

A report from IETF 85, November 2012, Atlanta, Georgia. Published by the Internet Society in cooperation with the Internet Engineering Task Force*

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From the Editor's Desk

By **Mat Ford**

Atlanta, Georgia, played host to the 85th meeting of the IETF with many attendees arriving via Hartsfield-Jackson airport, the busiest airport in the world. In this issue of the *IETF Journal* you'll find a roundup of some of the discussions and people that helped make this meeting so great.

Our cover article delves into what some would call the bread and butter of IETF processes—verifying the quality of a technology's standardised specification (in this case, NETCONF) by demonstrating the interoperability of multiple independent implementations.

Interoperability testing is also the subject of our article on Lightweight 4over6. Lightweight 4over6 is a less mature technology than NETCONF, but the article demonstrates the eagerness with which IETF participants code up their ideas to demonstrate practical utility and well-defined specifications.

We also present articles on the winners of the 2012 Itojun Service Award, and the Internet Society panel event that debated the future of the mobile Internet. Of course, no edition would be complete without columns from the IETF, IAB, and IRTF chairs, and coverage of hot topics discussed during the plenary meeting.

For more details of the Internet Area of the IETF in particular, a Working Group summary report is available at <http://wiki.tools.ietf.org/area/int/trac/wiki/IETF85>.

As always, we are hugely grateful to all our contributors. Please send comments and suggestions for contributions to ietfjournal@isoc.org. And remember, you can subscribe in hardcopy or via email at <https://www.internetsociety.org/publications/ietf-journal/ietf-journal-subscription>.

Successful NETCONF Interoperability Testing Announced at IETF 85

By **Bert Wijnen**

During 3–4 November, prior to the IETF 85 meeting, several implementers of the NETCONF protocol came together to do interoperability testing. We employed five NETCONF servers (devices or systems to be configured) and 10 NETCONF clients (programs to obtain and send configuration data to and from devices or systems). Figure 1 shows how clients and servers traditionally

Continued on page 6

Message from the IETF Chair

By Russ Housley

IETF 85 was a well-attended, successful meeting. Approximately 1,157 people from 55 countries came to Atlanta, Georgia, and actively engaged in helping make the Internet work better. It was exciting to see so many people collaborating.

The North American Cable Industry (NACI) was the meeting host, the hotel facilities were comfortable, and the soccer social on Tuesday was very entertaining. The soccer field was never empty—we suspect some attendees burned all of the calories that they consumed at the buffet! NACI was assisted by a large group of sponsors, including:

- Platinum Sponsors: Comcast and Time Warner Cable
- Gold Sponsors: Cable Labs and National Cable & Telecommunications Association
- Silver Sponsors: Bright House Networks, Cablevision, Charter, Cox, and Rogers
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Each organization contributed to a successful meeting. Thanks to all for your support.

The second Bits-N-Bites reception took place Thursday evening and featured exhibit tables for sponsors, free food, and free drinks. Sponsor tables by A10 Networks, Cable Labs, China Telecom, Comcast, Huawei, ICANN, IPSO Alliance, the Internet Society, and Tsinghua University had visitors throughout the event.

Since IETF 84, one new working group (WG) has been chartered and three WGs have closed. Between meetings, the Internet Engineering Steering Group (IESG) approved 73 Internet-Drafts for publication as RFCs. The RFC Editor published 168 new RFCs, including 38 Standards Track RFCs, four Experimental RFCs, and 25 Informational RFCs in the IETF Stream.

The Tao of the IETF is now a web page (<http://www.ietf.org/tao.html>) and has been translated into the top five non-English languages spoken by attendees of recent IETF meetings (<http://www.ietf.org/tao-translations.html>). I hope that these documents help new IETF attendees quickly learn about IETF culture.

The IETF 85 network included an implementation of SIDR route origin checking using the Resource PKI. Available signatures were validated, and valid signed routes were preferred. This was done using unofficial route origin attestations (ROAs) for the IETF network address space. I've challenged the NOC to employ official ROAs for IETF 86.

IETF 86 will take place in Orlando, Florida, U.S.A., on 10–15 March 2013. Comcast and NBCUniversal will be the meeting hosts. Scheduling information for the upcoming IETF meetings can be found at <http://www.ietf.org/meeting/>. I look forward to seeing you there. 🍷



Russ Housley, IETF Chair

The mission of the Internet Engineering Task Force is to make the Internet work better by producing high-quality and relevant technical documents that influence the way people design, use, and manage the Internet. See <http://www.ietf.org>.

Recent IESG Document and Protocol Actions

A full list of recent IESG Document and Protocol Actions can be found at <https://datatracker.ietf.org/iesg/ann/new/>

Words from the IAB Chair

By **Bernard Aboba**



Bernard Aboba, IAB Chair

IETF 85 Technical Plenary

The IETF 85 Technical Plenary, organized by Alissa Cooper, focusing on Internet performance measurement, included presentations by Dr. Henning Schulzrinne, chief technology officer of the FCC, and Sam Crawford, network engineer and operator of SamKnows.¹ A detailed report on the Plenary is available on page 7. Based on feedback from IETF 85 participants, the IAB selected “The End of Plain Old Telephone Service (POTS)” as the topic for the IETF 86 Technical Plenary.

Affirmation of the Modern Global Standards Paradigm

Russ Housley, IETF chair and member of the Internet Architecture Board (IAB), made a presentation on collaboration among standards development organizations at the Global Standards Symposium in Dubai, United Arab Emirates.² His presentation referenced the OpenStand principles, as did a presentation by Monique Morrow of Cisco Systems, and a post by Leslie Daigle, chief Internet technology officer of the Internet Society.

In order to provide an archival record of the OpenStand principles as agreed to by IEEE, IETF, IAB, W3C, and ISOC, after a four-week IETF-wide Call for Comment, the IAB approved publication of “Affirmation of the Modern Paradigm for Standards” as an Informational RFC within the IAB stream.³

Appointments

In the coming months, four slots on the IETF Administrative Oversight Committee (IAOC) will be filled—one by the IAB, and three by the IETF Nomcom (a full term, a replacement, and one to be filled by the newly selected IETF Chair). On 5 December, the IAB announced that it had reappointed Bob Hinden for its slot.⁴

RFC Editor

The RFC Series Oversight Committee (RSOC) is chaired by Fred Baker; the IAB lead is Joel Halpern. Since there is no separate RFC Editor stream, documents relating to the operation of the RFC Series are published on the IAB stream. On 27 December, the IAB completed an internal last call on “RFC Series Format Development,”⁵ prior to announcement of an IETF-wide Call for Comment. Public discussion of this document is occurring on the RFC Interest mailing list.⁶

ITU-T Coordination Programme

The ITU-T Coordination Programme is chaired by Eliot Lear; the IAB leads are Joel Halpern and Ross Callon. On 30 September, the IAB published RFC 6756, “Internet Engineering Task Force and International Telecommunication Union–Telecommunication Standardization Sector Collaboration Guidelines.”⁷

Continued on next page

The Internet Architecture Board is chartered both as a committee of the IETF and as an advisory body of the Internet Society. Its responsibilities include architectural oversight of IETF activities, Internet Standards Process oversight and appeal, and the appointment of the RFC Editor. See <http://www.iab.org>.

