
The Open Internet

What it is, and how to avoid mistaking it for something else.

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Introduction¹

It is not by chance that we have enjoyed the extraordinary success of the Internet as a global engine of economic, political, cultural, and social progress. Fundamental principles embedded in the architecture of the Internet as a collaboration among designers, builders, providers, and users led directly to this success. Sustaining it will require a commitment by today's policy makers to understand and respect those principles—not because they are honored by time or tradition, but because they confer tangible present and future benefits.

The term "Open Internet" has been used so often and so freely that everyone knows what it means—or thinks they know what it means, and assumes that everyone else means the same thing when they use it. After all, the core enabling principle of the Internet as a system that includes users, applications, and infrastructure is *openness*, which infuses every aspect of the modern Internet—technical, economic, political, and social. But depending on the context in which it is used, the word *open* conveys different meanings, particularly when subtle (or not-so-subtle) variations are introduced by translation from one language to another; and because "openness" has become an important issue in many Internet political debates, defining what it means has become part of those debates.

As is usually the case when people understand the terms and concepts of a debate differently, it will be difficult for us to resolve important issues of Internet policy until we reconcile our different understandings of *open* and *openness* in principle and in practice. That is the objective of this paper.

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What does Internet “openness” mean?

People familiar with the Internet and its terminology tend to think and talk about Internet *openness* in ways that are not always familiar to people with different backgrounds who think and talk about openness in other contexts. Different uses of the word can convey—or be intended to convey—shades of meaning in at least the following dimensions, all of which are relevant to the Internet:

- Transparency** The contents of an “open book” may be seen by all; nothing is secret or hidden.
- Participation** An “open invitation” to contribute implies a corresponding commitment to listen to contributions from everyone with an “open mind.”
- Accessibility** Access is “open” when it is not limited to specific people or groups; when a commercial enterprise welcomes all customers, we say that it is “open for business,” and according to the doctrine of “open government” citizens have the right to access the documents and proceedings of their government in order to exercise effective public oversight.
- Vulnerability** Standing “in the open” without protection or shield leaves one “open to the weather,” and an “open city” that is not or cannot be defended is “open to attack.”

The theme that most clearly emerges from these meanings of “openness” is *opportunity*. The open Internet enables an environment of social and economic growth and empowerment because it creates a level playing field in which everyone enjoys the same opportunity to participate.

Internet engineers and policy-makers began to refer to the Internet as “open” in the early 1990s, after it had begun the transition from a deliberately closed precursor (the U.S. Government-sponsored ARPAnet) to the voluntary federation of users and providers that prevails today. The first popular-press references to Internet openness focused heavily on the vulnerability dimension—and of course security issues still plague the Internet—but modern usage embraces transparency, participation, and access in balance with the risks associated with being in an open space. Different societies make different choices about the way in which individual and collective responsibility mitigate the vulnerability of openness.

Why is Internet openness important?

Openness is the core value of the Internet system:

- > As a tangible network infrastructure composed of hosts, routers, service providers, protocols, and many other technical components, the Internet is optimized for interoperability—peer components interact with each other without extensive prior configuration because information is shared openly, and every developer and operator has open access to the externally visible behavior of each element of the Internet system.
- > As an operational infrastructure that relies on the voluntary participation of many different parties to manage its independent parts, the Internet is an open society of individuals and organizations that fulfill their separate local missions by collaborating to make the global Internet work.
- > As an innovation engine that supports the development of new technical standards and policy initiatives, the Internet succeeds because openness—transparency, access, and participation—brings the best ideas to the table, distributes them widely, and engages everyone in the process of turning them into new services and applications that create new opportunities for Internet users around the world.

Without openness, Internet standards development would be a marketplace in which only the least interesting wares were displayed; Internet operations would be subjected to the inefficient friction that plagues systems in which the constituents operate individual walled gardens; and the Internet infrastructure itself would lack the robust resiliency that arises from a focus on interoperability across boundaries rather than the creation of boundaries to enforce jurisdiction.

A policy debate is often an argument about where to make tradeoffs among alternatives so that one interest or another is favored. As such, it necessarily begins with the assumption that each of the alternatives could (at least in principle) be implemented within the system to which the policy will apply.

In this respect, *openness* is not a value among others that might be prioritized up or down as societies in different parts of the world seek consensus on issues with many dimensions. Just as life on Earth would be fundamentally different if it were based on an element other than carbon, the Internet without openness would be a fundamentally different system. In a policy debate about life on Earth we could decide, for example, to give higher priority to the preservation of an animal habitat than to a competing interest in economic development. We could not, however, decide that life should be based on something other than carbon without redefining “life.”

