle Cotton, who has now been working for 6 years at IANA and was at times the only IANA person.

IETF 65
'Birds of a Feather' [BoF] Meetings

Applications Area:
dix - Digital Identity Exchange Protocol

General Area:
techspec - Requirements for IETF Technical Specification Publication

Internet Area:
nea - Network Endpoint Assessment
l2cp - Layer 2 Control Protocol
16ng - IPv6 over IEEE 802.16 (e) Networks

RAI Area:

p2p-sip - Peer to Peer Support for Session Initiation Protocol

Security Area:

hoakey - Handover and Application Keying and Pre-Authentication

IAD Report

Ray Pelletier, the IETF Administrative Director, showed an overview of the IETF expenses for the Fiscal Year 2005 and the budget for 2006. He then gave a status report of the secretariat services after being in place for 90 days. The transition from Foretec to NeuStar Secretariat Services went well, new tools and infrastructure have been set up as well as longer-term planning for future meetings.

IAOC Report

Lucy Lynch, the chair of the IETF Administrative Oversight Committee, reminded the plenary that after IETF 64, the IAOC had issued a Call for Consensus on the formation of an IETF Trust. The founding parties included CNRI, ISOC and the IETF. Some substantive issues were raised and the documents were modified to address community concerns. In December consensus was reached. The final IETF Trust Agreement can be found at:

http://www.ietf.org/trust/IETFtrustAgreement20051208.pdf

Consequently a number of actions were taken to round up the Trust Agreement.

In recent months, the IAOC has been focused on

- the development of an RFP for the RFC Editor services
- conducting the first annual review of the IAD
- future IETF meeting planning
- monitoring the US Department of Commerce (DoC) RFI regarding IANA services

Lucy clarified that the RFC-Editor RFP will be an open RFP and that there will be a request for interest first. Leslie Daigle added that she sent the planned process to the IETF mailing list recently.

Major projects for IASA in 2006 entail:

- IAD annual review and goal setting in June 2006 (IAOC)
- development and Execution of the RFC-Editor RFP (IAOC)
- managing IANA issues: DoC, contracting etc. (IAD)
- community relations per BCP101: minutes, financial updates, active listening (IASA)
- formalising the budget process (IASA)
- IPR related issues (Trust)
- managing archives and assets (Trust)

The IAOC web site will soon move to http://iaoc.ietf.org

The trust web site will soon move to http://trust.ietf.org

Updating the Tao of the IETF

Susan Harris gave a short summary of the main changes made to the Tao document (see more details on page 11) and asked the community, especially IETF Newcomers for feedback.

Nomcom Report

Ralph Droms, chair of the NomCom, listed the nominees for the open IESG, IAB and IAOC slots. It was a difficult task this time, because of the creation of the new Real-time Applications and Infrastructure (RAI) area and a resignation on the IAB.

The NomCom schedule, as laid out in RFC3777, turned out to be tight. Ralph and the NomCom proposed to review this schedule significantly. The tools developed together with Henrik Levkowetz and the tools team were very helpful and the development of additional tools for I* nominations and NomCom volunteers are being considered. Henrik added that the time schedule problem might also be solvable with the help of new tools.

"Thank You" to all departing IESG and IAB members

Fred Baker, the chair of the ISOC Board of Trustees (and former IETF chair) thanked all departing IESG members for their time on the IESG. They have done a great service to the IETF. Brian Carpenter echoed these thanks.

Leslie Daigle, chair of the IAB, thanked all departing IAB members in the name of the entire IAB.

Lynn St.Amour, CEO and President of ISOC, handed out plaques to Jonathan Rosenberg, Patrik Fältström, Pekka Nikkander, Pete Resnick and Bob Hinden as thanks for their service on the IAB and to Bert Wijnen, Allison Mankin, Alex Zinin, Scott Hollenbeck, Margaret Wasserman for their service on the IESG.

Alex Zinin, one of the departing IESG member, reflected on the IETF in the last 4 years. He felt that the IETF has become a more open and cooperative organisation that is more innovative and more international. It is also more operations-aware than a while ago. At the same time he felt the IETF has also become more formal and process oriented.

Alex pointed out a number of things he learned during his time on the IESG and gave the following recommendations to new IESG members:

-   trust your first impressions

-   you are a newbie - use that! (you bring the background from the community)

-   don't allow politics to rule

-   avoid bureaucracy burn-out

-   if it stalls - take it to the public (community can help!)

-   remember who your real boss is (the community!)

-   remember why you did it (keep your nom-com questionnaire)

-   know when to stop

Bert Wijnen, another departing IESG member, who served on the IESG for 8 years added that even though we are all here as individuals, he would like to thank his employer, Lucent Technologies, who basically sponsored his work for many of those years.

Bert also thanked the community for the help and support. He mentioned that he got a little worried lately about the IETF and the IESG (referring to issues like blocking people from mailing lists, a lot of the process issues etc.). He would like to see the

Incoming IESG Members

Lisa Dusseault	Applications Area
Jari Arkko	Internet Area
Dan Romascanu	Ops & Mgmt Area
Ross Callon	Routing Area
Sam Hartman *	Security
Magnus Westerlund	Transport Area (2 yr)
Lars Eggert	Transport (1 yr)
Cullen Jennings	RAI Area
Jon Peterson **	RAI Area

Incoming IAB Members

Leslie Daigle *

Elwyn Davies

Kevin Fall

Olaf Kolkman

David Oran

Eric Rescorla *

Incoming IAOC Members

Ed Juskevicius *

* returning incumbent

** moved from Tarnsport

IETF continue to focus on technology. As a thank-you to the community he sang two Dutch songs which was enthusiastically welcomed by the audience.

Open mic session

Brian Carpenter welcomed a suggestion to present IESG statistics to the community similar to the IANA and RFC queue statistics. He mentioned that the IESG had an 'Efficiency Retreat' and set some targets for itself. They should certainly be presented. Bill Fenner and Allison Mankin are working on tools to present them.

This was followed by a discussion about the perceived lack of food - notably cookies - during the IETF 65 meeting breaks which some community members took as a sign that the IETF was in very good shape if that much time is spent on such a topic during an IETF plenary session. Ray Pelletier admitted that the numbers were underestimated and were adjusted for the rest of the week.

Another topic that got raised were individual submissions to the RFC Editor. One author felt that the technical review board does not have sufficient expertise in one particular area. Joyce Reynolds, representing the RFC Editor on the IESG, noted that the RFC Editor is always trying to make the best effort to find the best reviewer on the review board, but that they cannot guarantee to have expertise in all possible fields. All reviewers are volunteers.

Complexity, a topic raised at previous IETF plenary sessions, was brought up again. Some people were worried that an increasing amount of complexity is exposed to the end-user, especially in the area of security. This can lead to users not deploying security standards. Sam Hartman, one of the security ADs, agreed and said "We don't only need to make sure security mechanisms are complete, we also need to ensure they are deployable." He suggested to develop more show cases and examples in order to demonstrate how security mechanisms can and should be used.

At the end of the plenary, the role of the IETF chair was raised. There was some concern that the IETF chair has too many roles to fill:

- IETF chair
- IESG chair
- General Area Director

One speaker felt that chairing the IESG might be the most important role for the IETF chair. Other tasks of the IETF chair could possibly done by others.

There was no agreement on this topic and in closing Brian pointed out the importance of the external role of the IETF chair.

Technical Plenary

Welcome and Introduction by the IAB chair

Leslie Daigle opened the technical part of the IETF plenary and announced that she was honored to be re-appointed as IAB chair for the next year.

IRTF Report

Aaron Falk, chair of the Internet Research Task Force (IRTF), described some recent IRTF highlights. A number of Research Groups (RGs) met during IETF 65. One of them was the Anti-Spam RG which also had a review with the IAB. The two new research groups (the Transport Modelling RG and the Internet Congestion Control RG) are making good progress. There is a charter under development for a MANET RG and for a group on scalable small-group multicast.

Mike St.Johns, Nominet (present at IETF 1): "One of the things about the Internet is that it was designed to be used by experts. We have gone from a benign environment where we knew everyone on the Internet to an environment where we have cyber-stalkers and cyber-terrorists. It is a different world. The web has changed things. I think for the good, because lots of people can get their voice out, but part of it is that we are diluting the truth... The Internet is the best system for spreading memes that we have ever seen."

The document "IAB Thoughts on the role of the Internet Research Task Force" is about to be published as an RFC. In addition to that the IRTF published draft-irtf-rfcs-00.txt to describe a process for IRTF RGs to publish RFCs.

