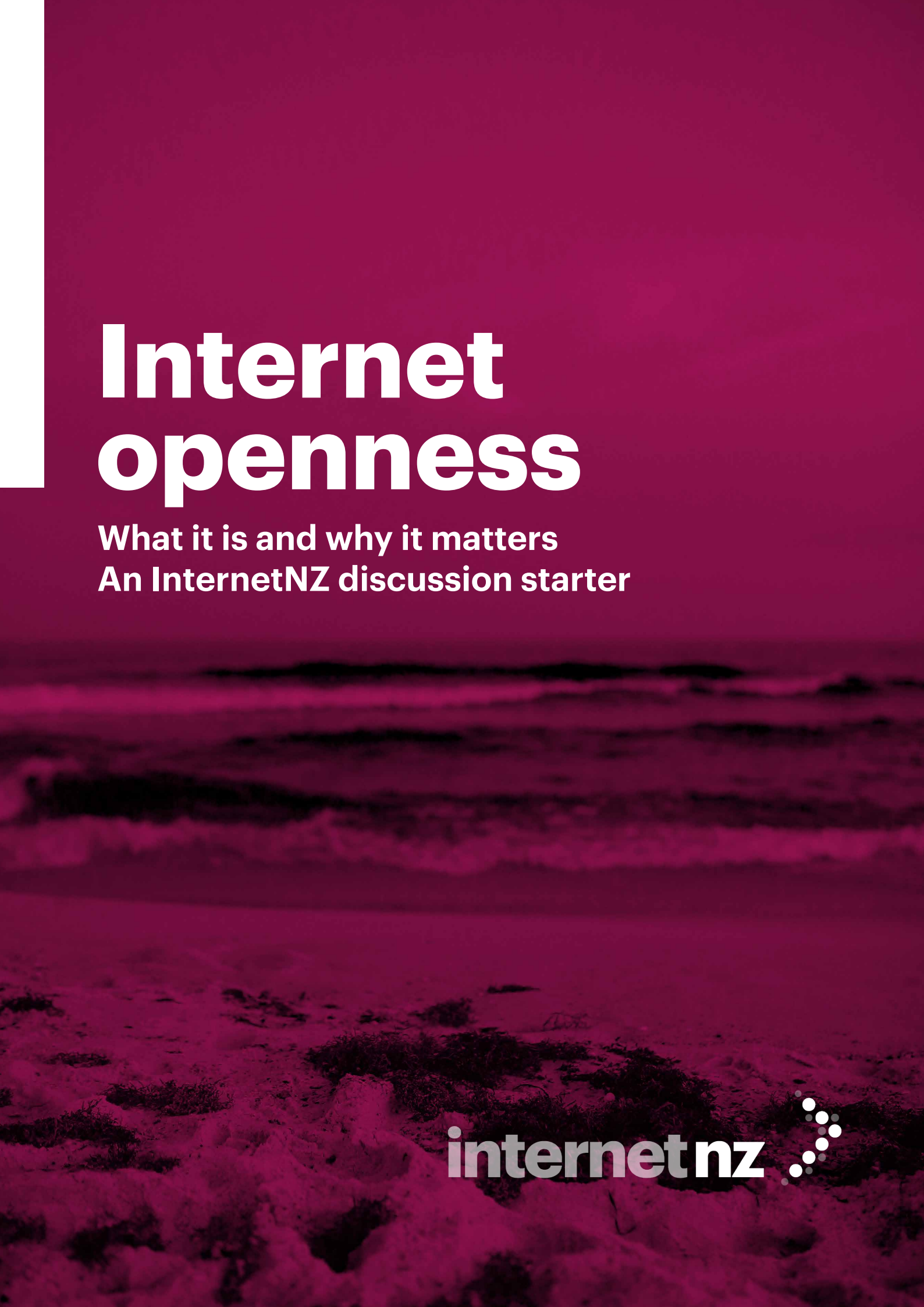
Internet openness

What it is and why it matters
An InternetNZ discussion starter



internetnz

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Foreword

InternetNZ has prepared this paper to start a discussion about Internet openness; what it is, what it means and what we can do to protect and enhance it. We want to hear your thoughts as we move forward with this work, and will be drawing on the ideas and questions you share as we develop our thinking through conversations, events, and future work too.