This essential difference between openness and other Internet attributes—such as how its constituent networks are interconnected, what regulations apply to service providers and users, and how the cost of operation should be shared—is widely misunderstood. Openness is why the Internet has the dynamic and evolving properties that make it so valuable as an engine of human progress. It is not simply a nice idea that might or might not survive exposure to the hard realities of global network politics.

What does Internet openness mean in practice?

Advocates of an open Internet are often miscast as proponents of an “anything goes” anarchy that would sweep aside the rule of law and other norms of human behavior in favor of “permissionless innovation.” But that is far from the reality of an open Internet, in which *permissionless innovation* is about enabling creative enterprise and employing existing technologies and institutions in new ways—the opportunity for entrepreneurs, creators, and inventors to try out new ideas and new business models without asking permission from any established gatekeeper. It is freedom, not disorder.

Any host or network can join the Internet simply by making the necessary physical connections and following the protocol standards. This is raw openness—the structure of the Internet makes it possible. Whether or not a particular host or network *may* join the Internet is a context-dependent policy issue. Recognizing the Internet as an open system does not invalidate policy regimes that may specify how, by whom, and under what circumstances the Internet may be used in a particular political or social environment. The converse is equally significant: many different policy regimes can be implemented and enforced without compromising the Internet’s essentially open character.

In practice, the open Internet has been fertile ground for the invention and development of remarkable new companies, capabilities, and modes of human interaction; and the openness principle continues to guide the Internet’s evolution in technical, economic, political, and social dimensions. Innovation in the Open Internet arrives by consensus through open collaboration among researchers, manufacturers, service providers, and users. It can enter from any source and propagate in any direction.

Technology

The openness of the Internet allows its users to experiment with new technologies—and new uses for old technologies—without making changes to the network itself that might disrupt the activities of other users. A new application that runs over the pervasive Internet Protocol (IP) infrastructure does not change that infrastructure, and therefore in principle affects only the users of the new application (“in principle” because a new application may have innocent or malicious side-effects on performance or security). Because the underlying Internet is not required to make any special accommodation for any of the applications that use it, new applications work without network operator intervention.

The open Internet also adapts readily and rapidly to the deployment of new telecommunication technologies. Because the Internet rides as payload over whatever underlying networks are available, new technologies—carrier ethernet and other optical transmission techniques for high-volume transport; cable and DSL for mass-market access; WiFi and 4G mobile radio for wireless—slide seamlessly into the Internet open system. As long as the underlying networks can move data bits or packets transparently from one place to another, the open Internet can use them.

Economy

Traditional telecommunications networks draw bright-line distinctions between carriers and their customers, and often among different classes of carrier. The Internet, on the other hand, is a voluntary federation of public and private enterprises, within which economic arrangements are negotiated individually as each enterprise sees fit. These arrangements are typically commercial agreements, which can, within the usual constraints of business law and governmental regulation, adapt to changing conditions and market requirements. Unlike traditional networks that were developed and deployed as monopoly franchises, the Internet design permits the ongoing entry of new service providers.

A good (idealized) example of the open Internet's federation economy is the way in which ISP peering arrangements are made. A small local ISP will typically connect to and purchase upstream bandwidth from a larger backbone ISP. To the backbone ISP, the local ISP is a customer. The value relationship here is one in which the backbone connection is worth considerably more to the local ISP than the local ISP's access customers are worth to the backbone, so money changes hands in order to create a mutually acceptable exchange.

Large backbone ISPs, on the other hand, generally exchange traffic with each other at no charge. The value relationship here is one in which each ISP benefits in roughly equal measure from a larger Internet with better connectivity; by exchanging traffic, each is increasing its own value. The largest ISPs also provide each other with transit service to other ISPs, since each typically hosts many smaller downstream providers and has many peering connections that increase the robustness of the Internet's global fabric. Smaller backbone ISPs, on the other hand, might get no-charge peering from a larger ISP for exchange of the larger ISP's traffic, but may pay a transit fee to use the larger ISP to reach other ISPs. A university may act like an ISP to its user community, and like a customer to upstream providers, but there is no need to decide if it is formally one or the other.

These arrangements are flexible and negotiable, based on local and global economic incentives that operate without central control.

Politics

Because the Internet is a federation of individually owned and operated networks, rather than a single "network" in its own right, it makes much more sense to talk about the *politics* of an open Internet than its *governance*. Just as openness enables many different arrangements within the Internet economy, it allows Internet political agreements to accommodate considerable variation in the organization, operation, and autonomy of the infrastructure elements that collectively support "the Internet." As a federation controlled by the decisions and actions of its members, the open Internet represents a political arena in which the spectrum of available choices among collaboration models is not limited to those that require a high degree of uniformity or centralization.