Words from the IAB Chair, continued

Liaison Oversight Programme

The Liaison Oversight Programme is lead by Spencer Dawkins. The IETF sent a liaison to ISO/IEC JTC1/SC6 regarding Tlsec,⁸ and to the Open Mobile Alliance⁹ relating to the resignation of the IETF's liaison manager, Murray Kucheraway.

Minutes of the 29 October 2012 virtual meeting of representatives of the IAB, the IESG, and the IEEE 802 Executive Committee are posted¹⁰ as are the minutes of the 25 July 2012 meeting.¹¹ To make progress on a revision to the IEEE 802/IETF liaison relationship document (RFC 4441), the IAB adopted "The IEEE 802/IETF Relationship" as an IAB work item.¹²

Glenn Parsons of the IEEE Registration Authority Committee (RAC) requested IETF feedback on a proposal for restructuring the Organizational Unique Identifier (OUI) within the IEEE 802 Medium Access Control (MAC) address.¹³ To provide pointers to and context for additional discussions scheduled during IETF 86, a short presentation will be made at the IETF 86 Technical Plenary.

Privacy Programme

The IAB Privacy Programme, led by Alissa Cooper, completed an IAB internal last call on "Privacy Considerations for Internet Protocols"¹⁴ prior to announcing an IETF-wide Call for Comment. Public discussion of this document occurs on the IETF Privacy mailing list.¹⁵

IP Evolution Programme

The IP Evolution Programme, led by Jari Arkko, has made progress on several documents within the IAB stream. The IAB adopted "Architectural Considerations in Smart Object Networking" as a work item.¹⁶ It published RFC 6709, "Design Guidelines for Protocol Extensions,"¹⁷ and completed an IAB

internal Last Call on "Architectural Considerations of IP Anycast"¹⁸ prior to announcing an IETF-wide Call for Comment. Public discussion of these documents occurs on the Architecture Discuss mailing list.¹⁹

The IAB also adopted "Report from the IAB/IRTF Workshop on Congestion Control for Interactive Real-Time Communication" as an IAB work item²⁰ and maintains a web page with materials from the workshop.²¹

Internationalization Programme

The Internationalization Programme is led by Dave Thaler. The IAB issued an IETF-wide Call for Comment on "Principles for Unicode Code Point Inclusion in Labels in the DNS."²² The document is being considered for publication as an Informational RFC within the IAB stream. The IAB completed an internal last call on "Issues in Identifier Comparison for Security Purposes"²³ prior to announcing an IETF-wide Call for Comment. Public discussion of these documents occurs on the Internationalization mailing list.²⁴ 

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Successful NETCONF Interoperability Testing Announced at IETF 85, continued from page 1

interact. The configuration data is based on a YANG data model.

Tests were done to ensure and demonstrate interoperability between all the implementations. Interoperability between genetically different implementations is one of the requirements in IETF in order to advance a protocol on the standards track. Also, interoperability tests help implementers identify any bugs in the code and any ambiguities in the IETF RFC specifications. In short, these tests help fix implementations and specifications.

The participants and the system configurations that they contributed for testing were as follows:

- CESNET and libnetconf's client and server example implementations (all were open source)
- Jacobs University and a NETCONF client (open source)
- Juniper and a NETCONF server and a test suite (client)
- MG-SOFT and a NETCONF browser (client)
- SegueSoft and a NETCONF browser (client)
- Tail-f and a NETCONF server and three clients (one was open source Java)
- YumaWorks and two NETCONF servers and two clients (one server and one client were open source)

We concluded that there does exist a robust set of interoperable implementations—meaning, we have met that requirement for advancement on the standards track and can confidently promote throughout the industry that NETCONF is mature and stable for further and wider deployment.

In addition, we report demonstrated interoperability for the following NETCONF RFCs:

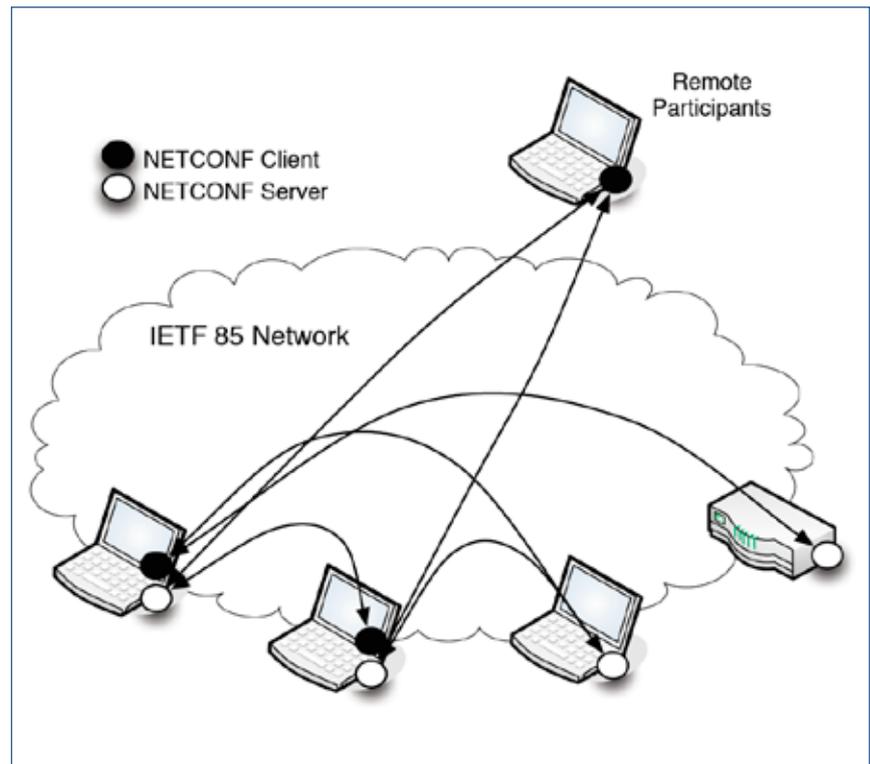


Figure 1. NETCONF Test Network Setup

“We concluded that there does exist a robust set of interoperable implementations—meaning, we have met that requirement for advancement on the standards track and can confidently promote throughout the industry that NETCONF is mature and stable for further and wider deployment.”

- RFC 6241, Network Configuration Protocol
- RFC 6242, Using the NETCONF Protocol over Secure Shell
- RFC 5717, Partial Lock Remote Procedure Call for NETCONF
- RFC 5277, NETCONF Event Notifications
- RFC 6243, With-defaults Capability for NETCONF

For RFC 6536, Network Configuration Protocol Access Control Model, we are continuing testing remotely.

We reported the initial results at the NETCONF Working Group (WG)

session at IETF 85 in Atlanta. Download the report at www.ietf.org/proceedings/85/slides/slides-85-netconf-3.pdf.

We asked the WG if, based on our report, they would support that we compile a complete report, including deployment reports, and if we may request advancement on the standards track. They offered sufficient support and no objections, and confirmed as such on the WG mailing list.

The next step is to request advancement on the standards track, based on the conditions from RFC 6410. 

IAB Plenary Explores Challenges of Network Performance Measurements

By Carolyn Duffy Marsan

Whether or not the Internet Engineering Task Force (IETF) should create a unified set of standards for measuring network performance was the topic of discussion at the Internet Architecture Board (IAB) technical plenary in Atlanta.

The discussion was prompted by recent efforts to create global testbeds and frameworks for measuring the performance of Internet access networks. Among the measurements that are typically collected by these efforts are packet loss, delay, and throughput of the broadband Internet service.