Internet openness is vitally important to InternetNZ. The Internet; open and uncapturable was one of the foundational values of our organisation. Openness is grounded in a belief that the Internet was, and still is, a resource for all; that making the most of that resource requires permissionless innovation, open creativity, open standards, and limitless potential.

Openness is what has allowed the Internet to evolve into what we see today, driving both its key benefits and many emerging challenges. Billions of webpages; millions of applications; billions of users; quintillions of bits of information, shared across boundaries, across cultures, across peoples. All of that is only possible due to openness, and how the open foundations of the Internet have created an ecosystem that allows free transmission of ideas around the world.

While openness is easy to describe in these terms, it is harder to specify. What does it really mean, and why does it matter? What does openness allow for? How do we protect and nurture that openness today, as the Internet continues to evolve and is used in ever more creative and challenging ways?

It is to explore these questions that we have prepared this paper. We live in an era where these conceptions of what openness may be under challenge — from closed ecosystems and platforms that exist on the Internet, from closing nation state barriers, and closing concepts that don't necessarily square with the simple concepts of Internet openness.

We think we all need to clarify and maybe reconceive of what Internet openness is to address these challenges. We want to explore these ideas with you, dear reader, and with the New Zealand Internet community, to clarify what openness is today, why it matters and how we protect, nurture and enhance it.

Another founding value of InternetNZ is multistakeholderism; or more simply put, that we see the power of the Internet best realised when we explore these ideas together, valuing diversity of opinion and clarifying common understandings through a collective process.

To that end, this paper is a discussion starter in the truest sense. We encourage and welcome your feedback — is this too big a set of ideas, and have we drifted too far from what Internet openness is? Alternatively, perhaps we have not been bold enough in proposing ways of thinking about these new challenges and ideas? We invite you to join us and explore the concepts in this paper so we may find a way forward on Internet openness, together.

Acknowledgements

We are grateful to a number of people that have contributed their thinking to this paper to get it to this point. Thank you particularly to Colin Jackson, fellow, founder and previous President of InternetNZ, who is thinking about the future, but helped us ensure our thinking was informed by InternetNZ's history so far.

We also wish to thank Alex Sims, Hamish MacEwan, Hayden Glass, Liz Williams, Mandy Henk and Robert O'Brien for conversations and comments that helped us improve this paper.

InternetNZ stands for Internet openness

Since InternetNZ was founded, we have stood for the benefits of Internet openness.[1] The idea of an open and uncapturable Internet is one we have carried through a range of policy debates, helping to rally support and hold together our key concerns. Now, at a time when the Internet is changing and facing new challenges, we need a usable, current understanding of Internet openness, so we can carry it forward for the next decade. Below, we begin that work, drawing together the work and thinking we have done on Internet openness to prepare for that future.

Our history of protecting Internet openness has played out in our responses to the issues of the day, from Telecom's market dominance in the 1990s, to the 2008 "skynet" law which required that Internet Service Providers (ISPs) would cut New Zealanders off from the Internet (see **Figure 1** below).[2]

Figure 1: 25 years defending the open Internet

	1990s Emerging Internet	**2000s** Emerging use	**2010s** Emerging impacts
Global challenges	Transition from US & academia to global, broad Internet use	Neutrality conflicts of networks and Internet	Privacy, security, & trust: state surveillance and dominant platforms
NZ context	Lack of innovation in local networks	Trade deals & local laws impacting Internet use	Global platforms as the default Internet use
InternetNZ stood for	Competition to drive innovation in access networks	Faster access networks	Inclusive conversations about the Internet, including at NetHui
InternetNZ opposed	Control by local ISPs and governments	Overreach in copyright enforcement	Harms from surveillance and global platforms

Though related, those different issues have each raised different concerns. Developing the understanding we need requires us to unpack these individual elements, so far bundled together into the term Internet openness.

1 Our 1995 articles of association set out our objects as a society, which include "promoting the competitive provision of Internet access, services and facilities in an open and uncaptureable environment".
2 "Govt reveals revamped Section 92A" Stuff, https://www.stuff.co.nz/technology/digital-living/3167690/Govt-reveals-revamped-Section-92A.

We need a definition of openness to guide us through the next decade

Our _ is an Internet that is open, secure and for all New Zealanders. To communicate and deliver that vision, we need a clear and current definition of Internet openness.
A crisp and relevant definition will help us to protect the essence of what the Internet is and what it offers people, while also being able to deal with the challenges it presents in a way that does not unintentionally damage it.