IRTF Technical Presentation - End-to-End Research Group

Karen Sollins, one of the co-chairs of the IRTF End-to-End (e2e) RG presented the status of that group. The e2e RG has existed since 1984 and is limited to 20 members with rotating, closed membership. The focus of the RG is on End-to-End services and protocols. There are 1.5 day long meetings 2 - 3 times a year. The group is set up as a forum to exchange ideas. Topics which have been discussed in the past include:

- Transactions (VMTP, SUN, RPC etc.)
- Multicast
- TCP congestion control
- Integrated Services
- New Architectures

At their last meeting, the e2e RG posed the following question: 'How might the computing and communications world be materially different in 10 - 15 years, and how might we define a research agenda that would get us to that world?'

Answering that question requires a vision of the future Internet. The e2e RG concentrated on the conceptual vision rather than on possible technical approaches to get to that future Internet.

Karen encouraged everyone to develop visions as well as architectural requirements that would bring us there.

More details on this work can be found in the following publication: 'Making the World (of Communications) a different Place' by Clark, Partridge, Braden, Davie, Floyd, Jacobson, Katabi, Minshall, Ramakrishnan, Roscoe, Stoica, Wroclawski, Zhang in ACM SIGCOMM CCR 35 (2), July 2005, pp. 91 - 96. A copy of that document can be found at

http://www.ir.bbn.com/~craig/e2e-vision.pdf

IAB Technical Presentation - Distributed Hash Tables

The IAB has regular informal, internal tech-chats. On a recent tech-chat about Distributed Hash Tables (DHTs), it became apparent to the IAB that there was material that would be interesting to share with the community - hence this plenary technical presentation.

Eric Rescorla, an IAB member, described the overall concept of DHTs, explained the difference between search and lookup and gave some examples . He further described different security mechanisms, their applications and the open issues for each of them.

In closing Eric noted that the work on Distributed Hash Tables is mostly research today and not really relevant to normal users at the moment even as they are being actively proposed for use within various protocol standards.

Not related to the above topic, but in good IETF tradition to combine serious work with some fun, various IETF participants stood up and gave Eric bags of cookies (referring to him complaining at the Administrative plenary about the lack of cookies during the breaks :)

Lixia Zhang, professor at UCLA (present at IETF 1): "We need to develop a vision. When the network was still small, we did not really need a clear vision... When we were slightly off track, we said 'ooops, let's adjust it.' But when the system is huge, it is much harder to adjust. If it is not steered into the right direction at all times, it will be very hard to turn. Therefore, I believe that today, it is essential to have a clear vision, because the network is this gigantic thing that is moving along and that we have to steer."

IAB update

Leslie Daigle gave an update of the IAB activities of the year.

The IAB identified 3 areas of interest last year:

- IPv6
- Architectural Perspective
- Unwanted Traffic
- And, of course there is always a "misc" category !

Regarding IPv6, the IAB started a dialogue with the operational community. A special thanks to Dave Meyer, a member of the IAB, who opened channels to the operations community by organising BoF sessions on IPv6 Multihoming at operators meetings (NANOG, APRICOT, RIPE). This effort will be continued. In addition to that the IAB has set up and IPv6 ad hoc committee:

http://www.iab.org/about/adhocs/ipv6-charter.html

On the topic of Architectural Perspective, the IAB has published a number of documents:

- RFC 4101: Writing Protocol Models (June 2005)
- RFC 4417: Report of the 2004 IAB Messaging Workshop (Feb. 2006)
- RFC 4367: What's in a Name: False Assumptions about DNS Names (Feb. 2006)

The architecture-discuss mailing list : `architecture-discuss@ietf.org` was also established for broader community discussions on architectural issues.

The IAB IDN ad hoc committee will be shutting down.

At the beginning of March 2006, the IAB hosted a workshop on the topic of 'Unwanted Traffic', with people from various backgrounds: backbone operators, enterprise managers, researchers, software developers.

The goal was to get cross-area communication and to raise awareness. As a main result from the workshop it has been recognised that the IETF needs to continue to build mechanisms to address the usual security and unwanted traffic issues while at the same time mechanisms have to be developed to respond to more serious, more organised security threats. The solutions might not be the same. A full workshop report will be published as an RFC.

At the end, Leslie listed some other ongoing and administrative IAB activities:

- Tech Comms ad hoc committee (to work with ISOC on a series of documents)

  http://www.iab.org/about/adhocs/techcomms-charter.html
- IETF-related process and liaison documents
- RFC 4089: IAB and IESG recommendation for IETF Administrative Restructuring (May 2005)
- RFC 4052/BCP 0102: IAB Process for Management of IETF Liaison Relationships (April 2005)

In RFC queue:

- draft-iab-ieee-802-rel-05
- draft-iab-irtf-02

Appeals

- Jefsey Morfin, suspension from ietf-languages mailing list

-      o   IAB annulled IESG decision
- Julian Mehnle, MADRID documents
    -      o   IAB upheld IESG decision

Jessy Cowan-Sharp, Masters Public Policy and Computer Science at Univ. of Maryland (Newcomer at the IETF): "One of the things that attracted me to come here - which is probably a double-edge sword - is the fact that it is so focused on the working groups. That makes it interesting, because you're actually doing work. On the other hand it is also what makes it inaccessible for Newcomers, especially if you haven't been reading the mailing lists for a while."

The discussion around the RFC Editor has been continued during the IETF 65 GENAREA meeting. The overall timeline was sent to the IETF mailing list:
http://www1.ietf.org/mail-archive/web/ietf/current/msg40840.html

as well as a straw proposal of an RFC Editor charter:
http://www1.ietf.org/mail-archive/web/ietf/current/msg40842.html

IAB documents:
http://www.iab.org/documents/selected-iab-documents.html

Current IAB Internet-Drafts:
http://www.iab.org/documents/drafts/index.html

IAB Minutes:
http://www.iab.org/documents/iabmins/index.html

Town Hall Meeting - Technical Topics

As all the IAB members came up on stage to host this session, a video of "virtual" Vint Cerf sharing congratulations to the IETF's 20th anniversary of the IETF was presented.

During the open mic session the topic issue was the End-to-End principle (in reference to Karen Sollins presentation on the e2e RG; see page 8).

It was noted that e2e and network neutrality today might be more a business rather than a technology decision.

While some people felt that the IETF should continue to concentrate on the development of protocols and not make recommendations about 'good' or 'bad' technologies , others believed the IETF needs to be promoting technologies and components that do support the e2e model and that it has a responsibility at that (similar to the IETF's conscious decision not to design protocols that make wiretapping substantially easier).

As way forward, comments in the room suggested that the IETF needs to accommodate both: the e2e principle as well as business considerations.

A role for the IAB in this could be to ensure the protocols work in networks today (including firewalls).

In the ensuing discussion, people wondered how the ends were actually identified. In IETF discussions, an end is typically identified by an IP address. Not everyone agreed with that. Patrik Fältström, one of the departing IAB members said: "End-to-End should be defined as the humans and their applications (e.g. chat, rss feeds). As long as the IETF designs protocols the way it has done so far, users will always be do able to use their applications."

Jeff Schiller suggested that a new definition of Internet services is needed. i.e. end-user security (assuming the network can not be trusted) vs. security in the infrastructure (providing reliability and availability for the end-user).

The web service community is one example of this distinction: because they could not trust the network, they developed security on the xml level, as Brian Carpenter pointed out. In the network neutrality context, he recommended to look at RFC 4084 (Terminology for Describing Internet Connectivity).

All presentations given during the IETF 65 plenary session can be found at:

http://www.ietf.org/meetings/past.meetings.html

IETF 65 Review: Tao of the IETF - Revised
By Susan Harris and Paul Hoffman

Newcomers to the IETF have long benefited from reading "The Tao of IETF - A Novice's Guide to the Internet Engineering Task Force" (FYI 17, RFC 3160). Thanks to original author Gary Malkin, the document covers the fundamentals of how the IETF works in a light, readable style. Reading the Tao sheds light on what happens at IETF meetings, how one can get involved, how the I-D/RFC publication process works, and the mechanics of holding and participating in Working Group meetings.

At the Dallas Operations and Administration plenary, co-authors Paul Hoffman (VPN Consortium, phoffman@imc.org) and Susan Harris (Merit, srh@merit.edu) announced that the Tao has undergone major revisions. The practical, "how-to" Working Group information has been greatly expanded, and text has been added about the IETF's new administrative structure, new tools, and efforts such as the EDU team.

http://tools.ietf.org/html/draft-hoffman-taobis

The IETF@20 Birthday Cake
photo: Ole Jacobsen

IETF 65 Review: RAI - a new area
*Interview with new RAI Area Directors: Jon Peterson, Cullen Jennings,
conducted by Mirjam Kühne*

Recently a new IETF area has been created: Real-Time Applications and
Infrastructure (RAI). We wanted to find out more about the motivation behind this
decision and the scope of the new area.