Sam Crawford, a network engineer who operates the SamKnows broadband performance measurement service, said end-to-end performance measurements help Internet service providers (ISPs) pinpoint the cause of service problems. For example, SamKnows measurements helped one ISP discover why its throughput rates dropped 14 percent over a six month period.

“Our probes were seeing massive drops in throughput, but the users weren’t complaining,” Crawford said. “Later, we realized wired throughput was being limited, but wireless access in homes was unaffected. The ultimate

cause was that the ISP’s latest consumer premises equipment had a bug, which caused this massive degradation in wired spaces but not in wireless spaces.”

Begun in 2008, the SamKnows measurement service has 50,000 hardware probes deployed in 34 countries taking performance measurements 24/7. In addition to the probes, SamKnows operates hundreds of measurement servers that process data from the probes. The data collection infrastructure not only gathers data from the probes, it also handles command and control and scheduling of measurements. SamKnows compiles its



Alissa Cooper, panelist and IAB member

we’re considering building large-scale measurement platforms, should we be giving consideration to some of the postprocessing challenges of working with the data as well?” he asked.

In addition to the data challenges, Crawford discussed the operational challenges involved with shipping and maintaining the tens of thousands of devices that gather network performance data. “All of this goes away if we embed measurement software in customer gateways, rather than shipping a separate probe,” Crawford explained. “I hope that would be another part of the standardization effort.”

SamKnows is looking toward conducting measurements of network performance for mobile devices, such as smartphones and their applications, and comparisons of IPv4 and IPv6 performance. Crawford said “there is a fair amount that could be standardized” in the area of network performance measurements.

Henning Schulzrinne, chief technology officer for the U.S. Federal Communications Commission (FCC), said existing network performance measurements don’t work well—they don’t provide usable, reliable data to consumers, nor do they scale well enough to provide detailed data about network delays to service providers.

“Users need to be able to diagnose and validate their own connectivity.

“If we’re considering building large-scale measurement platforms, should we be giving consideration to some of the postprocessing challenges of working with the data as well?”

—Sam Crawford
SamKnows



Sam Crawford, panelist and network engineer, SamKnows

network performance measurements for regulators and ISPs.

“Management of the measurement probes is one of the key areas that I think would benefit from standards work,” Crawford said.

SamKnows collects, processes, and archives more than 1 billion data points per month, and Crawford said it needs to do extensive post-processing to turn the data into useful information. “If

Continued on next page

IAB Plenary Explores Challenges of Network Performance Measurements, continued

“For those of us in public policy, we want to check on how broadband is evolving, and if it is getting faster or not.”

—Henning Schulzrinne
Chief Technology Officer
Federal Communications Commission

They need to find out if they are getting the performance that they bought,” Schulzrinne said, adding that this requires a better network management infrastructure. “For those of us in public policy, we want to check on how broadband is evolving, and if it is getting faster or not. Whether in rural areas or urban areas, consumers should be able to make a good choice.”

Schulzrinne pointed out that while the FCC has traditionally acquired and analyzed network performance data for legacy telephone networks, only during the last two years has it begun to measure the performance of broadband services delivered to consumers.

The FCC’s Measuring Broadband America effort includes 13 ISPs that cover 86 percent of the U.S. population, as well as other vendors, trade groups, and academic institutions. Approximately 9,000 consumers participate in



Henning Schulzrinne, panelist and chief technology officer, Federal Communications Commission

the study, which measures 16 metrics including sustained download and upload rates, packet loss, domain name system (DNS) failures, and latency under load. The FCC issued two annual reports describing the results of its survey and providing spreadsheets of all study measurements.

“We’re only trying to measure a small part of the existing infrastructure,” Schulzrinne said. “Currently, we’re focused on the stretch between the Internet connection to the home network and the point where the consumer ISP connects to the Internet-at-large. We do not measure backbone ISP performance or the home network, but we recognize that these are important to consumers.”

Attendees at the IAB panel expressed support for the IETF creating a standards-based architecture for network-performance measurements. In particular, they mentioned the need to explore the performance and network behavior surrounding emerging technologies, such as IPv6 and DNSSEC.

Schulzrinne said that the FCC has found that most ISPs deliver close to their advertised rates during peak hours. He also said that overall ISP performance improved between 2011 and 2012, which he attributed to the FCC’s measurement effort. “You improve what you measure,” he explained.

This year, the FCC plans to measure the network performance offered by four major wireless providers. However, Schulzrinne said that mobile performance measurements have several challenges, including the variation in the capabilities of mobile devices and the need to ensure location privacy.

Schulzrinne said there are many things the FCC can’t measure, including network performance and the

reliability of small ISPs, as well as access to such advanced features as IPv6 and DNSSEC. “We want to figure out which country has the cheapest broadband and why, what drives consumer adoption, and why one-third of the United States does not use the Internet at home,” he said.

Schulzrinne spoke positively about the proposed Large-Scale Measurement of Access Network Performance (LMAP) effort, which, if chartered, would standardise an architecture and a small number of infrastructure-agnostic protocols.

“Good telecom policy needs good data,” Schulzrinne concluded, urging the IETF to help the FCC to improve its Internet performance measurement effort. “We want to reuse measurements

for three purposes: ISP diagnostics and planning, consumer diagnostics, and public policy data gathering.”

Attendees at the IAB panel expressed support for the IETF creating a standards-based architecture for network-performance measurements. In particular, they mentioned the need to explore the performance and network behavior surrounding emerging technologies, such as IPv6 and DNSSEC.

“Being able to measure performance for IPv6 is critical,” said Yannick Pouffary, a distinguished technologist with Hewlett Packard, adding that this would demonstrate the difference between ISPs that roll-out IPv6 natively, and those that use carrier-grade network-address translation. 

Lightweight 4over6 Efforts Debuted at IETF 85

An IPv4 Service Continuity Solution for Smooth IPv6 Transition

By Qiong Sun, Chongfeng Xie, Yong Cui, Yuchi Chen, Ian Farrer, Mohamed Boucadair, Yiu Lee, Tina Tsou, and Shucheng Liu

IPv4 address exhaustion is a reality. The IETF has been investigating several tunnel-based solutions¹ to ease the introduction of IPv6, while continuously offering IPv4 services during the transition period. Dual-Stack Lite² (DS-Lite), which defines a model for providing IPv4 access over an IPv6 network,³ aims to better align the costs and benefits of deploying IPv6 in operators' networks. The DS-Lite model proposes a network address and port translation (NAPT) function in the operator's network to dynamically assign public IPv4 addresses and ports to internal IPv4 packets.

Lightweight 4over6⁴ (Lw4o6) is an optimization of DS-Lite designed to reduce NAPT states in the operator's network. The underlying idea of Lw4o6 is to relocate the NAPT function from the tunnel concentrator (lwAFTR) to the initiators (lwB4s). The lwB4 element is provisioned with a public IP address and a port set.

Public 4over6⁵ describes a model for assigning full-public IP addresses to initiators (4over6 CE). Lightweight 4over6 can be regarded as an address-sharing mode of Public 4over6.

There are three main components in the Lightweight 4over6 architecture (see figure 1):

- **lwB4.** Performs the NAPT function and encapsulation/decapsulation of IPv4/IPv6. It is provisioned with a public IPv4 address and a port set, which is used to restrict the external ports used by the NAPT function to source packets. The NAPT function is collocated in the lwB4.
- **lwAFTR.** Performs the encapsulation/decapsulation of IPv4/IPv6. It is also responsible for forwarding incoming packets to the appropriate lwB4, and outgoing packets to the IPv4 network.
- **Provisioning system.** Configures the lwB4 with the Public IPv4 address and port set.