In this paper we set out to develop this definition. We aim to **identify the elements of openness essential to the Internet's potential**, while **allowing room for reasonable policy responses to real online harms**. It is difficult to develop a definition which delivers the clarity we want, while addressing the balance and nuance needed to address current challenges.

This paper explores how the design and history of the Internet can guide our thinking on Internet openness. We first explore the core Internet infrastructure, considering how Internet technologies, architecture, governance, and markets relate to elements of openness. We then explore aspects of openness relating to online services.

Through that journey, we develop a draft definition of what Internet openness requires:

> **Internet openness means enabling people to observe, participate, and innovate, on both the core Internet infrastructure and major online services.**

We invite you to join us in an open discussion of our proposed definition. Your input will help us shape the next version of our thinking, and our work in helping New Zealanders harness the power of the Internet.

Introducing an open Internet

From open connections to open communities

Over the past three decades, people have built the Internet based on an optimistic view of openness, making design decisions to favour open connections and global sharing, and avoiding centralised points of control or failure. Enabled by its openness, the Internet has grown in scale and scope, reaching more than half of the world's people, and delivering an ever-expanding range of services people rely on to learn, work, and socialise.

This vision of openness is both inspiring and accurate, but it is only part of the picture. People using the Internet can face risky and harmful behaviours by others which deter their full participation as equals. Decisions by governments, courts, and businesses seek to address those harms and assert control, but these decisions can themselves challenge Internet openness. We think a key challenge for the next decade is a shift from enabling open connections for computers, to open online communities which include and benefit people.

Internet infrastructure offers open-ended connections...

The Internet is an evolving core infrastructure which lets people connect independent networks to share digital information around the world. Like pipes, paths, and roads in a city, it offers basic connections enabling diverse activities. Core technologies which move data packets and resolve domain names are **developed in the open**, and are **open for anyone to use for any purpose**, without payment or permission. People designed the core architecture so that it would always be **open to new uses over time**. Though imperfect in practice, key institutions of Internet governance apply a principle of **open and inclusive participation in decisions for the Internet**. To connect to Internet infrastructure, people rely on commercial markets for access and interconnection. Benefits of Internet openness require markets with **open entry and competition**, and are challenged by a trend of consolidation.

...while online services structure how people use the Internet

In our view, challenges for Internet openness increasingly relate to how people use and experience the Internet through online services like social media, search, and streaming video. These **online services provide digital architecture structuring people's online interactions**, curating what people see and influencing what they do. With global network effects and no physical limits, they can grow popular in ways that become self-reinforcing. Commercial online services are driven by information about people, which can be applied to attract attention, target advertising, and guide business decisions. Decisions by major online services influence billions of people, and sometimes challenge Internet openness due to a lack of transparency and interoperability.

We compare these online services with online communities driven by the benefits of openness. Wikipedia is the online encyclopedia anyone can edit. Open source software lets anyone copy and improve code, including vital code the Internet runs on. These open movements deliver huge value through **letting people observe and use information**. However, in practice, communities oriented to openness can exclude people, failing to deliver the benefits of full, inclusive participation by diverse people. Extending inclusive and positive participation is part of beneficial Internet openness.

So, what do we need to enable open communities online?

A more global, diverse, and inclusive Internet has impacts more people care about. Offline, communities have shared resources and rules for cooperation. Online, though most people use the Internet in creative, beneficial or benign ways, some behave in ways that exclude, harm, or present real risks to other people. These harms can challenge Internet openness, as can responses by businesses or governments. Bad behaviour deters participation, bad rules may block it entirely. Despite these challenges, we are optimistic about an inclusive vision of Internet openness, which meets the needs of people and communities online, while preserving the value of openness for technical connections and innovations.

The Internet should be open for people to observe, participate, and innovate

Under our draft definition the elements of Internet openness let people observe its operation, participate positively, and innovate to share new benefits. We think these elements of openness should apply to the **core Internet infrastructure** of Internet technologies, architecture, governance, and markets for connectivity.

To address the needs of the next decade, we think openness also needs to consider major **online services** which structure the ways people use the Internet. Under our draft definition:

> **Internet openness means enabling people to observe, participate, and innovate, on both the core Internet infrastructure and major online services.**

We can ask whether Internet infrastructure and services are working to realise these elements of Internet openness, as we set out below.