Question: When was it decided to set up a new area?

Jon: Already 5 or 6 years ago people spoke about setting up an area that was
focused on - what they then called telephony. At that time many people viewed it as
this 'container to put all this radioactive material into, so it cannot contaminate the
rest of the IETF' and therefore resisted that idea. Now the situation is quite different
with SIP and similar technologies having gained a certain prominence in the
industry.

We are certainly generating enough documents and working groups and have
enough visibility that it easily warrants its own area.

Cullen: It also reflects what is going on in the industry and as a result there are new
people with new energy in this field.

2 WGs were moved out of Applications (simple and geopriv). The rest were moved
from Transport [Editor's note: a full list of RAI WGs is included at the end of this
article].

The scope of things that we were trying to cover in the Transport area was diverging
further apart. It was covering an incredible range.

Jon: We needed to have at least two very distinct areas of expertise to work in
Transport. You needed to understand UDP plus all the SIP related work. That
makes it hard to find people to fill the job. I was brought in as a Transport AD,
because I had SIP expertise. I was not really a TCP expert.

Cullen: My area of expertise is also around SIP and the whole communications area.

Jon: Another aspect is security: there are people who design security mechanisms
and there are people who know how to apply security mechanisms to protocols that
need them. And I think in that latter category we have significant expertise.

Cullen: over the last 5 years, the whole issue of bringing presence in and how
presence works for communication systems, how to set up policies and how to deal
with these various aspects, is something no one was an expert in a few years ago.

Jon: Another factor that is worth mentioning is scheduling. Having the Transport
area include all of the SIP related meetings, finding time for all the meetings and
trying to ensure that people can make it, became increasingly difficult.

Question: What are the main topics currently being worked on in the RAI area?

Jon: The work on emergency services for real time communications (related to
emergency phone numbers like 911, 112) is important (see Emergency Context
Resolution with Internet Technologies (ecrit) WG). There has been an enormous
amount of work and clearly also some controversy around various ways to do the
protocol. That is one of the topics that the industry at large recognises as a
potentially limiting factor for deployment, for instance with Voice over IP.

Cullen: This is another example, like enum, that does not only involve technical
issues, but also touches on regulatory, operational and practical issues. The
emergency response work that is being developed now is likely to be better than the
currently deployed systems in many ways. It takes into account mobile devices and

allows a broad range of location information to be reported to the emergency responder. It also provides ways to place policy to restrict the privacy of the location information.

Jon: We had a BoF on peer2peer at this IETF 65. I believe everyone in the SIP community here at the IETF thought this was an enormously important effort. Although in this kind of environment there is bound to be disagreement about exactly the right approach. There are a lot of alternatives. There is a very strong consensus that we need to do something in this space, but we are not sure how SIP could operate in a context without service providers at all.

Cullen: We had a RAI open are meeting at IETF 65 where we talked about some issues that were relevant to lots of the WGs in the area. We spoke about how people want to organise work, how to be more effective and how to get lots of high quality documents done quickly.

Jon: The community has lots of good ideas about that.

The good news is that a lot of the core work on SIP itself is done. There is still a lot of work to do around leveraging it and building applications.

List of WGs in the Real-Time Applications and Infrastructure Area:

avt - Audio/Video Transport

ecrit - Emergency Context Resolution with Internet Technologies

enum - Telephone Number Mapping

geopriv - Geographic Location/Privacy

ieprep - Internet Emergency Preparedness

iptel - IP Telephony

mmusic - Multiparty Multimedia Session Control

sigtran - Signaling Transport

simple - SIP for Instant Messaging and Presence Leveraging Extensions

sip - Session Initiation Protocol

sipping - Session Initiation Proposal Investigation

speechsc - Speech Services Control

speermint - Session Peering for Multimedia Interconnect

xcon - Centralized Conferencing

Scott Bradner, University technology Security Officer at Harvard University: "The IETF is an incredibly important forum for the creation of standards - and standards in the true sense: they are standards, because people use them, not standards in the false sense of the traditional standards bodies where governments say 'you must use this specification.."

IETF 65 Review: Internet Area

By Geoff Huston

[Editors Note: While the following report provides a high-level overview of all working groups in the Internet area, some of them are discussed in more detail in the reports following this one.]

In this article I'd like to provide a brief run-down of the status of those Working Groups in the Internet Area that met at IETF 65 in March 2006, looking at the major items of interest that the WG is focussed on.

Note: This article does not attempt to provide a complete summary of all IETF activities in this area. It reflects the author's personal perspective on some current highlights.

This is not an official report, by the way, and I confess at the outset that I did not manage to attend all of these WG sessions at IETF 65. Much of the material here is based on the extensive reporting that the IETF produces, including the proceedings

http://www3.ietf.org/proceedings/06mar/index.html,

logs of text sessions http://www.ietf.org/meetings/text_conf.html

and the audio archives of the meeting http://videolab.uoregon.edu/events/ietf/

The Internet Area of the IETF sits in a position similar to that of the Internet Protocol layer in the traditional stacked layer of network models: between transport protocols and the underlying media. The "conventional" activities of this Area include standardization of IP adaptation layers (IP over *foo*), as well as a number of network attachment protocols and various forms of IP-specific protocols. For many years one of the major areas of activity in this area was the IPv6 WG.

IPv6 over Low power WPAN (6lowpan)

This WG is an example of the IP adaptation standardization role undertaken by the Internet Area – in this case the underlying media is the IEEE 802.15.4 class of networks, which includes a set of wide area low power wireless access systems. This WG includes the conventional agenda of IP adaptation interfacing, including framing, address generation and header compression specification. The WG also has the latitude to look at more innovative approaches to adaptation that make use of ad-hoc networks based on the MANET approach. The frame formats, address acquisition and header compression schemes have been documented in a 6lowpan draft which appears to be in its final stages in the WG review cycle (draft-ietf-6lowpan-format-02.txt). The WG is now looking at re-chartering with an intended focus on neighbour discovery, stateful header compression, recommendations for applications, meshed routing and security considerations. At IETF 65 the WG considered proposals for mesh routing, ad-hoc on demand distance vector routing, neighbour discovery and serial forwarding. It appears likely that the rechartering will proceed in the coming months.

Ad-Hoc Network Autoconfiguration (autoconf)

The autoconf WG is intended to standardize mechanisms to be used by ad-hoc (self-configuring) nodes for obtaining unique routeable addresses. Such ad-hoc nodes would be capable of supporting the MANET routing protocols for multi-hop communications. The WG is chartered to produce a "MANET architecture" and an auto-configuration mechanism. The WG is currently working on the MANET architecture document, as well as the problem statement documents for auto-configuration, so at this stage the WG is still in its initial phase. This is part of a larger effort to bring IPv6 standards into the realm of reliable self-configuration in mobile environments that may utilize various forms of ad-hoc connections to build up connectivity services. The WG was established just prior to IETF 64, so the progress to date has been noteworthy.

Dynamic Host Configuration (dhc)

The Dynamic Host Configuration Protocol (DHCP) is now a very well-established protocol with extremely broad deployment. DHCPv4 is a Draft Standard, and DHCPv6 is a Proposed Standard. This WG is, in effect, a protocol maintenance WG, maintaining oversight on proposed DHCP options and extensions in a manner that is consistent with the core DHCP specification, avoiding instances of option and extension clashes and duplication. Current WG activities include security and authentication, rigorous analysis of the specification, operation of DHCP in dual-stacked IPv4/IPv6 contexts and dynamic updates. The WG is a well established one with a very sizeable list of already published RFCs. The current work at IETF 65 was the consideration of a number of DHCP option proposals, namely for a timezone option for DHCPv6, emergency dial string option, 802.21 information service option, PANA authentication agent option, service override option, lease query option, and passive Duplicate Address Detection (DAD). The WG also considered mixed DHCPv4 and DHCPv6 environments and possible operational issues that could arise.

Detecting Network Attachment (dna)

As pointed out in the dna WG charter: "The current IPv6 stateless and stateful autoconfiguration procedures may take a fairly long time due to delays associated with Router Discovery and Duplicate Address Detection. … The main goal of this WG is to develop mechanisms that reduce or avoid such delays, in cases where they are not necessary. … The purpose of the dna WG is to define standards track and BCP documents that allow hosts to detect their IP layer configuration and connectivity status quickly, proposing some optimization to the current specifications that would allow a host to reconfigure its IPv6 layer faster than today. The WG has produced 1 RFC and one WG draft has passed WG Last Call and is now in the IESG review process. A further 7 drafts are still with the WG. This form of reworking existing specifications in order to optimise performance can be very slow and painstaking work, in that much of the existing sequencing of activity and the associated protocol timers were folded into the standard specification to ensure that the autoconfiguration steps did not converge to incorrect outcomes. The work of the dna WG follows a design team proposal to have the host be aware of layer 2 hints indicating a change in access point, and then have the host communicate to a router its concept of connectivity and have the router either confirm this view or propose a new network configuration for the host.

