The Nature of the Internet

Motivation and capsule summary
Leslie Daigle, October 7, 2014.

The Internet's technical community, responsible for the development, deployment and operation of the Internet, and the world's policy makers, responsible for the care of their citizens online and offline, have increasingly found themselves in heated discussion of how to address policy issues without "breaking" the Internet. In the worst case, policies imposed on network operators, content providers and users of the Internet don't work (fail to address the issue for which the policy was created) and stifle the Internet's growth and evolution. Sometimes, the policy measures succeed but the Internet's growth is stifled — leaving the technical community to wish that different approaches could have been brought to bear. Or, the policy issue is not addressed, leaving policymakers and regulators unsatisfied and with ongoing concerns about the Internet and its use. None of these outcomes is particularly desirable. To make steps toward the ideal outcome (policy issue addressed; Internet's growth unimpeded), a broader understanding of the nature of the Internet is needed, without requiring policymakers to be ready to argue technical points or vice versa.

Three things to understand about the Internet

The Internet is a "network of networks"

Created in an era when it was infeasible to build a single globe-spanning network, its purpose was to take existing local networks (then, typically research labs or campuses) and hook them together so that every network host could reach all others. Three key realities that emerge from that are:

1. Local networks are individually built and managed to serve the needs of the users in the lab, enterprise or customer sites
2. These networks are interconnected by virtue of interoperable protocols.
3. Global reach is achieved not just by hooking each individual network up

to all others, but rather by sharing resource to connect networks that are far apart.

This has meant that the Internet has required a communal effort, since its inception, even as it empowered individual networks to be developed and deployed to suit users' needs. It also means that it is very hard to do something to one part of the network and not affect the Internet as a whole.

The Internet can handle (some) change

The Internet is no stranger to massive change. The Internet of today is vastly different from how it was at its inception — that it has evolved over the course of 40+ years is a testament to its flexibility in the face of major change. As the Internet and the services it supports become an integral part of personal, commercial and political daily lives, there are increasing external pressures on the Internet. There is perceived need for change in the Internet, often met by resistance from key stakeholders. Yet, the Internet must be able to withstand some changes without losing its core nature — indeed, change is how the Internet has grown.

As much as the Internet changes, there are some things that (must) remain the same

Key to answering those questions is understanding the nature of the Internet in terms that are not strictly technical. The primary, unchanging features of the Internet ("invariants") and illustrates what matters in the face of several of today's external requirements for the Internet. These are outlined in some depth in a whitepaper published at the Internet Society.[1]

Three current tussles over the Internet and its reach

National boundaries and the Internet

In 2013, the impact of revelations of US government data collection practices caused other countries' governments to realize how much of their citizens' traffic flows through the US, whether or not it is destined for any user or service there. These realizations has lead to calls to re-route major Internet links to avoid

transiting US networks. Changing network routes is a common and ongoing occurrence, but it is usually driven by needs for network efficiency. Attempting to re-architect the Internet so that citizens' traffic remains within certain geopolitcal boundaries is at odds with responding to the global Internet's needs, and may well lead to less diversity and resiliency in (national) networks. For a further explanation, see [2].

Data localization requirements

Also in response to the revelations of government spying, Brazil introduced a proposal in its *Marco Civil* legislation (see [3] and [4] for unofficial English translation), to require such global Internet companies as Google to establish data repositories within Brazil. Although the specific proposal has been dropped from the now-adopted *Marco Civil* (see [5]), the concerns that drove its proposal remain. At a distance, it seems perfectly rational to expect that users' personal data remain within their own country. Examined more closely, several challenges come to light. Apart from the immediate challenge to existing impacted companies — Google would be required to re-architect its data network to comply — this raises a significant issue for new entrants to the industry of providing Internet-based services. What growing company can immediately provide separate services in every country on the planet? Or, must services that cannot comply with such requirements block access to would-be users from those countries? In either case, the Internet is impoverished and/or fragmented.

Implementing approaches to international issues by controlling local resources

The global nature of the Internet means that criminal acts may well be carried out in a very different jurisdiction than that of the victims. There are very few known (if any) repositories of illegitimately copied Hollywood movies and television shows in the United States. There are, however, plenty of American consumers of such works. To address this imbalance, one approach is to impose restrictions on the use of the Internet or its infrastructure within the impacted jurisdiction. This was the case with the "Stop Online Piracy Act" (see

[6]) proposed in the US. The SOPA act would have required US-based Internet Service Providers to fail to resolve the domains of "known" sites of pirated copyrighted material. The idea was that this would prevent access to the material. In fact, the known work-arounds were many, so it would not have succeeded. The most immediate impact would have been damage to a core Internet infrastructure, the Domain Name System.

Capsule Summary

The nature of the Internet and the issues facing it are presented in "teaser" form above. The issues are very real and deserving of thoughtful resolution. As they stand, implementing policy with current understandings is likely to result in the worst case outcome (an impeded Internet and policy issues left unresolved).

Instead, that resolution has to come in a form that respects and works with the nature of the Internet, not against it. Tradeoffs are necessary, as is stepping back to review what the core issue is. In engineering discussions, the question that is raised when arguments about choices arise is: *what problem are you trying to solve?*

Both aspects — the nature, and the issues — will be explored in further detail through the use of the Internet Invariants taxonomy [1].

References

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[3] Website: Brazilian Marco Civil proposal of November 2013, Accessed October 7, 2014 http://edemocracia.camara.gov.br/documents/679637/679667/Marco+Civil+da+Internet+-+6_11_2013/0e3fae49-7e45-4080-9e48-c172ba5f9105

[4] Website: Unofficial English translation of updated proposal for Marco Civil, Accessed October 7, 2014 http://infojustice.org/wp-content/uploads/2013/11/Marco-Civil-English-Translation-November-2013.pdf

[5] Reuters. "Brazil to drop local data storage rule in Internet bill." Accessed September 19, 2014. http://www.reuters.com/article/2014/03/19/us-brazil-internet-idUSBREA2I03O20140319

[6] Wikipedia. "Stop Online Piracy Act." Accessed September 19, 2014. http://en.wikipedia.org/wiki/Stop_Online_Piracy_Act

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