Open for people to observe

- Core Internet technologies should operate in ways that anyone can understand, for example protocols should be openly published and shared
- Decisions and institutions for the Internet should be transparent and inclusive, so anyone can see how decisions are made, why, and by who

Open for people to participate

- Anyone should be able to connect to and through the Internet
- People should be able to use the Internet without facing interference or attacks
- Internet services and markets should offer people real and positive choices

Open for people to innovate

- Internet technologies should be designed to allow for new uses
- Anyone should be able to build on Internet protocols and infrastructure
- Large online services should support effective exit rights and interoperability

Unpacking the concept of Internet openness

Internet openness is part of how the Internet has developed, and how it can continue to evolve in ways that benefit people. But in order to understand what we need from Internet openness in the future, we need to understand:

- what the challenges to openness are
- what the Internet is, and what it does.

Below, we highlight key changes and challenges for Internet openness, and the tools we will use to unpack its elements and decide what to carry with us.

We need to address changes and challenges to the Internet

A bigger Internet: more people are online

When InternetNZ was founded in 1995, about 12,000 connections got about 80,000 New Zealanders online.[3] Now, New Zealanders have 1.9 million fixed connections, and 4.9 million mobile devices, and the Internet reaches 97% of New Zealanders at least once a week.[4,5] Globally, the Internet has grown to reach more than half the world's population, with 4 billion people owning a smartphone.[6,7]

A broader Internet: innovation lets people do more online

The Internet has enabled new services which change the way people communicate. Letters and phone calls have been overtaken by email, video calling, social media, and online chat. Rather than use local networks for phone calls or messages, people are increasingly communicating through the Internet. Over 80% of adult New Zealanders have a smartphone.[8] Of those with smartphones, over 80% use an Internet-based messaging app such as WhatsApp, Signal, Line, WeChat, or Facebook Messenger.[9]

3 "New Zealand Official Yearbook 1996", https://www3.stats.govt.nz/New_Zealand_Official_Yearbooks/1996/NZOYB_1996.html.
4 "2018/19 Internet research | InternetNZ", https://internetnz.nz/2019-research.
5 "Internet service provider survey: 2018 | Stats NZ", https://www.stats.govt.nz/information-releases/internet-service-provider-survey-2018.
6 Mary Meeker, "Internet Trends 2019" https://www.bondcap.com/report/itr19.
7 "Benedict Evans, The end of mobile", https://www.ben-evans.com/benedictevans/2019/5/28/the-end-of-mobile.
8 RDC Mobile Industry Trends, p 47.
9 New Zealand Commerce Commission Mobile Market Study - Preliminary Findings, p 45.

A more centralised Internet: consolidation

Consolidation in Internet access, infrastructure, and services means that over time, fewer large businesses control more of the Internet.[10] Internet services include online platforms, which have become hugely successful as global advertising businesses and forums for people to interact. This fuels concerns about:

- **privacy impacts** due to business models, such as tracking people's behaviour to target advertising, and due to third party exploitation, such as Cambridge Analytica's abuse of Facebook developer tools[11]
- **a lack of choice and competition** driven by the **network effects** which apply when having lots of users or data can help a business to grow into and retain a dominant position.

Online harms and responses

The Internet can be used in ways that harm people both online and offline. People can suffer direct harms from online harassment and bullying, or from security risks like phishing targeting their assets or personal information. Harms can also be indirect. Globally, foreign governments and other actors have used social media to undermine democratic institutions and social cohesion. Governments have employed the Internet to surveil global communications. Extremist groups have used the Internet to spread their ideology, recruit people, and encourage acts of violence. Much of this harm is enabled or exacerbated by the impacts of information being pulled through online services, with algorithmic curation at global scale. Around the world, these harms are driving:

- **barriers to equal participation online**, as risks to privacy, security, and wellbeing deny some people the full benefits of the Internet
- **government regulatory responses**, with current and proposed regulations around the world that present potential threats to Internet openness
- **technologies shifting to encryption**, with concerns about online privacy and surveillance driving shifts to encrypt more Internet traffic and protocols.

10 "What Is Consolidation?" Internet Society 2019 Global Internet Report, https://future.internetsociety.org/2019/consolidation-in-the-internet-economy/.
11 InternetNZ, "Links and Thinks: A Cambridge Analytica Long Read" (March 2018), https://internetnz.nz/blog/links-and-thinks-cambridge-analytica-long-read.