DNS Extensions (dnsext)

This is another example of a WG that has a significant protocol maintenance component. In this case the protocol is the DNS, and while there is a significant protocol maintenance component, the primary focus of the WG is DNSSEC. The WG is concerned with issues relating to DNSSEC deployment and the potential for protocol modifications in the light of DNSSEC experience. In addition the group is also studying zone transfer, notify and update documents as they progress towards Draft Standard status. Current activity is concerned with a set of DNS specification clarification documents, and the NSEC3 issues.

Extensible Authentication Protocol (eap)

EAP appears to be nearing the end of its current charter to revise the EAP specification with a view to fully document the protocol and improve the interoperability of the protocol. This charter is almost complete, and with the publication of the revised EAP specification in June 2004 and the state machine specification in August 2005, the remaining work items are concerned with the keying framework and the network selection problem. It appears that these two drafts are close to WG Last Call, and with that the only remaining task for this WG is to complete the problem definition document on network selection.

Host Identity Protocol (hip)

HIP has had a relatively lengthy history in the IETF. The idea was originally published as an individual Internet-Draft in May 1999. The basic idea is to inject a hash of the public key into the IP datagram as a means of providing a constant identity pivot within a packet sequence. This allows a certain level of locator agility while maintaining a presentation of a constant connection state to the upper level protocols. As noted in the HIP charter, "The Host Identity Protocol (HIP) provides a method of separating the end-point identifier and locator roles of IP addresses. It introduces a new Host Identity (HI) name space, based on public keys." This is an interesting WG in that its charter is not one that is primarily intended to produce standard protocol specifications, but to define a set of infrastructure elements to allow for wide scale HIP experimentation. At this stage the base HIP protocol specification has completed a WG Last Call, and the architectural description of HIP is to be published as RFC 4423. The mobility and multihoming specifications are in WG Last Call state, and are essentially complete. At this stage it appears that the WG is nearing completion of its chartered work items, and a rechartering discussion is underway in this WG.

Layer 2 Virtual Private Networks (l2vpn)

This WG is responsible for defining and specifying a limited number of solutions for supporting provider-provisioned layer-2 virtual private networks (L2VPNs). The VPN area is one that has certainly consumed a significant amount of attention from the IETF over the years, and the current IETF framework to work on this admittedly large topic is to group VPNs into a number of classes and work on each class as a distinct WG effort. In this case the l2vpn WG is looking at LAN-emulation VPN structures, IP-over-LAN emulation services, and point-to-point private wire services. The working group has a large set of active drafts at present. Five of these drafts were being reviewed as to their security properties by a Security Area review group after a WG Last Call, and a number of documents are close to a WG Last Call. However there are a further 7 drafts under current consideration, and 3 more waiting in the wings. This is a detailed area of activity, and one of the broader WGs in scope, despite the efforts to restrict its scope to layer-2 VPNs, and I suspect that this is not a WG that will have reached the logical end of its charter anytime soon!

Layer 3 Virtual Private Networks (l3vpn)

This is the routed equivalent of the l2vpn WG, looking at VPNs where the VPN is an active routing entity for the client VPN. This WG has already produced 10 RFCs and while there are a further 14 Internet-Drafts in the process, most of these have completed a WG Last Call and are in the subsequent stages of IESG review or awaiting publication. There are only 3 drafts that are currently in the WG, one concerning verification of routing information generated by PE routers and a further two drafts relating to multicast requirements. The discussion on whether to recharter the WG or to declare victory and move on is a likely topic for this WG in the coming months.

Mobility for IPv4 (mip4)

According to the mipv4 WG charter. "IP mobility support for IPv4 nodes (hosts and routers) is specified in RFC 3344. RFC 3344 mobility allows a node to continue using its "permanent" home address as it moves around the Internet. The Mobile IP protocols support transparency above the IP layer, including maintenance of active TCP connections and UDP port bindings." At present the IETF appears to be in a phase of consolidation in terms of revisiting some basic specifications, and mobility for IPv4 has not escaped such attention. The WG is working on an update to RFC 3344 that clarifies some aspects of the protocol as well as making some adjustments to the protocol specification (draft-ietf-mip4-rfc3344bis-02.txt). This would set the path for mipv4 to progress to a Draft Standard within the Internet Standards process.

Mobility for IPv6 (mip6)

MIPv6 has a similar objective to mipv4, unsurprisingly, but the mechanisms used in IPv6 to provide this functionality are quite different. At this stage the number of working group documents and related individual submissions is up to 18 drafts, although its not quite as daunting as it sounds. The MIB and shared key documents are to be published as Proposed Standards, and the bootstrap and extensions to the socket API are in the final stages of revision prior to publication. The WG has also completing a review of Mobile IPv6 with IKEv2 and the revised IPv6 architecture.

MIPv6 Signalling and Handoff Optimization (mipshop)

A quick glance at the MIPSHOP drafts and its charter milestones would have you believe that this WG has completed its work items on Hierarchical Mobile IPv6 mobility management (HMIPv6) and Fast Handovers for Mobile IPv6 (FMIPv6). However the group considered 11 individual contributions relating to further potential work for this WG. In other words its chartered work appears to be complete, but the continuing level of interest in this area of activity is extremely high. It appears that this WG may be assuming a role of evaluation of various forms of experimental extensions for MIPv6 that relate to particular envisaged deployment scenarios in the signalling and handoff area.

Mobile Nodes and Multiple Interfaces in IPv6 (monami6)

One of the critical aspects of the IPv6 architecture is the concept of multiple addresses, where an endpoint can be configured with multiple address prefixes simultaneously. This presents some issues to mobility protocols with multiple care-of addresses and potentially multiple Home Agent addresses. The objective of the monami6 WG is to produce a problem statement and associated specifications to clarify the use of multiple addresses in mobility contexts. The multi-homing motivation scenario and mipv6 analysis drafts are in their final stages of WG review and work is progressing on multiple care-of addresses and flow binding.

Network Mobility (nemo)

The nemo working group is concerned with managing the mobility of a network, looking at the issue in the form of interactions between Home Agents and Mobile Routers. The working group appears to be in the latter stages of defining common terminology, requirements, models and issues. It is likely that this material will be completed in the coming months, exposing the critical parts of followup agenda, namely routing optimization in both IPv4 and IPv6 contexts (as well as hybrid v6 over v4 contexts, no doubt) and adequately addressing the associated security issues that proliferate this area of mobility. This is a relatively challenging area to work in and it will be interesting to see how well the Internet Area can produce clear

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Bob Hinden, Nokia (present at IETF 1): "I think there are two different dimensions where we will see lots of growth: one is in places that don't have the Internet today. That is a big challenge in many ways. The other dimension is the development to make everything on the Internet interconnected. Instead of just having the laptops, PCs and servers we have to today, we will have an increasing amount of devices that are small or embedded. They may be self-organised but networked together. In the first case the network is getting wider and covering more area and more people. But I think it is also going to get a lot more denser with more devices on the network all the time.

Building this big, complicated, very dense network where everything is networked together and everything has a potential to talk to each other and in a secure way, so it is usable, will keep us all busy for a long time."

and concise specifications to address this space. The decision to recharter nemo to undertake this work, or use a new WG for this route optimization effort has yet to be made.

Network-based Localized Mobility Management (netlmm)

The basic motivation of this WG is in the assertion that mobility for IP nodes can be more efficiently handled if mobility management is broken down into localized mobility management and global mobility management. Local mobility involves movements across some administratively and geographically contiguous set of subnets. As the netlmm WG charter notes: "In the WLAN infrastructure market, WLAN switches, which perform localized mobility management without any mobile node involvement, have seen widespread deployment … [this suggests] localized mobility protocol with no mobile node software to specifically implement localized mobility management". It appears that the WG is heading towards the substance of its study in the draft "Network-based Localized Mobility Management Interface between Mobile Node and Access Router" (draft-laganier-netlmm-mn-ar-if-00). However, the WG is following what has become a very conventional IETF approach of first working at a Problem Statement (what are we talking about), Requirements (why is this useful) and Threat Model (what could go wrong here) as the initial steps into this space.

