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Feature Topic on Recent Advances in IETF Standards

The mission of the Internet engineering Task Force (IETF) is to “produce high quality, relevant technical documents that influence the way people design, use, and manage the Internet in such a way as to make the Internet work better” [1]. This is a continuous process driving and driven by the rapid evolution of the Internet. Protocols and other technical standards developed by the IETF are fundamental building blocks of our networked society. This feature topic gives an overview of recent achievements in creating standards that soon will have an impact on design, use, and management of the Internet. For this issue, we received 20 papers, many solicited directly from those who are responsible for these standards, from which we selected papers which represent five of the eight areas of the IETF: Routing, Transport, Operations and Management, Internet, and Realtime Applications and Infrastructure.

The IETF was created in 1986, shortly after the original DARPA Arpanet prototype networks were updated with the original TCP/IP protocol stack (in 1983). It provided then, as it does now, an open forum where extensions and modifications to the Internet protocols can be coordinated and evaluated, and where new protocols can be standardized. Its meetings occur three times a year, all over the globe, and include participants from industry, research organizations, and academia, all taking part as individuals. Unlike other standards bodies, such as the IEEE and ITU, there is no membership fee, and decisions are made “by rough consensus and running code,” rather than by either individual or organization voting [2]. All IETF positions, except for the RFC Editor and a secretariat, are staffed by volunteers, supported only by their individual organizations.

The IETF issues a number of different types of documents classified as standards, guidelines (“best current practice,” or BCP), experimental, or informational. All of these are issued as RFCs, originally intended as “Request for Comments”; these documents all begin as Internet Drafts, which are ephemeral documents that expire after six months. RFCs can be created by individuals or can be the result of the coordinated effort of a Working Group in the IETF or IRTF, the former focusing on engineering of protocol standards and supporting documents for operational use, and the latter focusing on experimental protocols. Here we focus on emerging IETF standards, some of which have been in development for many years.

“The Coming of Age of MPLS” introduces Multiprotocol Layer Switching (MPLS), a key protocol for specifying network paths for traffic engineering that is widely deployed. The paper focuses on the transport profile for MPLS (MPLS-TP) that has been developed recently for applying MPLS to Packet Transport Networks (PTN) as defined by the ITU. The standardization process of MPLS-TP is quite unusual. It started in the ITU then moved to the IETF, with both organizations still contributing to it. MPLS and MPLS-TP were developed in the IETF Routing Area, which focuses on routing protocols and protocols for managing packet paths.

The Transport Area has traditionally fostered the development and evolution of TCP and UDP, the former supporting web access, file transfers, and e-mail, and the latter common for Internet telephony and video streaming. In “Stream Control Transmission Protocol: Past, Current, and Future Standardization Activities,” the authors present SCTP, a transport protocol originally designed to support telephony signaling, with emerging use for mobile applications.

The Operations and Management Area develops standards and guidelines for network management and oversight. This includes a set of common network management protocols, notably: SNMP, NETCONF, and SYSLOG. A new protocol that recently has been added to this family is described in “An Introduction to IP Flow Information Export (IPFIX).” IPFIX serves for reporting on IP traffic and other high volume network measurement data.

The Internet Area focuses on the IP layer, based on IP – a best-effort, variable-length packet that forms the basis of all Internet communication. Although the Internet was designed to integrate communication over any conceivable communication medium, some media present unique challenges. In “Connecting Low power and Lossy Networks to the Internet,” the authors discuss the issues raised by such networks, which include ways to reduce power requirements, relax some common assumptions that are no longer true in challenging environments, and support links that have much higher persistent packet loss rates.

Realtime Applications and Infrastructure (RAI) is a more recent area of the IETF, focusing on support for audio, video, and other kinds of time-sensitive traffic. It develops common standards for transport and signaling protocols, including those for Internet telephony and video-on-demand services. Due to the importance for emergency calling, location-related issues are covered in the RAI area. “Internet Geolocation and Location-Based Services” describes how end systems can obtain location information and carry it in common application-layer protocols such as SIP for VoIP, as well as how to ensure that such sensitive information is accessible only to parties authorized by the user.

These five papers provide a small window into the diverse emerging standards of the IETF and their potential future impact on the Internet.

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[1] Alvestrand, H., “A Mission Statement for the IETF,” BCP 95, RFC 3935, RFC Editor, ISSN 2070-1721, Oct. 2004.

[2] Hoffman, P., “The Tao of the IETF: A Novice’s Guide to the Internet Engineering Task Force,” RFC 4677, RFC Editor, ISSN 2070-1721, Sep. 2006.

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