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IAB Thoughts on the Role of the Internet Research Task Force (IRTF)

Status of This Memo

This memo provides information for the Internet community. It does not specify an Internet standard of any kind. Distribution of this memo is unlimited.

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Abstract

This document is an Internet Architecture Board (IAB) report on the role of the Internet Research Task Force (IRTF), both on its own and in relationship to the IETF. This document evolved from a discussion within the IAB as part of a process of appointing a new chair of the IRTF.

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1. Introduction

As part of the process of appointing a new chair of the Internet Research Task Force (IRTF), the IAB considered the future role of the IRTF both on its own and in relationship to the IETF. The IAB has expanded this discussion into this IAB report on the role of the IRTF, and circulated this document for wider community review. (As one result of this discussion, Aaron Falk was appointed the new chair of the IRTF in March 2005.)

2. The Relationship between the IRTF, the IAB, and the IETF

Before 1989, the IAB (then called the Internet Activities Board) oversaw a number of task forces. In 1989, organizational changes were made to coalesce these task forces into two groups, the IETF and the IRTF. The IRTF was tasked to consider long-term research problems in the Internet, and the IETF was to concentrate on short- to medium-term engineering issues related to the Internet. At this time, all of the task forces except the IETF were restructured as IRTF research groups. For example, the End-to-End Task Force became the IRTF's End-to-End Research Group (E2ERG) and the Privacy & Security Task Force became the IRTF's Privacy & Security Research Group (PSRG) [IABWebPages] [RFC3160] [E2ERG].

Much of the early participation in the IETF as well as in the IRTF was from the academic and research communities. (We don't have a citation from this, but a look at the members of the IAB from the 1980's and early 1990's shows IAB members from institutions such as MIT, UCLA, BBN, UCL, SDSC, and the like, while IAB members from the last few years were more likely to list their organizations at the time of service as Cisco, IBM, Microsoft, Nokia, Qualcomm, and Verisign [IABWebPages]. We expect that a study of authors of RFCs would show a similar trend over time, with fewer authors from the academic and research communities, and more authors from the commercial world.) While the IRTF has continued to have significant participation from the academic and research communities, the IETF has focused on standards development and has become dominated by the needs of the commercial sector.

The IRTF has generally focused on investigation into areas that are not considered sufficiently mature for IETF standardization, as well as investigation of areas that are not specifically the subject of standardization, but could guide future standards efforts.

The IRTF Research Groups guidelines and procedures are described in RFC 2014. The IRTF Chair is appointed by the Internet Architecture Board (IAB), and charters IRTF research groups (RGs) in consultation with the Internet Research Steering Group (IRSG) and with approval of the IAB. The chairs of the RGs comprise the main part of the IRSG, although the IRTF Chair can also appoint at-large members to the IRSG.

As RFC 2014 states, the IRTF does not set standards. While technologies developed in an RG can be brought to the IETF for possible standardization, "Research Group input carries no more weight than other community input, and goes through the same standards setting process as any other proposal" [RFC2014] (Section 1.1). This is necessary to ensure that RGs don't become a part of the standards process itself.

RFC 2014 continues to say that "since the products are research results, not Internet standards, consensus of the group is not required" [RFC2014] (Section 3). However, the NameSpace Research Group was one RG that did require consensus decisions; this group was chartered exclusively to make a recommendation to the IETF.

RFC 2014 goes on to describe Research Group operation, meeting management, staff roles, group documents, and the like. This document is not a revision of RFC 2014, but instead a more wide-ranging discussion of the possible roles of the IRTF.

The past history of IRTF Chairs is as follows: Dave Clark (1989-1992); Jon Postel (1992-1995); Abel Weinrib (1995-1999); Erik Huizer (1999-2001); Vern Paxson (2001-2005).

2.1. Differences between IRTF and IETF Groups

Two key differences between IRTF research groups and IETF working groups are that IRTF groups are not trying to produce standards of any kind and that the output of IRTF groups does not require consensus within the RG, or broad consensus from the IETF.

In some cases, IRTF groups have acted as research groups with minimal constraints, creating a community for discussing research proposals, with mature proposals "tossed over the fence" to an IETF group for standardization. The Reliable Multicast Research Group (RMRG) was an example of such a group, with standardization efforts in the Reliable Multicast Transport working group (RMT).

2.2. Research Groups as Non-blocking Entities

As stated in RFC 2014, the IRTF does not set standards. It is important that, unless clearly specified otherwise by the IESG, research groups do not act as gateways controlling the advancement of standards, experimental RFCs, or informational RFCs produced by working groups in the IETF.

Similarly, as stated in RFC 2014, existing research groups also do not necessarily prevent the creation of new research groups in related areas. Of course, when considering a proposal for a new research group, it is perfectly appropriate for the IRTF and the IAB to consider the relationship with existing research groups. However, "multiple Research Groups working in the same general area may be formed if appropriate" [RFC2014] (Sections 1.1 and 2.1).

3. The Range of IRTF Groups

There is a wide range of ways that IRTF groups can currently be structured. Some of the most significant are:

* Membership: Groups might be open or closed (in terms of membership). The End-to-End Research Group and the NameSpace Research Group are both past examples of closed RGs.