Network Time Protocol (ntp)

NTP is another of those venerable protocols with very extensive deployment experience. In this case NTP is the timekeeper for the Internet. This WG is chartered to advance NTP along the standards track, by documenting the deployment experience of NTPv4 and completing the specification of NTPv6. From that respect the WG is close to completion of its initial charter, and is looking to add work items concerning IPv6, security and auto-configuration. The NTPv4 document is close to completion within the WG and requires some further revision to reflect NTP extension and authentication fields, the definition of IANA-managed protocol parameter registries and some guidance on the poll interval. The work on the algorithm specification for NTP is also underway. The WG appears to be steadily working through its agenda.

Protocol for carrying Authentication for Network Access (pana)

Its worth quoting the WG charter here to describe the intent of this working group: "The goal of PANA is to define a protocol that allows clients to authenticate themselves to the access network using IP protocols. Such a protocol would allow a client to interact with a site's back-end AAA infrastructure to gain access without needing to understand the particular AAA infrastructure protocols that are in use at the site. It would also allow such interactions to take place without a link-layer specific mechanism. […] provide support for various authentication methods, dynamic service provider selection, and roaming clients." Once more this WG has followed the convention of initial documents concerning Framework (what are we talking about), Requirements (why is this useful) and Threat Model (what could go wrong here) as the initial steps into this space. The requirements and threats documents are already published as RFCs and the core PANA specification document, framework description and IPSEC use specification have been passed to the IESG. The SNMP and Pana State Machine descriptions have also been largely completed. The current focus of the WG is on pre-authentication, context transfer, mobility optimizations and interoperation with AAA systems.

Pseudo Wire Emulation Edge to Edge (pwe3)

As any student of Computer Science will tell you there is nothing quite like recursion. Of course recursion is not confined to algorithms and the potential to emulate various media-layer servers as virtual services over an IP substrate has proved to be irresistible for IP. The WG is looking at the encapsulation, transport, control, management, restoration, interworking and security of emulated point-to-point link servers. The set of emulated services includes Ethernet, Frame Relay, PPP, HDLC, ATM, low-rate TDM, SONET/SDH and Fibre Channel. This is a relatively challenging agenda and the WG has already completed documents on a generic architecture and requirements, as well as encapsulation methods for Ethernet, Frame Relay, ATRM and HDLC PPP. However the list of active drafts is impressively long at this point. So there appears to much for this WG to undertake across the remainder of 2006.

Site Multihoming by IPv6 Intermediation (shim6)

This WG has adopted a two phase approach to the area of study. The initial work phase has been to develop a core set of documents that describe the "basic" set of SHIM6 protocol actions, as well as the associated protocol objects that will be used in the SHIM6 protocol. This base scenario looks at the multi-homing problem from the perspective of two communicating hosts that undertake an exchange locator information between themselves as a means of preserving active sessions by being agile across locator pairs in the event of active path failure. This protocol specification work is largely complete, and the three documents are in the closing stages of the WG's consideration. SHIM6 will now be turning its attention on to a number of potential refinements to the approach, including site-based locator policy settings, split functionality SHIM approaches, and also to the area of signalling path and locator information vertically within the protocol stack. At the same time the WG is now soliciting implementations of the base specification in order to assess the robustness of the protocol specification.

Softwires (softwires)

The issues relating to various permutations of IPv6 and IPv4 have been studied by the IETF for many years now, and the softwires WG is the latest in what has become a rich tradition for the IETF. According to its charter, the softwires WG is undertaking the standardization of the discovery, control and encapsulation methods for connecting IPv4 networks across IPv6 networks and IPv6 networks across IPv4 networks in a way that will encourage multiple, inter-operable implementations. "softwires" are, in this context, various forms of tunnels, and the richness of tunnel approaches, and the level of mutual incompatibility in these approaches are the critical issues for this WG. This WG is looking to define a software end-point discovery mechanism, a softwire setup negotiation protocol and a standard encapsulation. The WG appears to have reached consensus on a "Hub and Spoke" scenario using L2TP and a "Mesh" scenario using extensions to Multi-Protocol BGP with negotiated tunnel encapsulation types. The practical approach being taken by the WG in looking to the capabilities of deployed networks and equipment to guide their standardization decisions appears to be one that offers a practical and effective approach to this longstanding issue.

Transparent Interconnection of Lots of Links (trill)

Many operations folk have grappled with Spanning Tree protocol in L2 networks for many years. There have been noteable victories and equally noteable defeats over the years! Spanning Tree has well known weaknesses and one approach to move to more robust protocols in this space is to look at the problem as a routing problem. The trill WG is looking at the application of link state routing protocol technology to this problem space, using the initial rbridge proposal as a starting point (draft-

perlman-rbridge-03.txt). The WG is looking at a problem statement, architecture document and a routing requirements document in addition to the rbridge protocol specification.

BoF Sessions

IP over IEEE 802.16(e) Networks (16ng)

This is the second attempt to introduce the work item of standardizing IP over WIMAX (IEEE 802.16) into the IETF. This appears to be a matter principally of coordination between multiple standards bodies and also coming to grips with multiple convergent layers.

Layer 2 Control Protocol (l2cp)

This BoF was concerned with the configuration of access devices, and, in particular the control of the L2 (switching) operation of access devices. The proposed mode of operation for this group is in keeping with the current style of the IETF to first look at a common framework to describe the environment, then generate a set of requirements for the space, and then look at protocol development work, preferably through protocol adaptation or recycling: "The WG will define a framework and set of requirements, and will investigate and define a solution for an IP based Layer 2 control protocol that is robust, reliable and scalable. L2CP will be based on extensions to existing protocols. The initial proposal for L2CP is based on GSMPv3."

Network Endpoint Assessment (nea)

This BoF was concerned with a proposal for a Network Endpoint Assessment protocol specification, intended to assess the "status" of devices before that attach to a network. This work is related to the Endpoint Attachment Protocol (EAP) and RADIUS, but focuses on what is termed "posture assessment", where "posture" is the device's current state of operating system patches, Firewall state, and similar, and where the assessment checks this state against a set of policy rules.

IETF 65 Review: IPv6 Host Mobility

By Wolfgang Fritsche and Gerardo Giaretta

Note: This article does not attempt to provide a complete summary of all IETF activities in this area. It reflects the author's personal perspective on some current highlights.

Mobile communication is continuously becoming more and more important in our daily life. Consequently also an increasing number of IETF working groups are dealing with mobility aspects. In this field one could roughly distinguish between host mobility, network mobility and ad-hoc networks. This review focuses especially on IPv6 host mobility aspects discussed during the IETF 65 in March 2006.

Mobility for IPv6 WG (mip6)

The mip6 WG focuses on enhancing the Mobile IPv6 base protocol with functionality required for a large-scale deployment. These enhancements will include mechanisms for bootstrapping the security associations between Mobile Node (MN) and Home Agent (HA), improvements for HA reliability, or support for MNs changing their home addresses. Beyond that the WG will draft problem statements concerning issues with firewalls, deployment in IPv4 networks and multicast.

The bootstrapping design team has completed its work, specifying two scenarios. In the split scenario the mobility service is authorized by a different service provider from the network access provider, and the HA address discovery is performed using the DNS. In the integrated scenario the mobility service and access providers are the same and the HA address discovery is done by using DHCPv6. For the split scenario an external review by DNS and IKEv2 experts has been proposed for optimizing solutions for DNS home address update and home prefix advertisement. During the IETF 65 meeting, the goals for the AAA-HA interface were presented. This would be sufficient for the split scenario. The integrated scenario requires an interface between AAA and NAS. It has been recommended to broaden the scope of this document to cover both, AAA-HA and AAA-NAS interfaces. Standardization of these interfaces is expected to happen within the radius and/or diameter WGs.

Another work item for the mip6 WG is the Dual Stack MIPv6 (DSMIPv6) document. This document allows the use of MIPv6 only for dual stack nodes, i.e. to eliminate the need for two simultaneous mobility management protocols. Several issues were discussed during the meeting including the use of a new keepalive mechanism (as opposed to the binding updates only) and the message formats.

The WG has recently established a new design team to investigate HA reliability.

MIPv6 Signalling and Handoff Optimization WG (mipshop)

The mipshop WG focuses on defining optimizations for Mobile IPv6 signalling and handoff performances. The WG has published the specification for Fast Handover for Mobile IPv6 (FMIPv6, RFC 4068) and for Hierarchical Mobile IPv6 (HMIPv6, RFC 4140) and has been recently re-chartered to cope with further optimizations related to IP mobility.

The new charter includes two main topics. The first one is related to the previous charter: the mipshop WG will continue to work on HMIPv6 and FMIPv6 in order to prepare their publication as proposed standards. The new charter includes some activities that are related to the IEEE 802.21 Media Independent Handoff (MIH) working group. Mipshop will define the mechanisms to deliver MIH services information through a "layer 3 or above" protocol.