We need to unpack the Internet: what it is, and what it does

What is the Internet? It is a mix of technologies and institutions with diverse and changing applications, so it is hard to sum up.[12] The first thing we want to get clear on is the difference between the core Internet infrastructure, and the online services this enables people to build and use. Below, we compare the Internet to the open ocean as both are great resources owned by no one, which connect people and cross boundaries, to bring both benefits and conflicts.[13]

Core Internet infrastructure: what the Internet is

Dictionaries define the Internet as a global network based on standardised protocols, which connects different networks around the world.[14,15] This is the capital "I" Internet, the core infrastructure which is unique and globally shared, so deserves a proper name. We can compare this core infrastructure to the water and currents which make up the ocean of the Internet.

Online services: what the Internet does

Today when people talk about the Internet, they are often talking about the services people see and use online. Websites and services like Facebook, Google search, YouTube, Wikipedia, WhatsApp, or PayPal are not the core Internet, but rely on its nature to work. As services, they have huge impacts on how people use the Internet. We can compare these services to ways people use the ocean, like companies which offer holiday cruises or transport goods internationally.

Where does Internet openness run out?

As indicated above, we think Internet openness is a vital concept for the core Internet infrastructure, and a useful one for thinking about how online services operate. But does it apply to everything touched by the Internet? We think there's a point where it runs out, just like the ocean, where people are engaging in activities that are not focused on the Internet and what it does. We are keen to hear from you where you think that line should be drawn.

12 E Krol and E Hoffman "FYI on 'What is the Internet?'", https://tools.ietf.org/html/rfc1462.
13 See Milton L Mueller Ruling the Root (MIT Press, 2009), referring to a poster at p 57
14 "Definition of internet | Dictionary.com" www.dictionary.com, https://www.dictionary.com/browse/internet.
15 "Internet | Definition of Internet in English by Oxford Dictionaries" Oxford Dictionaries | English, https://en.oxforddictionaries.com/definition/internet.

Unpacking openness: shared resources, shared impacts

Openness is a set of ideas about how systems benefit and impact people. We will use the ideas below to frame and evaluate Internet openness.

Unpacking the Internet as a global resource

Like the ocean, the Internet has resources that are shared globally such as the core TCP/IP protocols, and resources controlled by particular people such as submarine cables. These different parts can be managed by different groups of people and in different ways: as shared public goods, as spaces with controlled admission, or as a common pool needing community management to avoid overuse.[16,17,18,19] **Figure 2** on the next page summarises models for managing resources (in the off and online world) based on whether use of the resource reduces it, and whether it is easy or hard to control who uses it.[20,21,22]

16 George Friedman "The Internet and the Tragedy of the Commons" (4 January 2017) Geopolitical Futures, https://geopoliticalfutures.com/the-internet-and-the-tragedy-of-the-commons/.
17 Joseph Nye "Cyber Power" Belfer Center for Science and International Affairs, https://www.belfercenter.org/publication/cyber-power.
18 Mark Raymond "The Internet as a Global Commons?" [2012].
19 Elinor Ostrom "Beyond Markets and States: Polycentric Governance of Complex Economic Systems" (2010) 100 American Economic Review 641.
20 "Public and Private Goods / The Tragedy of the Commons | GEOG (EME) 432: Energy Policy", https://www.e-education.psu.edu/geog432/node/277.
21 C Dustin Becker and Elinor Ostrom "HUMAN ECOLOGY AND RESOURCE SUSTAINABILITY: The Importance of Institutional Diversity" (1995) 26 Annu Rev Ecol Syst 113.
22 Elinor Ostrom "Beyond Markets and States: Polycentric Governance of Complex Economic Systems" (2010) 100 American Economic Review 641.