* Timescale: While RGs are generally long-term, groups could be either long-term (ongoing) or short-term with a specific goal; the NameSpace Research Group is an example of an RG that was chartered as a short-lived group [NSRG]. We note that RFC 2014, written in 1996, assumed that RGs would be long-term: "Research Groups are expected to have the stable long term membership needed to promote the development of research collaboration and teamwork in exploring research issues" [RFC2014] (Section 1).

* Relationship to IETF: Groups can include a goal of producing proposals to be considered in the IETF (e.g., the Anti-Spam Research Group) or can be independent of any current or proposed work in the IETF (e.g., the Delay-Tolerant Networking Research Group).

* Range of activities: IRTF activities could consist not only of research groups and their associated meetings, workshops, and other activities, but also of separate workshops or other one-time activities organized directly by the IRTF. To date, however, the IRTF has not organized such activities other than in the form of BOFs at IETF meetings.

* Both research and development: IRTF groups can focus on traditional research activities, but they could also focus on development, on tool-building, on operational testing or protocol interoperability testing, or on other activities that don't fit the framework of a working group (WG). Instead of having a specific plan for the evolution of the IRTF, we think that this will have to be explored over time, with discussions between the IRTF Chair, the IRSG, and the IAB (and with the IESG as appropriate).

As discussed above, the IAB believes that the range of research groups could be expanded further, in terms of timescale, relationship to the IETF, range of activities, and range between research and development.

4. Issues for the Future

This section discusses some of the issues in the future evolution of the IRTF. A key issue, discussed in Section 4.1 below, concerns how the IRTF can best contribute on questions of network architecture.

Similar issues could be raised in how the IRTF can best contribute to incubating technology for later development in the IETF. We emphasize that we are not proposing that the IRTF should become a de facto holding point for technologies that are not making clear progress in the WGs. Some technologies might not make progress in WGs because of key open issues, making an RG an appropriate step.

Other technologies, however, might not make progress in WGs because of a lack of interest, inherent design weaknesses, or some other reason that does not justify moving it into an RG instead.

4.1. IRTF Groups and Network Architecture

One interest of the IAB is how progress is made on issues of network architecture. This includes help in developing and evaluating new architectures, and in understanding the evolving architecture and architectural issues of the decentralized, deployed Internet infrastructure. This also includes developing tools that could be used in the above tasks.

The spectrum of potential activities for IRTF groups ranges from the visionary to the specific, including the following:

* Architecture: Where are we, and where do we go from here?

* Incubation: We think we know where to go, but we don't yet have the tools to get there.

* Problem focus: We have some specific problems to solve or potential solutions to evaluate.

Some RGs have addressed broad architectural issues, with a mixed set of results; examples of such RGs include the End-to-End Research Group, the NameSpace Research Group, and the Routing Research Group. For other RGs (e.g., the Host Identity Protocol Research Group), the focus of the group is to study a specific proposal, with wider architectural issues raised at workshops held by the RG. Finally, some RGs are in specific areas with well-defined boundaries, with topics that don't have broad impact on the wider Internet architecture.

Where an IRTF RG lies on the spectrum of possible activities depends in part on where the IETF and the field itself lie. For example, in areas such as network management where the IETF community has doubts or concerns about where we should be going with management technology, it would be useful for the IETF to be able to look to the IRTF for architectural evaluation. In contrast, in areas where the architectural approach is better established, an RG with an incubation approach might be more appropriate. Finally, where many pieces of the puzzle are in place, but some significant problems remain, an RG with a problem focus might make sense.

For those RGs with an architectural focus, it would not be appropriate for the IAB to charter an RG to come up with *the* architectural perspective on some topic; any such result would necessarily have to pass through the wide feedback and consensus procedures of the IETF. However, it is appropriate for the IAB to ask an RG for exploration and discussion of an architectural issue; e.g., the IAB has asked the Routing Research Group for feedback about research objectives for inter-domain routing improvements [IABMinutes]. It is also possible for RGs to make recommendations on architectural or other issues, with or without the request of the IAB; e.g., the End-to-End Research Group [RFC2309] and the Crypto Forum Research Group have both made recommendations to the general IETF community. However, some RGs function better as a breeding ground for ideas, and not as a consensus-building community. For example, while the NameSpace Research Group was "an invitational research group chartered exclusively to make a recommendation to the IETF" [NSRG], the group never achieved a clear consensus.

While the IAB doesn't have clear answers on the evolving role of the IRTF in addressing and understanding open architectural issues, this is an area that will be explored in the upcoming years, in collaboration with the IRTF Chair. One of the goals of the IAB is to make more use of the IRTF in investigating architectural issues.

4.2. The Relationship between the IETF and the IRTF

Another area that could use more attention is making the relationship between the IETF and the IRTF more productive. For many (though not all) of the research groups in the IRTF, part of the power of the RG lies in its relationship to the IETF. Of current and recent RGs, for example, this is true of the Anti-Spam (ASRG), the Crypto Forum (CFRG), Host Identity Protocol (HIP), and a number of others.