During the IETF 65 meeting, three Internet-Drafts have been presented concerning MIH: one presentation dealt with the problem statement and two other presentations were related to the requirements for Handover Event/Command Services and for

Handover Information Services. None of these drafts has been accepted as WG item and the WG is still discussing the scope of the detailed work.

A security solution for HMIPv6 was presented : the solution is based on SEND. Naturally, the solution assumes that the MNs use IPv6 stateless autoconfiguration and SEND and does not need any AAA involvement.

A solution for FMIPv6 security was proposed: an AAA exchange is used by the MN to request a key from the home AAA server to be shared with the access router (AR) in order to protect the FMIPv6 Fast Binding Update.

At the end of the meeting, there was some discussion on adopting some Internet-Drafts as WG items; in particular, RFC4068-bis and other proposals based on AAA and SEND for FMIPv6 security and other FMIPv6 related drafts (FMIPv6 over foo). The consensus call for WG adoption is still on-going in the mipshop mailing list.

Mobile Nodes and Multiple Interfaces in IPv6 WG (monami6)

The monami6 WG focuses on producing problem statements and specifications addressing issues related to simultaneous use of multiple IPv6 addresses on mobile hosts or routers. These multiple addresses could be assigned to a single or multiple interfaces. Furthermore the WG will investigate flow bindings (mechanisms, to bind a certain flow to one of the MN's care-of addresses).

An update of work on using several care-of addresses for Mobile IPv6 was presented. This solution was extended to allow the registration of several care-of addresses within a single bulk registration. In case the MN has multiple interfaces, it has to de-register all its registrations if one of its interfaces attaches to the home network. As a next step security considerations will be added to the draft.

A new draft on flow binding was presented. Currently Mobile IPv6 only allows binding of all traffic to a single interface. The intention of this work is to achieve a finer granularity of flow binding on interfaces. A new rule identification option is included in Binding Updates and Binding Acknowledgements that specifies which flows should be bound to which care-of address, and consequently to which interface. A flow in this context follows the definition in RFC 2460. It should be possible to add or remove a flow from a certain care-of address. This functionality could be used for splitting the MN's traffic received from the HA, the Correspondent Node (CN) or the Mobility Anchor Point (MAP).

Network-based Localized Mobility Management WG (netlmm)

One could distinguish between global and localized mobility management, whereby the latter is focusing on mobility management within access networks. The netlmm WG will design an IPv6-based, link-layer agnostic protocol between Access Routers (ARs) and the Mobility Anchor Point (MAP) in the access network, which handles localized mobility aspects on the network side transparently to the mobile host.

The netlmm WG had its first formal meeting during IETF 65. The requirements draft for netlmm will be renamed into "design goals", and will remove the gap analysis section, which briefly discusses other mobility management approaches and their gaps in meeting netlmm requirements. The draft on netlmm threats will focus on covering threats to the MN-AR interface. Threats to AR-MAP interfaces are considered to be easier to solve, and are therefore not part of this work.

A design team has been established to work on the required protocol design. It is planned to have a first version available IETF 66 in July 2006. This protocol design should cover components such as MN identifier, dynamic MAP allocation, message types for location updates between AR and MAP, message transport (control plane), security between AR and MAP, address assignment for MNs, support for any IP version, data plane transport, AR-MAP reachability detection, or AR handover. The design won't consider components such as the MN-AR interface, inter-MAP

handover, fast handover, or hierarchical MIPv6. So far the design team has not yet decided on a specific protocol for netlmm.

In addition to the protocol designed for the AR-MAP communication the WG also adopted work on the interface between MN and AR. This informational work will illustrate the use of existing protocols, such as SEND, IPv6 ND or DNA on this interface, but won't specify any new functionality.

Protocol for carrying Authentication for Network Access (pana)

The pana WG focuses on defining a protocol that allows clients to authenticate themselves to the access network using IP protocols. The WG has already published the requirements for the solution (RFC 4058) and a threat analysis and the security requirements (RFC 4016). Currently, the pana protocol specification is in IETF last call, together with the pana framework document that described how the PANA protocol can be applied to different deployment scenarios and can interwork with other IETF protocols, such as IP address configuration protocols (e.g. DHCP and IPv6 stateless auto-configuration).

Another WG draft is quite close to submission as RFC: the pana-ipsec draft specifies how the PANA protocol is used to bootstrap an IPsec security association between the client and the network in order to protect data exchanged over the wireless link. This document is currently under AD review.

During the IETF 65 meeting, an update for the use of SNMP in a pana environment has been provided: the document specifies how SNMP is used between the PANA Authentication Agent (PAA) and the Enforcement Point (EP) in order to install policies that need to be applied to the traffic sent and received by the client. The draft is fairly stable and a WG last call will be issued; in addition an external review by SNMPv3 experts has been proposed.

Handover and Application Keying and Pre-authentication BoF (hoakey)

During IETF 65 the hoakey BoF had its first meeting. The scope of the BoF was quite broad and included the definition of mechanisms based on the Endpoint Attachment Protocol (EAP) to derive keys used during handover events, and solutions based on EAP to derive keys that can be used by other applications in order to bootstrap these services in a more efficient way (i.e. in order to avoid performing multiple EAP authentications with the same EAP server). Mechanisms to perform pre-authentication for network access were also included in the BoF proposal.

Concerning the topic of handover keys, a problem statement draft has been presented; the idea is to apply the concepts defined in the EAP key hierarchy to the case of an MN that changes the point of access to the network, resulting in a change of Enforcement Point or Authenticator. The scope of the proposed charter is not to extend EAP or the EAP key hierarchy, but to provide a model for handover keys, defining the entities involved and how handover keys are derived.

Concerning the application keys, another problem statement has been presented. There were several concerns regarding the way the application keys should be defined and handled. The problem statement itself has not be considered clear enough to proceed with the work: as an example, in several deployments the identities and credentials used for application authentication are not the same for network access authentication and this prevents to leverage on the latter to perform the former.

Finally, a problem statement about pre-authentication for inter-technology handover has been presented. The scope of this work does not include proactive IP address assignment that can be performed through other mechanisms; the idea is to proactively perform pre-authentication to neighboring authenticators in order to

decrease the interruption time when a handover occurs. The proposed charter aims to investigate the requirements for a pre-authentication protocol and the impact of pre-authentication procedures on current AAA protocols, such as RADIUS or Diameter.

IETF 65 Review: Wireless
By James Kempf

Note: This article does not attempt to provide a complete summary of all IETF activities in this area. It reflects the author's personal perspective on some current highlights.

Two new wireless-related working groups met for the first time during IETF 65:

1. NETLMM - working on a protocol for network-based, localized mobility management
2. EMU - working on an update of EAP-TLS to improve interoperability and bring it to standards track, standardization of an EAP method using shared keys, and an EAP method using password databases.

In addition, there were BOFs related to mobility and wireless:

1. 16NG (met for the second time) - discussing work needed by IEEE, WiMax, and WiBro to put IPv6 over 802.16e
2. HOAKEY - discussing work to standardize the EAP application key hierarchy for handover, backend AAA work for preauthentication, and AAA key distribution for services.

In this review, we will discuss two working groups that are about done with their charter deliverables: the MOBIKE WG and the 6LOWPAN WG. MOBIKE is in the Security Area and 6LOWPAN is in the Internet Area.

The MOBIKE working group was chartered to define modifications to the IKEv2 mutual authentication and key exchange protocol that allow a moving node or a node with multiple interfaces to switch local addresses without having to re-establish their IKEv2 and IPsec security associations. The protocol does not apply to IKEv1. The working group confined their work to tunnel-mode SAs, transport-mode SAs were explicitly declared out of scope. The work is expected to be most useful for VPN clients, so that they can move between wireless access points or between multiple wireless interfaces - for example WLAN and GPRS - without having to establish new security associations. Although the protocol supports use of multiple addresses on both ends, only one pair of addresses (client side, VPN-gateway side) may be used at a time. The protocol does not support dynamic load balancing between addresses. The initiator of the IKEv2 SA, typically a remote VPN client is responsible for deciding what pair of addresses to use. The VPN gateway simply tells the client what addresses it has available but does not initiate an update of the client's IPsec SAs until the client requests it. The protocol includes two features designed to handle explicit security concerns associated with mobility and multihomed hosts. A return routability check is included so that a VPN gateway can optionally check whether the client is, in fact, reachable at the addresses it has specified. This prevents a redirection attack, in which a fully authenticated client-attacker provides addresses where another node is reachable, to which the attacker then redirects traffic. An explicit mechanism for excluding Network Address

Translators (NATs) and other address translators such as IPv4/IPv6 gateways is included. This mechanism is primarily for site-to-site VPNs and other cases where NATs and other middleboxes that modify addresses are known not to be present, and any modification of the IP address can be considered an attack. The working group has produced two documents, one on design considerations (an Informational document) and another defining the protocol itself (for Proposed Standard). Both documents have passed IETF last call and are in the RFC Editor's queue. At IETF 65, the working group discussed remaining items, principally a modification of the PFKEY interface to reduce overhead of IPsec SA movements and tunnel overhead, and a possible new item, the Bound End to End Tunnel (BEET) draft, which had been proposed as a work item initially but was deferred until the initial work was complete. The working group decided to drop the PFKEY goal due to lack of implementation interest. BEET provides limited tunnel mode semantics for IPsec ESP when the ESP security association is end-to-end, rather than end-to-middle, as in VPNs. The working group has decided to close since there was also not enough interest in continuing work on BEET.