Lightweight 4over6 decouples IPv4 and IPv6 address architectures, which means that it doesn't require IPv4

address information to be embedded in the IPv6 address. As a result, flexible and independent IPv4/IPv6 addressing schemes can be used, enabling operators to efficiently utilize public IPv4 addresses without affecting existing IPv6 address schema. The solution simplifies address planning and increases the lwAFTR scalability.

Currently, the Lightweight 4over6 design team includes seven operators, including China Telecom, France Telecom, Deutsche Telekom, and

Comcast; and eight vendors, including Huawei, GreenNet, and FiberHome.

Two interoperability tests have been carried out with the participation of Huawei, GreenNet, Fiberhome, Yamaha, BII, Tsinghua, and China Telecom. The first test was conducted at Tsinghua University from 22–29 October 2012; the second test was conducted by the CNGI committee in Beijing University of Posts and

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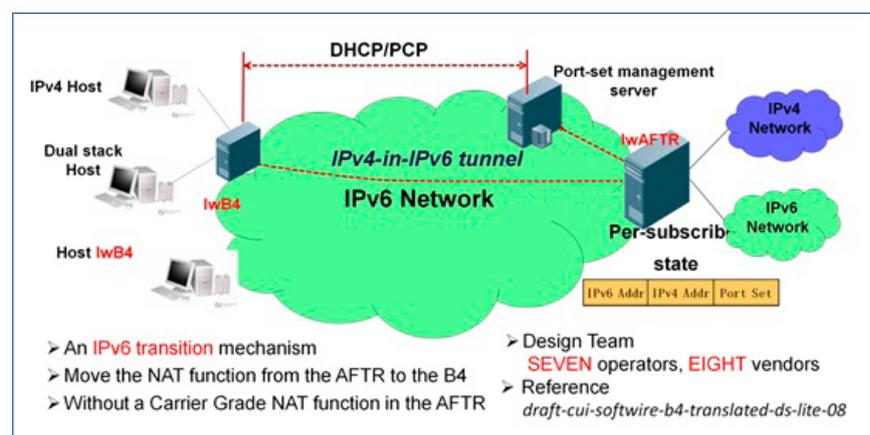


Figure 1. Lightweight 4over6 Overall Architecture

Lightweight 4over6 Efforts Debuted at IETF 85, continued

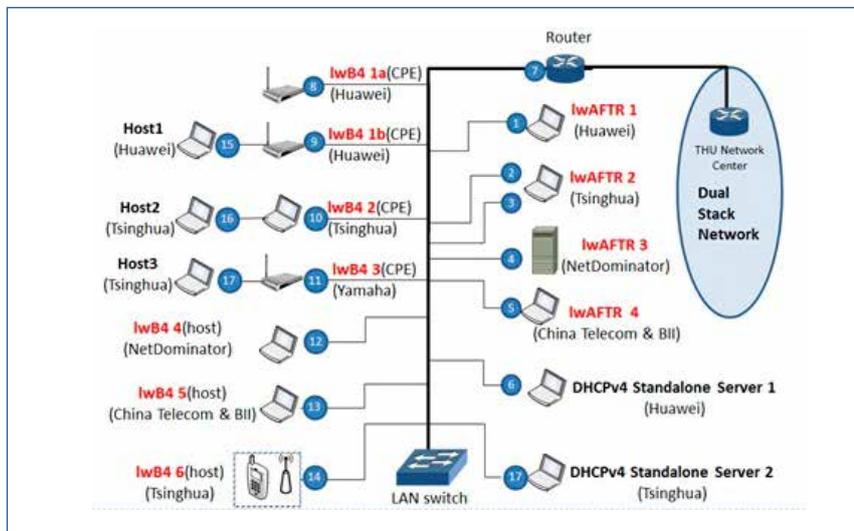


Figure 2. Interop Test Topology

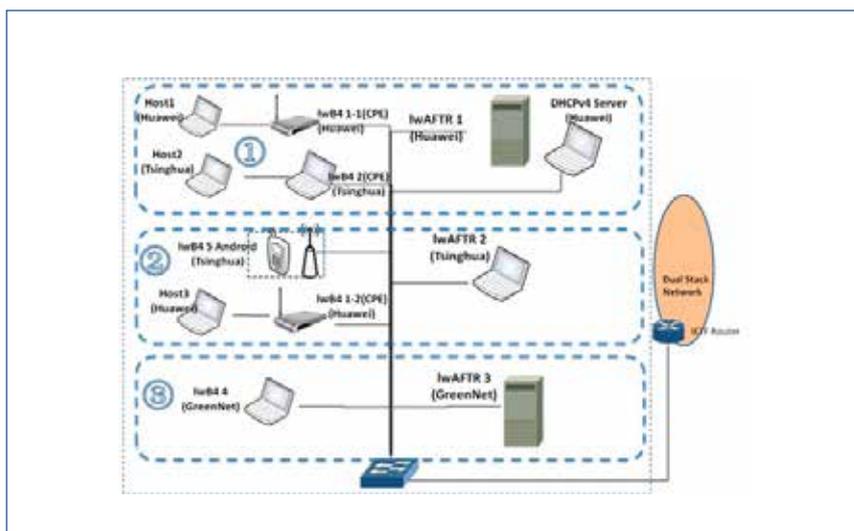


Figure 3. Overall Topology of Lightweight 4over6 Demo System

Telecommunications from 12–15 November 2012. This test consisted of seven lwB4s and four lwAFTRs. More than 1,400 test cases have been run between them. See figure 2.

Inspired by the IETF mantra of “rough consensus and running code” to expose IETF technologies to real operator requirements and scenarios, the Lightweight 4over6 design team demonstrated their prototypes during IETF 85 with the hope of gaining community feedback.

Figure 3 shows the topology of the demonstration, which included:

- five hosts, including one Android host with built-in lwB4 function and a Windows 7 host with built-in lwB4 function,
- four CPEs embedded the lwB4 function,
- three lwAFTRs,
- one DHCPv4 server, and
- one Ethernet switch connecting all the devices together and connected

to the IETF dual-stack router for external connectivity.

The demonstration illustrated three scenarios, which are labeled as 1, 2, and 3 in figure 3.

Scenario 1 comprised two CPEs with built-in lwB4. CPEs were provided by Huawei and Tsinghua. Also in this scenario was an lwAFTR (also acting as a DHCP relay) and a DHCPv4 server, both provided by Huawei. The IPv4 provisioning method was DHCPv4-over-IPv6;⁶ and the lwB4s were provisioned with the same public IPv4 address from DHCPv4 server with different port sets.⁷ Port set allocation policy was statically configured in the DHCPv4 server.

Scenario 2 comprised two lwB4s—one CPE based and one Android mobile host based, both provided by Huawei and Tsinghua. The lwAFTR (acting as a DHCP server) was provided by Tsinghua; the DHCP server embedded in the lwAFTR provisioned a second public IPv4 address with different port sets to the two lwB4s. Port-set allocation was dynamically managed by the DHCP server.

For both scenarios 1 and 2, the team set up two WiFi APs, which were broadcasting SSID lw4o6-1 and lw4o6-2, thereby enabling the audience to experience Lightweight 4over6 on their own devices.