The open Internet has already demonstrated that it can co-exist with many different governmental and non-governmental political systems, to an extent that is historically unprecedented. The multistakeholder model of Internet political organization recognizes and embraces this strength of the openness principle. As a

medium for diverse political factions to interact far more broadly and immediately than they have in the past, the open Internet has inevitably stimulated political frictions, with both constructive and destructive consequences. The politics of openness engage each political system in decisions about how to deal with these consequences, both locally and globally.

Some political agreements for an open Internet must be globally coordinated in order for the system to work at all, including the management of names in the Domain Name System (DNS) root and the top-level allocation of IP addresses. In an open Internet, however, the institutions that perform these allocation and assignment functions do not have direct “control” over the name and address spaces they administer. The political arrangement according to which these functions are performed is a voluntary bottom-up agreement developed by the multistakeholder community of interest that enables the Internet to work better by preventing name and address conflicts.

Society

The principle of openness has allowed the Internet to become the most important social medium of our time by fostering interactions that transcend traditional social boundaries. But freedom is not anarchy; it exists within the rule of law. Societies impose legal restrictions in order to promote particular community norms. The open Internet, as a social medium, may affect the way in which laws are applied to community members, but it does not by itself change the laws. For example, although it encourages and facilitates the sharing of information, it does not vacate locally- or globally-instantiated laws of copyright.

Antisocial behavior does not become acceptable simply because it is “on the Internet”—indeed the openness of the Internet can potentially magnify certain harms, especially those involving privacy and control of personal information.

What are the tangible benefits of an open Internet?

“Openness” is not a policy that advances the values of one group at the expense of another’s; it is an inclusive and irreducible feature of the Internet as a system, and its benefits are therefore those of the Internet itself.

The open Internet succeeds in conferring these benefits not because Internet advocates relentlessly assert that “openness is good,” but because openness confers tangible benefits that would otherwise be difficult or impossible to obtain.

The ability to connect

Communication with others is at the heart of humanity. While the Internet technically provides machine to machine communication, the machines—computers—have become mankind’s most versatile tools. As a worldwide system with billions of reachable users and devices, able to spontaneously adapt to new devices and applications, the Internet provides unprecedented facilities for information sharing. Its end-to-end model of service provision means that intermediate systems and underlying networks do not need to participate in the creation of new applications, nor do end users expect any specific behavior from intermediate systems and networks.

The ability to speak

The Internet provides a global platform for one-to-one, one-to-many, and many-to-many speech. Tools exist to help users achieve different levels of anonymity and privacy, and these can evolve rapidly in response to ongoing threats.

The ability to innovate

Applications on the Internet belong to the end users, and can be both created and used by anyone. The lower layers that transport packets need not even be aware of the higher layer applications or their specific content. Cloud computing is an example of an innovative way to take advantage of the Internet’s capacity and ability to neutralize the barrier of geographic distance. Some new applications may place specific new burdens on network providers, and thus meet obstacles based on technical, business, or social issues. Application developers have therefore generally worked within the constraints of available services, even if pushing at their boundaries, while service providers have recognized how upgrading their service offerings to support additional types of applications can enhance their own businesses. This dynamic process occurs naturally and incrementally in the open Internet, as each innovator builds upon the creativity of others.

The ability to share

The Internet has enabled massive world-wide collaboration on many activities, from distance learning to open source software development. Many old books now in the public domain have become available freely

via the Internet, and arrangements have been made with some copyright holders for access to copyrighted content. The Internet has provided an avenue for new musical performers, amateur and professional video producers, and authors to reach new audiences.

The ability to choose

Openness confers the ability to choose (in principle) among multiple providers of facilities and services. Users can choose from a wide variety of content, commerce, connectivity, and other service providers; infrastructure companies can choose from among a variety of peering and routing arrangements to carry traffic. That choice may be constrained by economic, political, or other contextual factors, but not by the open Internet itself.

The ability to trust

While there have been many threats to the security and privacy of Internet users, tools for establishing and maintaining trust continue to evolve to meet them. Security upgrades to DNS (the Domain Name System) and BGP (the Border Gateway Protocol that knits together the Internet's backbone), for example, improve trust, as do end to end security, certificate-based authentication, and improved encryption. Trust is also enhanced by transparency in the open development of security protocols and practices.

Conclusion

Because *openness* is the core organizing principle of the Internet, understanding what it means—and what it does not mean—is an essential prerequisite for meaningful discussion of a wide range of critical technical, economic, social, and political issues.

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