The 6lowpan WG was chartered to work on the problem of transmitting IPv6 packets over 802.15.4 low power wireless networks. These networks are characterized by a bit rate of 20 to 250 kbps in the frequency range of 900 to 2400 MHz. The link layer is almost but not entirely like standard 802.11 networks, but the range is much more limited. Also, since broadcast is expensive, it is necessary to avoid multicasting wherever possible. The deliverables for the working group were to produce a problem statement, describing why the standard default IPv6 to Ethernet binding needs changing, and a solution document, describing modifications to various aspects of sending IPv6 packets over 802.15.4 links. The problem statement document is complete, and the solution document is undergoing final discussion. 802.15.4 nodes are allowed to have 16 bit MAC addresses in order to save space in link layer frames. The solution document specifies a way to generate the interface identifier part of the IPv6 address (bottom 64 bits) using a 16 bit instead of an EUI-64 bit MAC address. Since the MTU for 802.15.4 frames is below the minimum MTU for IPv6 packets, fragmentation, and reassembly mechanisms are defined. Modifications to stateless address autoconfiguration that suppress multicast are also specified. Finally, a stateless header compression algorithm is presented to reduce the header overhead of IPv6 packets. At IETF 65, the working group discussed a few remaining items in the solution draft, and possible recharter items. Node configuration and setup for 802.15.4 nodes was discussed as a possible recharter item. The idea here is to reduce further the need for human intervention to automate connecting sensors and other non-human interfaced devices to the network. Security configuration is especially a concern. The development of a specification for layer-2 mesh routing was also discussed as a charter item. The idea would be to investigate a MANET routing protocol such as AODV and see what would be needed to adapt it to setting up Layer 2 meshes. Although specifications are available for mesh routing of 802.15.4 networks, the specifications are difficult for developers to access. Another possible recharter topic is the a set of recommendations for applications, such as service discovery or application protocols such as SNMP. Finally, working on security threats and solutions was discussed. The working group has established a Wiki as an experiment in recording discussion and design ideas that don't end up in the working group documents. The Wiki can be accessed at

http://6lowpan.tzi.org

The Evolution of an Internet Standard

By Geoff Huston

The IETF is, in effect, a standards making organization, and, like many other standards making organizations, it has a principle focus on the generation of "standard" specifications of technologies and their intended use. Obviously in the IETF's case this focus lies with the Internet, and within that increasingly broad scope of activity, the IETF appears to specialize on aspects of the technical infrastructure of the network and the associated aspects of operational management. Of course this brief hand-waving summary of the IETF probably raises more questions than it answers – How are standards produced? How does the IETF decide that a topic is a suitable area for standards-related study? How does the process used by the IETF work? When is the process complete?

One way of answering such questions is to go through a description of the IETF's Internet Standards Process (RFC 2026)[1]. However that's probably pretty dry material to all but the most dedicated of standards aficionados. The IETF ethos is one that espouses practical sense: "rough consensus and running code" offers a very pragmatic perspective on the standards process. So in the same spirit of taking a practical perspective here, perhaps the best way to describe this process is to follow the path of an individual document as it progresses through the IETF process. I'll use the document describing the 4-Byte AS number specification, for no other reason than it is a document that the author is relatively familiar with and it appears to have a background that is relatively typical of the IETF process.

Step 1 – Understanding the Need

The IETF does not generate standards upon a whim (or at least not very often!), nor does it do so to meet some annual production quota (or at least that's not the intention!). Internet Standards produced by the IETF are intended to address a practical need where a standard specification can assist both vendors and consumers of a product or a service to be assured that a standards conformant implementation will undertake certain functions in a known manner, and that, as appropriate, implementations of the standard specification from different vendors will indeed interoperate in intended ways.

The first step in the IETF's process is one of reaching a reasonable common understanding of the requirements that the work should address. At times the exposition of the requirements is undertaken during the process of formation of an IETF Working Group, and the requirements are aired in the formative Birds of a Feather (BoF) sessions at IETF meetings. At other times the discussion of requirements may happen within an existing Working Group (WG) as part of a proposal to adopt a specific work item into the scope of the WG's activities. Also at times WGs have been formed solely to produce requirements, with the intention to pass these requirements to other WGs for subsequent activity. And, of course, at other times the requirements are gathered into the IETF from exposition of the topic in other venues. No matter what the path, the essential question that should be

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[1] This document now is 10 years old, and not unsurprisingly certain aspects of this document have been revised due to the changing landscape. The updates to this original specification can be found in RFC 3932, The IESG and RFC Editor Documents: Procedures, RFC3979 Intellectual Property Rights in IETF Technology and RFC3978 IETF Rights in Contributions.

Steve Crocker, CEO of Shinkuro Inc.: "The most important thing for the IETF to do is to continue to organise and manage itself to develop the highest quality technical work and to do so in an efficient and open way that is inviting to new people. I have a very special place in my heart for the IETF. It is creating an entirely different world and some of the things that come naturally out of the IETF are fairly radical from a principle point of view: We have no membership. So, we have no way to restrict ourselves. That also means we cannot have votes. Making decisions by 'rough consensus and running code' turned out to be remarkably effective."

answered is "just what problem are we solving here, and why does this problem need to be solved in this venue?"

In the case of the 4-Byte AS Number work there was no IETF-generated requirement specification that was passed to the Inter-Domain Routing WG. This was a case of a need being expressed through other studies and being bought into the IETF. In the late 1990's a number of studies of the inter-domain routing space indicated that the consumption of AS numbers was exhibiting clear exponential growth trends, and that exhaustion of the existing AS number space could occur by 2005 if those trends were to continue. This was the subject of presentations to the IETF on routing in the late '90s.

The form of introduction of how to address this problem into the IETF followed a relatively traditional path in the form of an individually submitted Internet-Draft draft-chen-as4bytes submitted by Enke Chen and Yakov Rekhter in September 2001. In reviewing this draft some years later, it is interesting to note that the draft addressed the relatively straightforward specification of an expanded AS number field in the BGP protocol as the result of a capability advertisement. The motivation for the proposal is not considered in the draft, and is a common convention in Internet-Drafts. The document notes a potential problem with transition from the shorter existing AS number space to this larger 32 bit number space, but does not address how such a transition could be supported. It also does not explain in any detail what may happen if the local routing domain is using a 4-Byte AS number when it attempts to initiate an eBGP peer session with a BGP speaker that does not recognise such 4-Byte AS numbers. So what we have here is the genesis of an idea, but one that clearly has to be refined.

Step 2 – WG Admission

The next step in the IETF process is to place the work item into the agenda of a WG. One option is the chartering of a WG to look quite specifically at a particular item of work, and such decisions to charter a dedicated WG are made by the IESG. The IESG decisions to charter WGs are generally based on their assessment of the level of support from the IETF to take on the work, the degree to which the work fits within the chosen scope of the IETF's activities. Also taken into consideration is an indication of the feasibility of the proposed activity, and the extent to which there are a sufficient number of individuals who are keen to actually do the work. Of course not every work items generates its own WG, and a more common path is to integrate the work into an existing WG. This is conventionally signalled by the adoption of an individually submitted Internet-Draft as a WG document. Adoption of a draft by a WG involves a shift in the status of the document, in the document is now a WG document and revisions to the document should reflect the rough consensus of the WG.

In the case of the 4-Byte AS draft, the document was accepted as a WG document in 2001 by the IDR WG. This was based on the charter of the IDR WG to standardize and promote the use of BGP-4. The transition to a WG document also saw considerable refinement in the document of the transition case, where the local routing domain is using a 4-Byte AS number when it attempts to initiate an eBGP peer session with a BGP speaker that does not recognise such 4-Byte AS numbers. This initial WG draft draft-ietf-idr-as4bytes-00 describes the dual translation and tunnelling techniques that form the core aspect of this work.