The interchange between the IETF and the IRTF could be improved in both directions: from the IETF to the IRTF in terms of information about IETF problems that could be helped by further research and development, and IETF evaluation of RG efforts and direction; and from the IRTF to the IETF in terms of reports, documents, proposals, BOFs, and the like. Current paths for this interchange include IRTF reports at IETF plenary meetings; RG meetings before or after the IETF, or in one of the scheduled sessions during the IETF; workshops; and IRTF documents.

One possibility (for some research groups, not for all of them) could be for an RG to have a design-team-like relationship to the IETF or to an IETF working group, with an RG charter that includes an agreement of deliverables, with some notion of the time frame for those deliverables. An issue that would need to be resolved here is when is it appropriate for an RG to undertake such a relationship vs. an IETF WG doing it directly, as is sometimes already done.

We note that as in WGs, RGs are composed of volunteers who make their own choices of research and engineering topics. RGs are usually started by a proposal from individuals who want to form the RG. Thus, it is important to realize that IRTF activity often will not be viable in the absence of individuals who would like to take on the particular work, and this tempers the usefulness of IETF WGs providing input to the IRTF regarding desired IRTF directions or activities. For example, while the IETF can request specific research activities from IRTF RGs, results will require individuals within the RGs willing to undertake this work.

IRTF RGs have been of significant benefit to the IETF; a number of IETF proposals began as discussions in the End-to-End Research Group, for example. At the same time, the interchange with RGs can take significant time and effort from WG chairs and from ADs, sometimes with little to show for it if the RG's direction is at odds with that desired by the WG chairs or ADs. One task for the future is to improve the dialogue between the IETF and the IRTF while not increasing the load on WG chairs and ADs.

One role of the IRTF could be to open some new communication paths between the research community and the IETF. Over the last ten years, as the Internet has grown and matured, and the difficulties of making changes to the Internet architecture have increased, the research community's participation in the IETF has dropped. We are not necessarily expecting to reverse this trend, but it would be good for the output of the research community to reach the IETF somewhat more than it does now, and for the research community to hear more from the IETF.

We would like to shape an IRTF that meets the needs of researchers in this domain, providing interaction both with other researchers and with other industry technologists. In this respect, we would like to see an IRTF that has momentum that is self-sustaining from voluntary efforts, that undertakes (some) work on topics that align to the interests of the IETF, and in such a fashion continues to be of material assistance to the IETF standardization effort. We would also like to see an IRTF that continues to give thoughtful consideration and input to the development of the Internet architecture.

4.3. Relationships between the Research and Development Communities

One of the current and future roles played by the IRTF is that of a bridge between the research and development communities; the research community in general is less of an active force in the IETF than it was in the beginning of the IETF's history. At the risk of resorting to stereotypes, IETFers sometimes view the network research community as irrelevant or disconnected from reality, while researchers sometimes view the IETF as insufficiently thoughtful or as an unproductive place for investing one's research energies. There is also a natural difference in timescales, with the IETF more focused on near- to medium-term issues, and researchers often more focused on longer-term issues.

Unfortunately, disconnections between the research and development communities can hurt both the research and the development. Just as one example, from "Failure to Thrive: QoS and the Culture of Operational Networking" [B03]: "Remarkable intelligence and energy have been lavished upon the architectural design of QoS, but much less attention has been devoted to careful analysis of the relevant problem space from an operational or economic perspective. This discrepancy is symptomatic of a broken (or attenuated) feedback loop between network operations and research." Thus, one potential role of the IRTF is to help provide a productive forum that improves the communication in both directions between the two communities.

4.3.1. What's in a Name: On the Name 'Research Group'

There have been proposals that for some groups the name "Research Group" is incorrect or unnecessarily off-putting to some potential participants and that other names such as "Architecture Group" might in some cases be more useful. Such a terminology change is potentially quite significant, and needs to be evaluated in terms of the IAB's overall role and responsibility for guiding the development of architectural considerations within the IETF. Another issue is that different RGs have different mixes of people, in terms of researchers from academia, industry practitioners, and IETF WG participants; it is not clear how changing the names would affect this.

4.4. The RFC Track for IRTF Documents

Currently, RFCs produced by RGs are published as individual submissions, under the review of the RFC Editor [RFC3932]. There is currently a discussion (and pending Internet-Draft) about the need for a venue for publishing RG output that is clearly marked as research, as opposed to the output of an IETF WG. This is both to more clearly distinguish RG output from standards documents of the IETF and to give RG output more visibility than that of individual submissions. Similarly, RG output might have different reviewing criteria from that of other documents considered as individual submissions. This discussion is ongoing.

More visibility for RG Internet-Drafts could increase the level of interchange between the RG and the rest of the community.

It would also be helpful to decrease the delay in the publication time for IRTF RFCs. Anything that *increased* the publication time would probably be counterproductive.

5. Security Considerations

There are no security considerations in this document.

6. Acknowledgements

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We note that when this document was begun, Sally Floyd was a member of the IAB, and Vern Paxson, as IRTF chair at the time, was an ex-officio member of the IAB.

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