# The Internet Way of Networking

A Foundation for Success

## INTRODUCTION

### The Internet as an Evolving Ecosystem

What makes the Internet 'the Internet'? Why was it adopted globally so quickly, and how does it continue to birth and sustain the latest innovations?

In just a few decades, the Internet has enabled global economic growth and improved the quality of life for billions of people around the world. While it may be hard to predict what's next, to ensure the Internet's future success we need to identify and protect what makes it unique.

The Internet is often described as an ecosystem because it is complex, diverse and dynamic. An ecosystem is defined as a "complex of living organisms, their physical environment, and all their interrelationships".[1]

As organisms evolve and compete, and their environment varies, ecosystems are in a constant state of change. The Internet is similar. As networks develop, applications compete, and users adapt to a changing environment, the Internet is in perpetual flux: yet its foundation remains essentially the same.

Like an ecosystem, the Internet is not designed; rather it evolved from a set of networking principles that emphasized openness and interoperability and maximized interconnection - the number of interrelationships it could create. In contrast, other networking models – such as those invented by the Xerox Corporation, Bell Labs or the International Standardization Organization (ISO) - didn't succeed as their hierarchical and centralized designs controlled and limited how networks and people could connect.

No one entity can design a true ecosystem. In fact, when people try, they fail. In the nineteenth century, "scientific forestry" was introduced in Germany.[2] Instead of different kinds of trees, bushes and scrub, monocultural forests were planted in straight lines that were easier to monitor and harvest. Management of the simpler forests was done centrally as local knowledge was no longer needed, and their orderly appearance appealed to those

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[1] https://www.britannica.com/science/ecosystem

[2] Scott, James C. *Seeing Like a State; How Certain Schemes to Improve the Human Condition Have Failed*, Yale University Press, 1998

who liked systems to look and feel orderly. Initial timber yields were huge, but a century later the next generation of trees was small and weak. A new term entered the German vocabulary; *Waldsterben*, or 'forest death'. The attempt to rationalize forests into a simpler system failed, disastrously. Why?

By simplifying a complex and dynamic system into a single desired output, the forest designers failed to see that diversity and interrelationships were not unnecessary waste but the source of the forest's value. Tree monoculture was vulnerable to disease, and straight lines fell to wind, fire and flood. Efficiency gains were cancelled by lower resilience, and yields collapsed when the new forest exhausted the long-accumulated soil 'capital' of the old. It took decades to re-create the diversity and resilience that had been destroyed by trying to re-design a successful ecosystem.

Although barely fifty years old, the Internet is like an old-growth forest in its depth, variety, and ability to survive attacks and disasters and continually reinvent itself. It is a 'network of networks' whose value is the inter-relationships between different devices, applications, and uses linked by a common set of protocols. Its management isn't centralized; instead, intelligence and autonomy are concentrated at the edges, in the hands of those running local networks. The Internet is a place everyone can enter, multiplying its connections and increasing their value for all. So, it is not just the technology, or its services and use that define the Internet, it's *how* we network, which we call the 'Internet Way of Networking', that also matters.

Like any live ecosystem, the Internet is constantly evolving. This perpetual evolution without a centralized plan or control – but with thousands of people and organizations working collaboratively on standards, protocols, and their application in the real world – is what has made the Internet a success.

But could the Internet's perpetual evolution end up shaping it in a way that is no longer generative, and therefore not fostering growth and innovation? Could we see a regression to more centralized ways of networking, either from a desire to simplify a complex system, or over-confidence in the Internet's dynamism and resilience? It's possible. If we fail to recognize and protect the Internet's fundamental properties, we risk a series of irreversible and accelerating changes that strip the ecosystem bare, a sort of "climate change for the Internet".

Around the world, networking models are emerging that constrict inter-networking and aim to systematically organize the Internet into a permission-based network. More authoritarian countries seek to export their visions for the Internet, with gated access to a mere fraction of the open Internet. Elsewhere, concerns have arisen about significant business players' influence over important parts of the Internet infrastructure. All these developments

threaten what we call the Internet Way of Networking and, therefore, the healthy evolution of the Internet.

## The Internet Way of Networking

The Internet Society works to make the Internet a global platform for people everywhere to connect, communicate, and innovate, now and in the future. We have identified five critical properties of a way of networking that maximizes the benefits the Internet brings.

- An Accessible Infrastructure with a Common Protocol
- An Open Architecture of Interoperable and Reusable Building Blocks
- Decentralized Management and a Single Distributed Routing System
- Common Global Identifiers
- A General Purpose Network

These properties are essential both because they are necessary for the Internet's healthy evolution and because they convey the essence of what makes the Internet unique.

The Internet Way of Networking springs from the five critical properties, but it's important to note the Internet they describe has never existed in its purest form. The critical properties don't hark back to an idealised past. Instead, they represent the Internet's optimal state. By codifying the basics of the Internet's most perfect form, we have a reference point that helps us tell if the Internet is moving away from or towards the best it can possibly be.

Each of the essential properties helps to sustain particular benefits that the Internet can produce. When they are present, they maximize both the Internet's health and its potential to create and disseminate value. For example, unrestricted access and common protocols deliver global connectivity, and encourage the network to grow. As more and more participants connect, the value of the Internet increases for everyone. Another example is a single identifier set that delivers consistent addressability and a coherent view of the entire network, without fragmentation or fractures.

While each critical property cannot guarantee the associated benefits, together they form the necessary condition for future evolution in a way most likely to create and disseminate the value that comes from connection.

## An Impact Assessment for the Internet

The Internet Way of Networking is a positive framework that lets us test whether new ideas support the best potential of the Internet. It gives us a stable frame of reference to evaluate current networking conditions, proposals for technological development, regulations, and technical governance arrangements. If a new development undermines or even reverses

one or more of the critical properties, we now have an objective and easily applicable lens through which to view its effects.

And as evolution based on open collaboration continues, the Internet Way of Networking lets us evaluate incremental changes and external trends in a forward-looking way that keeps the fundamentals of success front and centre.

## How to Use the Internet Impact Assessment Toolkit

A more detailed explanation of the Internet Way of Networking can be found in the whitepaper, The Internet Way of Networking: A Foundation for Success. It describes how each critical property works in practice, how it generates benefits, and what can happen if it is damaged.

The larger Internet Impact Assessment Toolkit, of which the white paper is a critical element, also includes a set of use cases that show how the critical properties of the Internet Way of Networking can be used to assess whether a developing trend or idea could impact the Internet. The use cases cover such topics as: interconnection and routing, data localization, and intermediary liability.

Each use case identifies a trend based on real-life examples and assesses its likely impact on the critical properties and the values and benefits they bring to the Internet. We also extrapolate from current trends to suggest how the future Internet would be affected if the trend continues.

We invite you to apply the five critical properties of the Internet Way of Networking to use cases or more detailed case studies of relevance to your community, and to share the results. Which technological, policy, and other new developments and trends are affecting the Internet near you? Can they be mitigated or lessened?

The choices we make today help determine the Internet of the future. If those choices are guided by the Internet's critical properties, its ecosystem will keep its vitality as it continues to evolve. We hope you find the Internet Way of Networking both a useful expression of 'what makes the Internet the Internet' and a practical tool to sustain the Internet.