Step 3 – WG Refinement

Once a document is adopted by a WG there is an iterative process of document refinement and WG review to successively refine the document to reflect the WG's considerations. The intended purpose of these open peer review cycles is to ensure that the document is peer reviewed, that it reflects a shared understanding of the space, that the specification is neutral and unbiased, that it is useful to the Internet, that it reflects a rough consensus of being of high quality, and that it is a feasible and practical approach to addressing the topic. When to complete this iterative process is normally signalled by a WG Last Call on the document. The judgement call of whether a WG Last Call has reached a rough consensus of the WG is one of the roles of the chair (or chairs) of the WG.

The 4-Byte AS document was refined as part of the iterative process a number of times. The initial revision (version 1, February 2001) included specific consideration of the transition mechanism where AS Confederations were being used. Version 2 (April 2001) of the draft included an IANA Considerations section relating to the BGP Capability code point assignment, and BGP Type Code assignments for the new structures introduced in this draft, as well as the assignment of an AS number to be used in the transition phase. Version 3 (May 2001) appears to offer some minor grammatical changes to the draft. Version 4 (September 2001) appears to also offer only minor changes to the grammar and appears to be a token holder for the work to ensure that all references to the work are not lost on the 6 month expiration cycle of Internet-Drafts. Versions 5 (May 2002) through to 10 (July 2005) appear at regular 6 month intervals and have no substantive changes at each iteration. WG documents need volunteer input in order to progress, and in some ways the IETF is no different to any other organization with limited resources – the organization tends to focus on the most pressing needs of the day. In this case, once the Internet bust exerted its influence on the industry the consumption rate of AS numbers slowed dramatically, and the predicted point of exhaustion of the existing number pool pushed outward to around 2011 – 2013. The urgency in defining a solution to this problem dissipated and the work on this document slowed down as a result. Following the circulation of revised expiry projections and the need to undertake considered planning to assist in the transition issue, in mid-2005 the topic was revised with some external impetus of revised projections concerning the exhaustion of the 2-Byte AS Number space and the need to undertake preparatory activities in a planned fashion. Version 11 (September 2005) reflected some grammatical changes to get the document ready of a Working Group Last Call, as well as a more informative Security Considerations section. Following the Working Group Last Call a further revision of the document was published (version 12, November 2005), including some changes to bring the draft to the current levels of Internet-Draft format and content guidelines, with the inclusion of an Introduction section, use of terms as defined in RFC 2119, and the addition of text relating to proxy aggregation conditions in transition, and explicit text to describe the reconstruction of the 4-Byte AS path. The IANA Considerations section was expanded to include the creation of the larger AS Number registry.

On November 12, 2005, the document was passed from the IDR Working Group to the Routing Area Directors, with the request that the document be published as a Proposed Standard.
https://datatracker.ietf.org/public/pidtracker.cgi?command=view_id&dTag=6498&rfc_flag=0

Step 4 – Implementability and Interoperability

One of the hallmarks of the IETF's standards process is to stress the importance of useful and practical standard specifications. The conventional manner in which this is assessed is the evaluation of the functionality and interoperability of two or more independent implementations of the specification. Such an assessment is recorded in the production of an implementation report. Reports that have been prepared for the IETF for various standards can be found at http://www.ietf.org/IESG/implementation.html. These documents record the implementation of an IETF protocol specification, those parts to the specification that were implemented and any aspects that were not implemented. They also document the outcomes of interoperability tests, and may include an assessment as to what extent the specification is sufficiently well phrased such that implementations that faithfully follow the specification will indeed interoperate correctly with other implementations.

Formally within the IETF Standards Process this requirement of documentation of implementations and their interoperability occurs when a specification moves from Proposed Standard to Draft Standard in the Internet Standards Process. However, a cursory glance at the RFC collection reveals 1,302 Proposed Standards, 119 Draft Standards, and 104 full Standards. The pragmatic observation is that much of industry that uses standard specifications are happy to work off the IETF's Proposed Standards, and there is generally little motivation to move any document through the next steps of the IETF Standards Process to a Full Standard. This implies that the formal steps of review of implementations and their interoperation is missing for many of the IETF's protocol specifications[2].

Each Area of the IETF has some discretion as to how it manages its part of the Standards Process, and the Routing Area has determined to address this issue of the extensive use of Proposed Standard as the stopping point for specifications by adopting the procedure that publication of Routing Area Proposed Standard documents should be accompanied by implementation and interoperability reports of the specification.

In the case of the 4-Byte AS work the report was published as an Internet Draft in September 2005 as an individual submission to the internet drafts editor (draft-huston-idr-as4bytes-survey), documenting two implementations of this draft and their interoperation.

Step 5 – Publication

The next step in the process is the handover from the WG to the IESG publication process. The first step is the handing of the document from the WG to the Area Directors as a publication request. This is the current state of the 4-Byte AS draft, which is currently marked as "publication requested". Normally within a week or two the document will have been reviewed by the Area Directors and placed on the agenda of the next IESG meeting. The role of the IESG is to conduct a review of the

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[2] Editors note: The IETF newtrk WG is looking it this issue.

document and include in that review an IETF-wide Last Call for publication of the document. It is not unusual for a document to attract some substantial comment at this step. Formally this is the point in time where the document is subjected to a broader review that includes "cross-area" consideration, and it is often the case that the document needs to resolve issues related to their impact on related technologies and their interoperation. It is not unusual for the document to be passed back to the working group for further consideration at this time to resolve these review comments into the document.

At some point the process of iterative review will reach a conclusion. The document is ready for publication, and is handed over to the RFC Editor for copy-editing and markup into a consistent document format . The document is also checked by the IANA, to ensure that any necessary protocol parameter registries are in place. The authors are consulted on any changes made to the document during this copy-editing phase, and then, once the authors' permissions have been obtained, the document is published as an RFC.

Step 6 – Use and Experience

At the same time others are making use of the specification in their line of activity, producing implementations of the technology or considering how such a technology could be used within their particular environment.

In this case the suppliers of BGP implementations are consumers of the 4-Byte AS specification, as they will inevitably be asked to provide this capability in their product. In addition, the Regional Internet Registries have an interest in this topic, as they will have to undertake a role of supply of these larger AS numbers, and need to coordinate this supply with availability of BGP implementations that will be able to manipulate these larger AS number fields. There are also implications in the area of documentation, training and supporting material that need to reflect the issues associated with the transition into the larger number space.

Some Observations

This production of an Internet Standard is neither a particularly fast, nor a particularly slow process. As needed, the document review process can be relatively fast, and RFC documents have been produced in timeframes of months, rather than the years taken in the example we have followed. On the other hand, when urgency is not a critical consideration, then the process can take on a more deliberative momentum, and, as with the example we've followed here, the process may take some years.

Perhaps more worrisome than the issue of timeframes is that we're continuing to condense the process of review and collapsing much of the role of Proposed Standards in the later stages of the Internet Draft, and Proposed Standard documents are becoming a surrogate form of Full Standard these days. The implications to the IETF's ethos of running code as an essential criteria for its documents are certainly a valid consideration as a result, as is the consideration of the utility and clarity of the IETF's documents. But, of course, every organization evolves to meet changing needs and roles, and the IETF is no exception to this. What constitutes an Internet Standard may change over time, and the process for generation of such standards may also change over time, but I for one would hope

Wouter Wijngaards, developer at NLnetLabs (Newcomer at the IETF): "To meet the people was the most important thing for me. That was really essential. I had a chance to meet people that I would normally only communicate with via e-mail: people who wrote the specifications for the software I am currently working on (NSD), people who use that software and people who are DNS experts and I could get advice from. I think the software I am writing will be more interoperable after having been at the IETF and having spoken to all these people."

that we continue to ensure that its not just the process that counts, but that the outputs continue to be useful to the Internet at large.

[Editors Note: For a more detailed description of the 4-byte AS number specification, see the recent issue of IPJ: http://www.cisco.com/ipj]

Recent IESG Document and Protocol Actions

A full listing of recent IESG Document and Protocol Actions can be found at:

http://ietfjournal.isoc.org/DocProtoActions0201.htm

A view of Dallas flooded
photo: Patrik Fältström

Calendar

Summer 2006 - 66th IETF
 July 9-14, 2006
 Host: Ericsson
 Location: Montreal, Canada

Autumn 2006 - 67th IETF
 November 5-10, 2006
 Host: TBD
 Location TBD

Spring 2007 - 68th IETF
 March 18-23, 2007
 Host: TBD
 Location: TBD

Summer 2007 - 69th IETF
 July 22-27, 2007
 Host: TBD
 Location: TBD

Autumn 2007 - 70th IETF
 December 2-7, 2007
 Host: TBD
 Location: TBD

IETF@20

The IETF is 20 years old in 2006. Check out ongoing activities on http://ietf20.isoc.org