Scenario 3 comprised a lwB4 connecting to an lwAFTR, both provided



Yong Cui and Yuchi Chen explain the demonstration to Ted Lemon and others.



(left to right) Yong Cui, Tsinghua University; David Lamparter, Quagga dev; Ales Vizdal, T-Mobile Czech Republic; Tina Tsou, Huawei; Ian Farrer, Deutsche Telekom; Shucheng Liu, Huawei; Cathy Zhou, Huawei; Jie Hu, China Telecom; Qi Sun, Tsinghua University; Yuchi Chen, Tsinghua University

The campus routing topology is organized as core-to-edge (hub-and-spoke), with emphasis on maintaining an IPv6-only stack for as much of the infrastructure as possible. Such an approach reduces operational costs more than a pervasive dual-stack infrastructure and accelerates the transition to the targeted IPv6-only architecture.

by GreenNet. The lwB4 requested the IPv4 address and available port set from the lwAFTR using PCP protocol.⁸

The team demonstrated Lightweight 4over6 via a variety of IPv4 applications, including web browsing, video streaming, VoIP (e.g., Skype), and peer-to-peer multimedia (e.g., PPLive), running on a range of devices, including smart phones, laptops, and tablets. Audience participants could not detect that they were actually connected to an IPv6-only network.

Spectators—including operators and vendors—offered many valuable comments and raised many good questions, including one about Lightweight 4over6 deployment scenarios. Lightweight 4over6 can be deployed in IPv6-only access network and continue to provide IPv4 connectivity for IPv4 services. The deployment scenarios of Lightweight 4over6 are similar to that of DS-Lite.

Testing and deployment of this mechanism is happening around the globe. China Telecom has been

running a Lightweight 4over6 field trial in Hunan Province, China, since early 2012 that includes lwAFTR deployed at the entrance to the metropolitan area network (MAN), and the lwB4 function deployed in subscribers' customer-premises equipment (CPE).⁹ China Telecom plans a larger-scale deployment in the year 2013. Germany's Deutsche Telekom (DT) is presently testing Lightweight 4over6, and has completed lab testing on the functionality of the lwB4 and lwAFTR. So far, their implementation has been proved to be simple and stable.¹⁰

Spectators also inquired about the relationship between Lightweight 4over6 and DS-Lite. Lightweight 4over6 puts the NATP function in the lwB4. The lwB4 is then given a public IPv4 address and a restricted port set, and the lwB4 uses this information to perform a NATP function for IPv4 connections. DS-lite puts the NATP function in the address-family transition router (AFTR) and provides more dynamic NATP functions among hundreds of B4s. For NATP-state management,

Lightweight 4over6 requires per-subscriber state in the AFTR. In contrast, DS-lite requires per-session state in the AFTR. Despite these differences, DS-Lite and Lightweight 4over6 are compatible and can be deployed together to provide different user services based on a service agreement. 

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Internet Untethered: Internet Society Panel Debates the Future of Mobile Internet

By Carolyn Duffy Marsan

The mobile data network has changed dramatically over the past four years, largely due to the popularity of smartphones and tablets, and the innovative applications created for them. The Internet Society (ISOC) held a panel discussion concurrent with the IETF meeting in Atlanta to discuss how the next four years might unfold as the Internet becomes increasingly untethered.

“From the initial skeptical reaction to the Apple iPhone, people have taken these devices to places nobody would have imagined,” said moderator Leslie Daigle, chief Internet technology officer for the Internet Society. “People’s expectation is that there should be something of a seamless integration between the experience of the Internet in the wired world and the experience of the Internet from wireless broadband.”

Daigle said new mobile devices are impacting how data services evolve, how

bandwidth is managed, and how applications work as more people interact with Web sites such as Wikipedia and Twitter via smartphones. She asked panelists to imagine how the mobile Internet might evolve over the next few years and whether or not it would remain a decentralized, distributed network of networks with low barriers to entry, built on open standards, and providing global connectivity.

Pete Resnick, principal engineer in the Office of the Chief Scientist at Qualcomm, said he is worried that the Internet is migrating toward locked-down devices controlled by vendors.

“Nowadays we have devices that we write applications for, but the applications are pretty locked down—and the platforms seem pretty locked down, too,” Resnick said. “If you’re a developer, you’re either writing for the Apple app or Google Play store, or maybe you’re still writing Blackberry apps. We’re locked down into those particular environments.”

Panelist Victor Kuarsingh, network architect for Rogers Communications, said it is impossible to predict how consumers will use the mobile data network in the future. “We’re seeing traffic growth that is two orders of magnitude more than it was two years ago,” Kuarsingh said. “Every time we attempt to anticipate users, we guess wrong. But we know they will use it for new, innovative things... Things are happening very, very quickly in the mobile space, which makes it exceedingly challenging for operators.”

“We’re seeing traffic growth that is two orders of magnitude more than it was two years ago. Every time we attempt to anticipate users, we guess wrong... Things are happening very, very quickly in the mobile space, which makes it exceedingly challenging for operators.”

—Victor Kuarsingh
Network Architect
Rogers Communications



Victor Kuarsingh, panelist and network architect for Rogers Communications

“Nowadays we have devices that we write applications for, but the applications are pretty locked down—and the platforms seem pretty locked down, too.”

—Pete Resnick
Principle Engineer
Qualcomm



Pete Resnick, panelist and principle engineer in the Office of the Chief Scientist, Qualcomm

Cameron Byrne, technical staff architect at T-Mobile USA, agreed that mobile data traffic is growing exponentially and changing rapidly. Byrne is optimistic that mobile device manufacturers and application developers will continue to embrace open protocols to meet consumer demands for interoperability.

“One of the key things we are going to see in the next few years is how the silos provide greater integration with each other and greater integration with the Web overall,” Byrne predicted. “I think there will be a network effect as we see various services interact. For example, [Apple’s] FaceTime will be a more useful service if it can do WebRTC and Skype can do WebRTC... Hopefully these silos will become portals to broader any-to-any communications.”

Daigle asked panelists if it is possible for mobile applications to evolve into a more open platform, and, if so, how this might happen.

“Applications are in silos for business considerations,” Resnick said. “There are controls around apps because somebody has to make money at them. I think we can break out of it... but it takes an enormous amount of pressure from consumers. The fact is, people are going to Facebook, which is a closed environment. People are using FaceTime, which is not [an open] protocol. It’s tricky, and it’s not an engineering problem.”

Kuarsingh predicted that siloed applications, such as FaceTime and Skype, will adopt IETF protocols such as WebRTC and become interoperable because consumers will demand it. “My prediction is that WebRTC becomes a gateway protocol for the silos to speak to each other,” he said. “That’s what I’m excited about. The lure of someone on Skype being able to talk to someone on FaceTime through a common broker like WebRTC will be great.”

Kuarsingh said that the key to having the mobile Internet evolve into a more open environment is having more vendors and increased competition. “I like the concept of having more players,” he said. “It definitely helps even things out as you get enough people who want certain things to occur.”



Audience members were invited to direct questions to the panelists.

Resnick said vendors of mobile platforms haven’t gotten to the point where they realize that opening up their platforms is good for business. “If some of the platforms were more open, that would allow technology to advance and innovation to happen. Then all boats would rise,” he said. “I don’t know what the catalyst will be for platforms to let go.”

Byrne argued that consumer demand will drive mobile platforms to openness. “It’s going to be the case where I want to call people across platforms,” he said. “The ability to do that is going to be crucial, and it is going to happen because consumers are going to make it happen.”

Panelists said they are hoping that the mobile Internet will continue to evolve toward providing a similar quality of service to that presently available on the wired Internet.

“I would like to see [mobility] not be a barrier to what you want to do,” Kuarsingh said. “I’m hoping that this is where we are going—whether you are on a tablet, a PC, or a Smart TV, the experience should be very seamless. But I’m not going to underestimate the amount of effort that it is going to take.”

Resnick countered that while he would like to have a similar experience from the data network whether the connection is wired or wireless, he would also like to see differentiated experiences for mobile devices. “We want to be able to customize and differentiate and innovate for mobile users,” he said, adding that people buy mobile devices because they want to use them for special, on-the-go purposes. 



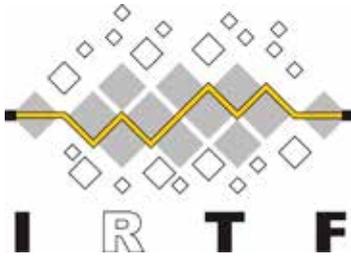
Cameron Byrne, panelist and technical staff architect, T-Mobile USA

“One of the key things we are going to see in the next few years is how the silos provide greater integration with each other and greater integration with the Web overall. I think there will be a network effect as we see various services interact... Hopefully these silos will become portals to broader any-to-any communications.”

—Cameron Byrne
Technical Staff Architect
T-Mobile USA

IRTF Update

By Lars Eggert



During IETF 85 in Atlanta, Georgia, U.S.A., four chartered Internet Research Task Force (IRTF) research groups (RGs) held meetings:

- DTNRG—Delay-tolerant Networking
- ICCRG—Internet Congestion Control
- ICNRG—Information-centric Networking
- NCRG—Network Complexity

In addition, a new, proposed research group on software-defined networking held a very well-attended meeting. Despite a broad problem space that will require

further refining, the group is on a good trajectory to be officially chartered by IETF 86.

Since IETF 84, one new RFC was published on the IRTF RFC Stream: RFC 6693, “Probabilistic Routing Protocol for Intermittently Connected Networks,” out of the DTNRG.

The last two Applied Networking Research Prize (ANRP) winners of 2012 presented their research at IETF 85’s IRTF Open Meeting. Srikanth Sundaresan presented his measurement study of access-link performance on home gateway devices, and Peyman Kazemian presented his general and protocol-agnostic framework for statically checking network specifications and configurations. (Alberto Dainotti, the first ANRP winner of 2012, presented at IETF 84.)

The ANRP’s 2013 nomination cycle has concluded, and 36 nominations were received. The selection committee is reviewing them and is scheduled to select the prize winners during the spring of 2013. We expect the first ANRP winners of 2013 to present their work during the IRTF Open Meeting of IETF 86. See <http://irtf.org/anrp> for more information about the award and past winners.

Please join the IRTF discussion list to stay informed about these and other happenings. The website is <http://www.irtf.org/mailman/listinfo/irtf-discuss>. 

Returning Fellows Offer Added Value to IETF Meetings

By Carolyn Duffy Marsan

Dessaegn Mequanint Yehuala, lecturer and researcher at the Computer Science Department of the Addis Ababa University in Ethiopia, has been able to attend three IETF meetings—71, 77, and 85—because he received funding from the Internet Society. Both Dessaegn and the IETF have discovered value in the Internet Society’s Returning Fellowship programme, which encourages network engineers from emerging economies to ramp up their contributions to IETF working groups in return for the financial support necessary to attend multiple meetings.

By attending several IETF meetings, “I had the opportunity to [learn] new notions in the technology domain, and to network with people,” Dessaegn says.

The ISOC Fellowship program sponsors network engineers like Dessaegn to pay for their meeting fees, travel, and other expenses so they can attend IETF meetings. The goal of the programme is to increase the diversity of input to the IETF and to increase global awareness of the IETF.

Sponsored recipients are expected to participate in working groups relevant to their areas of work or study and to contribute to these working groups by scribing or taking Jabber notes at three working group meetings.

Dessaegn has been a silent subscriber to the Internet Congestion Control Research Group (ICCRG) and the Multipath TCP (MPTCP) working group. However, he is focusing on the Information Centric Networking Research Group (ICNRG), which is relevant to his research in latency hiding techniques for constrained networks that provide enhanced, ubiquitous access to big data. “Participating in the ICNRG [doesn’t] require me to catch up... the research areas addressed in the working group closely relate to my current work,” he says.

After attending several IETF meetings, Dessaegn learned that it was best to join only a few working groups—ideally when these groups are new.

He recommends not trying to join every working group.

“It’s better to be selective and focused with the aim of making meaningful contributions to a working group.”

—Dessaegn Mequanint Yehuala
Returning Fellow



Returning Fellow Sandra Cespedes

“It’s better to be selective and focused with the aim of making meaningful contributions to a working group,” Dessaegn says.

Dessaegn recommends joining a working group of interest at the formative stage, in order to elevate participation beyond being an observer or bystander. “Returning Fellows need to be aware of the possibility of presenting their individual research work or Internet Drafts at IETF meetings as long as their work aligns to a specific working group’s area of focus,” he added.

Sandra Cespedes, associate professor in the Department of Information and Communications Technologies at Icesi University in Cali, Columbia, has had a similar, positive experience as a Returning Fellow. Sandra received funding from ISOC to attend four IETF meetings: 69, 76, 79, and 83.

Sandra says being a Returning Fellow has offered her many benefits, including “the opportunity to understand from the inside how the standardization process of Internet protocols works, and the ability to share that information with members of my community, including my colleagues and students at Icesi University and the group members of my research group at the University of Waterloo, where I was doing my Ph.D. studies.”

Sandra appreciated the opportunity to mingle with people who developed many of the protocols that she was studying as part of her Ph.D.

“The Returning Fellowship programme helped me realize that everyone can contribute to the standardization process

Continued on next page

Returning Fellows Offer Added Value to IETF Meetings, continued

by revising drafts, asking questions on the mailing lists, writing minutes during meetings, or even proposing new drafts,” she said. “I am currently a coauthor of an Internet Draft as a result of my participation in the Returning Fellowship programme and collaborative work with other IETF participants.”

Sandra is active in the Network Based Mobility Extensions (Netext) and Mobility Optimizations

“It isn’t often that professionals and engineers from developing countries can find a way to make an impact of global scope. This is the perfect scenario to make that happen.”

—Sandra Cespedes
Returning Fellow

(Mobopts) working groups. She gave a presentation at the Mobopts working group meeting at IETF 81 and wrote minutes during IETF 84. She also contributed to the writing of an Internet Draft which was presented during IETF 84.

“My advice to Returning Fellows is to take this opportunity as their chance to make changes in the real world,” she said. “It isn’t often that professionals and engineers from developing countries can find a way to make an impact of global scope. This is the perfect scenario to make that happen.”

To learn more about the ISOC Fellowship to the IETF programme or to apply for a fellowship, please visit <http://www.internetsociety.org/fellows-ietf>.

ISOC Fellowship to the IETF Programme Welcomes Fellows with Dinner and Cheer

ISOC Fellows to the IETF were warmly welcomed to IETF 85 on 4 November 2013 by Mentors, Internet Society staff, sponsors, and guests. A good time was had by everyone in attendance. We thank them all for their participation.





IETF 85 ISOC FELLOWS

Alejandro Acosta
Venezuela

Tesfa Tegegne Asfaw
Ethiopia

Suhaidi Hassan
Malaysia

Chowdhury Qamrul Huda
Bangladesh

Waldeniye Gedara Chinthaka
Wasantha Kumara
Sri Lanka

Caciano Machado
Brazil

Gregorio Manzano
Venezuela

Sheneela Naz
Pakistan

Julianne Sansa Otim
Uganda

Tiago Setti
Brazil

Peer Azmat Shah
Pakistan/Malaysia

Nestor Michael C. Tiglao
Philippines/Portugal

Dessalegn Yehuala
Ethiopia

Hassan Zaheer
Pakistan



If you know a great candidate for the IETF Fellowship programme, let us know! Visit <https://www.isoc.org/leaders> or email leaders@internetsociety.org for more information and an application.
To learn more about the IETF and its work on Internet standards, visit the IETF website at <http://www.ietf.org>.

Comcast, Facebook Engineers Win Itojun Service Awards

By Carolyn Duffy Marsan

Comcast and Facebook engineers were honored for their extraordinary dedication to the deployment of IPv6 and were awarded the fourth annual Itojun Service Awards at the IETF meeting in Atlanta. This year's recipients of the Itojun award were John Jason Brzozowski, chief architect IPv6 at Comcast, and Facebook software engineers Donn Lee and Paul Saab.

Brzozowski was recognized for his efforts to provide IPv6 connectivity to cable broadband users in North America and for evangelizing the importance of IPv6 deployment globally. Comcast plans to complete IPv6 deployment for all United States residential customers by June 2013.

Lee and Saab were recognized for making popular content available over IPv6 and for their contributions to World IPv6 Day in 2011 and World IPv6 Launch in 2012. Facebook deployed IPv6 in production mode in May 2012.

Awarded annually since 2009, the Itojun Service Award honors the memory of Dr. Jun-ichiro "Itojun" Hagino, who passed away in 2007 at the age of 37. The award was established by the friends of Itojun and is administered by the Internet Society to commemorate Itojun's extraordinary



Jun Murai (left), member of the Itojun Service Award selection committee and founder of the WIDE project, congratulates Itojun Service Award winners, Paul Saab (middle) and Donn Lee (right).

"IPv6 turned out not to be so difficult. I encourage everybody to start doing IPv6."

—Paul Saab
Software Engineer, Facebook
Itojun Service Award Winner



John Jason Brzozowski, chief architect IPv6 at Comcast and Itojun Service Award winner

dedication to IPv6 deployment. The Itojun Service Award includes a presentation crystal, a US\$3,000 honorarium, and a travel grant.

Previous recipients of the Itojun award were engineers from Google, FreeBSD, and the French ISP, Free.

"It's obviously a great honor to be recognized with many friends and colleagues," Brzozowski said, urging IETF attendees to "keep working hard to deploy IPv6."

Saab added that "IPv6 turned out not to be so difficult. I encourage everybody to start doing IPv6." →

IETF Ornithology: Recent Sightings

Compiled by *Mat Ford*

Getting new work started in the IETF usually requires a birds-of-a-feather (BoF) meeting to discuss goals for the work, the suitability of the IETF as a venue for pursuing the work, and the level of interest in and support for the work. In this article, we'll review the BoFs that took place during IETF 85, including their intentions and outcomes. If you're inspired to arrange a BoF meeting, please be sure to read RFC 5434: Considerations for Having a Successful Birds-of-a-Feather (BoF) Session.

Internet Video Codec (videocodec)

Description: To quote from the proposed charter for a working group on this topic, "According to reports from developers of Internet video applications and operators of Internet video services, there is no standardized, high-quality video codec that meets all of the following three conditions:

1. Is optimized for use in interactive Internet applications.
2. Is published by a recognized standards development organization (SDO) and therefore subject to clear change control and IPR disclosure rules.
3. Can be widely implemented and easily distributed among application developers, service operators, and end users.

The goal of this working group is to ensure the existence of a single, high-quality video codec that can be widely implemented and easily distributed among application developers, service operators, and end users. At present it appears that ensuring the existence of such a codec will require a development effort within the working group."

The objective of this working-group-forming BoF meeting was to understand the problem and solution space, close any open issues with the proposed charter, determine if people are willing and able to do the work (write, review, code), determine if the IETF is the right place to do the work, and determine if a working group would have a reasonable chance of success.

Proceedings: <http://www.ietf.org/proceedings/85/minutes/minutes-85-videocodec>

Outcome: A mostly positive discussion highlighted a few issues with the proposed charter that need further work. It is expected that a revised charter will be proposed by the next meeting.

RFC Format (rfcform)

Description: Discussion on RFC formatting. The BOF worked through some of the overriding assumptions, the existing requirements to be kept in any revised format, new requirements, RFC Editor requirements, and existing requirements that can be retired. For a summary of the more contentious issues relating to RFC format, see <http://www.rfc-editor.org/rse/wiki/doku.php?id=formatsummary>.

Proceedings: <http://www.ietf.org/proceedings/85/minutes/minutes-85-rfcform>

Outcome: The attendees provided detailed feedback on the various requirements and assumptions up for discussion. Discussion continues on the list (<https://www.rfc-editor.org/mailman/listinfo/rfc-interest>).



*Ruby-throated Hummingbird
(Archilochus colubris)*

Continued on next page

IETF Ornithology: Recent Sightings, continued

Interface to the Routing System (irs)

Description: The Interface to the Routing System (IRS) provides a common, standard, read/write interface that allows access to the information that enables the routing components of routing elements in the network. This BoF meeting was held to determine the focus and support for work within the IETF to specify abstract data information models, specific data models, and protocols to operate the IRS. The BoF did not assume that new data modelling languages or protocols will be required—that decision is expected to form part of the analysis carried out by a working group, if one is formed.

Proceedings: <http://www.ietf.org/proceedings/85/minutes/minutes-85-irs>

Outcome: This was a productive meeting that showed strong support for working group formation with a reduced scope (i.e., fewer chartered documents to produce). The discussion to refine the charter will continue and it is hoped that a working group will be formed by the next IETF meeting.

Security Automation and Continuous Monitoring (sacm)

Description: This was a working-group-forming BoF. If formed, the SACM working group will develop, where practical, security automation protocols and data format standards in support of information security processes and practices. These standards will help organizations better utilize security practitioners by automating the routine tasks related to endpoint and server security, thereby enabling practitioners to focus on more advanced tasks. The initial focus of this work is to address enterprise use cases.

Proceedings: <http://www.ietf.org/proceedings/85/minutes/minutes-85-sacm>

Outcome: The meeting concluded that the problem space is reasonably well understood, that standardisation is required, and that the IETF is the right place to do the work. There was consensus to create a new working group to tackle this, focussing initially on architecture and requirements as key foundational pieces of work needed to understand next steps.

Certificate Transparency (certrans)

Description: This non-working-group forming BoF discussed plans to specify mechanisms and techniques that allow Internet applications to monitor and verify the issuance of public X.509 certificates, such that all issued certificates are available to applications, and each certificate seen by an application can be efficiently shown to be in the log of issued certificates. Furthermore, it should be possible to cryptographically verify the correct operation of the log.

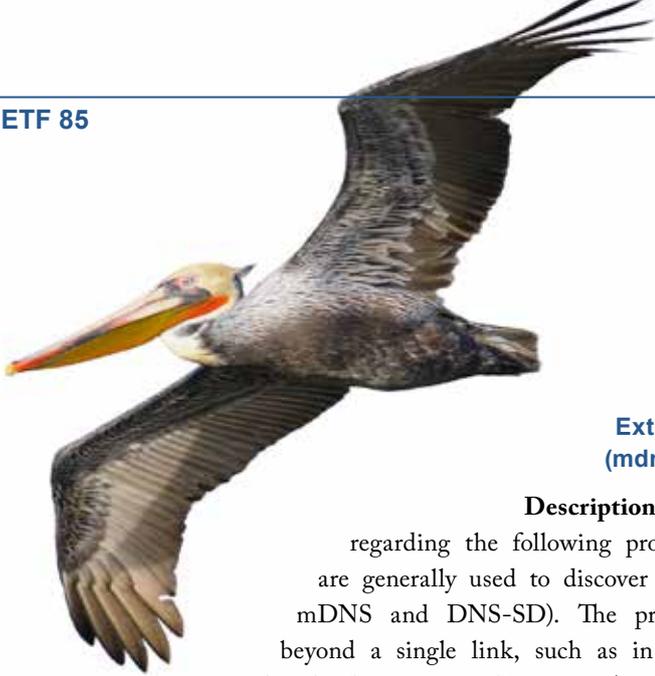
Proceedings: <http://www.ietf.org/proceedings/85/minutes/minutes-85-certrans>

Outcome: The meeting discussed several options and concluded that an AD-sponsored experimental RFC was the right thing to do with draft-laurie-pki-sunlight. It may make sense to form a working group after that. In the interim, it was suggested that an Internet Architecture Board workshop on this topic might help make progress.



*Long-eared Owl
(Asio otus)*

Brown Pelican
(*Pelecanus occidentalis*)



Extensions to the Bonjour Protocol Suite (mdnsex)

Description: This was a working-group-forming BoF regarding the following problem. Currently, zeroconf networking protocols are generally used to discover services within the scope of a single link (e.g., mDNS and DNS-SD). The problem is how best to extend these protocols beyond a single link, such as in future multilink home networks (as envisaged by the homenet working group), or in routed campus or enterprise networks. As demand for service discovery across routed networks grows, vendors are beginning to ship their own early solutions. It is both timely and important that efforts to develop improved, scalable, service-discovery solutions for routed networks are coordinated toward the production of a single, standards-based solution.

Proceedings: <http://www.ietf.org/proceedings/85/minutes/minutes-85-mdnsex>

Outcome: This was a good meeting with lots of participation and strong support from attendees to work on this problem and review documents. More work is needed to refine the proposed charter. It is hoped that a working group can be chartered by the next IETF meeting.

Fixed Mobile Convergence (fmc)

Description: Fixed/mobile convergence (FMC) deals with the issues surrounding the interactions of fixed and mobile networks. Of specific interest are issues with serving access to the user terminals that requires the sharing of subscribers' policies between the fixed and mobile networks. Existing deployment scenarios range from wireless local area network (WLAN) access points directly connected to a mobile-operators core via mobile-operator owned WLAN access points to one or more access points controlled by a fixed-network operator or single access points at residential premises.

Proceedings: <http://www.ietf.org/proceedings/85/minutes/minutes-85-fmc>

Outcome: The proponents of this work received strong feedback that they have a lot more work to do to clarify the problem they are trying to solve. Very few of those in attendance understood the presented use cases. Taking some of these use cases to the Broadband Forum might be a next step toward identifying those gaps that need to be addressed in the IETF.

HTTP Authentication Mechanisms (httpauth)

Description: Both versions 1.0 and 1.1 of hypertext transfer protocol (HTTP) can run over a secure or an insecure transport. By default, the user is not identified or authenticated. But HTTP does contain a framework for user authentication. Existing standards provide two authentication methods:

- Basic: analogous to point-to-point protocol's (PPP's) password authentication protocol (PAP)
- Digest: analogous to challenge-handshake authentication protocol (CHAP) or MD5-Challenge

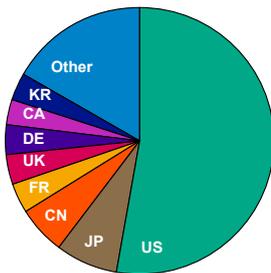
Both of these authentication methods are considered insecure. This BoF meeting discussed whether an IETF working group should be formed to develop a better authentication mechanism for HTTP.

Proceedings: <http://www.ietf.org/proceedings/85/minutes/minutes-85-httpauth>

Outcome: The meeting exposed two schools of opinion regarding the merits of this proposal. One group believed this should be chartered immediately to solve an obvious problem. The other group felt that it is still unclear what the scope of useful work would be and that chartering a working group without a clear scope would likely lead to failure. ❖❖❖



IETF 85 At-A-Glance



Registered attendees: 1157

Newcomers: 195

Number of countries: 55

IETF Activity since IETF 84 (July–October 2012)

New WGs: 1

WGs closed: 3

WG currently chartered: 115

New or revised Internet-Drafts (I-Ds): 1567

IETF Last Calls: 71

Internet-Drafts approved for publication: 73

RFCs published: 73

- 67 IETF (55 WG, 12 Individual/AD Sponsored), 2 IAB, 1 IRTF, 3 Independent

IANA Activity since IETF 84 (July–October 2012)

Processed 1300+ IETF-related requests, including:

- Reviewed 92 I-Ds in Last Call and reviewed 95 I-Ds in Evaluation
- Reviewed 110 I-Ds prior to becoming RFCs, 68 of the 110 contained actions for IANA

Processing goal average for IETF-related requests: 91%

Projects and Deliverables

- Phase 2 of integration of tools beginning implementation
- XMLization of registries 91% complete, converting final registries

IANA and DNSSec

- 95 TLDs have a full chain of trust in the root, see http://stats.research.icann.org/dns/tld_report/
- Ceremony 10 was executed successfully 26 July 2012
- Ceremony 11 was executed successfully 12–13 Nov 2013

RFC Editor Activity since IETF 84 (July–October 2012)

Published RFCs: 73

I-Ds submitted for publication: 75

- 64 IETF WGs

RFC Format updates

- (Draft) Requirements document available, see [draft-rfc-format-flanagan](#)

Improved RFC Search Engine (beta), see

- (Draft) Requirements document available, see http://www.rfc-editor.org/search/rfc_search.php

Info pages for subseries identifiers

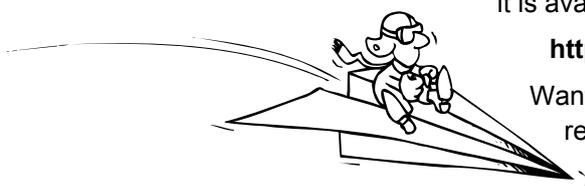
- Example: <http://www.rfc-editor.org/info/bcp9>

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IETF 86

10–15 March 2013
 Hosts: NBC Universal, Comcast
 Location: Orlando, FL, USA

IETF 88

3–8 November 2013
 Host: TBD
 Location: Vancouver, BC, CA

IETF 87

28 July–2 August 2013
 Major Sponsors: DENIC, EurID
 Location: Berlin, Germany

IETF 89

2–7 March 2014
 Host: TBD
 Location: London, England

For more information about past and upcoming

IETF Meetings

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