Figure 2: Different resources have different management needs

	Use reduces the resource	Use preserves the resource	Use improves the resource
Hard to exclude users	**Common pool (shared use)** *Fisheries, forests, people's attention* **Benefits require responsible community management**	**Public goods (free for all)** *Climate, parks, social trust, Internet protocols* **Benefits require external resources**	**Open networks (share for all)** *Languages, open source, online discussion* **Benefits require wide participation**
Easy to exclude users	**Private goods (owned use)** *Your clothes, your devices cables, satellites* **Benefits require clear ownership and ways to transfer ownership**	**Toll goods (fee for admission)** *Cinemas, online subscriptions, patents, certifications* **Benefits require proportional fees, membership size, and overall value**	**Closed networks (share for some)** *Online advertising, app stores* **Benefits require avoiding lock-in**

Pulling together the resources that make up the open Internet

The Internet is a complicated mix of technologies and institutions built and used by people. It incorporates public goods, like the TCP/IP protocols, which deliver more benefits the more widely the people use them. Private goods are also vital for people's use of the Internet, depending on businesses that operate local and international networks, as we consider below. In our view, the common pool aspects of the Internet are most important for Internet openness in the next decade. Economists are familiar with the "tragedy of the commons", where shared resources lacking responsible management are destroyed by overuse or pollution.

As we explore below, we think that some of the most important challenges for Internet openness relate to reconciling local and community-based concerns with the global reach of Internet infrastructure and online services.

Core infrastructure: what the Internet is

Technology for open connections

Internet technologies connect people around the world and devices as diverse as watches, smartphones, cameras, air-conditioners and satellites. These core technologies operate in ways open to new uses over time, enabling a **general-purpose** Internet with **global reach**, made up of **reusable building blocks**. The Internet Society identifies these key properties for an Internet **open to innovation**.[23]

TCP/IP moves data packets

The most fundamental Internet technology is the **TCP/IP protocol suite**, which offers a general-purpose way for different networks to connect and share data.[24]

- **Internet protocol** breaks information into data packets labelled with a destination **Internet protocol (IP) address**, and finds a hop-by-hop path to get there across diverse networks and transmission technologies.[25]
- **Transmission control protocol (TCP)** connects through Internet protocol, handling retries and error correction for reliable communications.[26]

At a global scale, separate networks use **border gateway protocol (BGP)** to share information about which addresses they can reach.[27] Everything the Internet does is built on the open-ended transmission of packets through these protocols.

Domain names offer open addresses people can use

Domain names like **internetnz.nz** offer a separate system of names through the domain name system (DNS). Compared with IP addresses, which are long numbers that change often, domain names are more stable and easier for people to use.

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23 Internet Society, "How we see the Internet", https://future.internetsociety.org/2019/introduction/how-we-see-the-internet/.
24 Vinton G. Cerf, Robert E. Kahn, "A Protocol for Packet Network Intercommunication", IEEE Transactions on Communications, Vol. 22, No. 5, May 1974 pp. 637–648.
25 D Waitzman "Standard for the transmission of IP datagrams on avian carriers", https://tools.ietf.org/html/rfc1149.
26 J Postel "Transmission Control Protocol", https://tools.ietf.org/html/rfc793.
27 Susan Hares, Yakov Rekhter and Tony Li "A Border Gateway Protocol 4 (BGP-4)", https://tools.ietf.org/html/rfc4271.

Distributed protocols let people get information on their terms

Both Internet protocol and DNS work through recursive lookup. Devices using these protocols work like a bike courier on their first day, narrowing down the right destination by asking a series of questions like what street is the building on? What floor is that organisation? Which mailbox is that person's? This allows information about addresses to be local and distributed, supporting resilient connections which do not rely on a central authority, and respecting that people navigating connections might want to understand and control them.

Encryption for private connections on open networks

Internet protocols are not built for privacy. Encryption technologies enable privacy and security on the Internet, scrambling information mathematically so the intended recipient can unlock its meaning, but other people will struggle to. Over time, more Internet traffic is being encrypted, prompting debates about its benefits and downsides. For more, you can read our **papers about encryption**.[28]

Openness in the core Internet technologies

The core Internet protocols reflect strong **public good** and **network effect** aspects, where bringing more people online creates a better-connected world for all. Core Internet technologies have been developed openly, can be implemented by anyone, and build on the principle of **interoperability**, meaning they enable people to make their own decisions and use them in new ways.[29]

Connections anyone can use and learn about

Core Internet technologies are openly developed and shared, enabling anyone to learn how they work and build devices or systems that connect to or make use of them.

Connecting anyone to anyone without restriction

Internet technologies enable global connections without restrictions on who can reach who, and without interference in how communications are routed or encrypted.

28 "Encryption | InternetNZ", https://internetnz.nz/encryption.
29 Cory Doctorow "Interoperability: Fix the Internet, Not the Tech Companies" (11 July 2019) Electronic Frontier Foundation, https://www.eff.org/deeplinks/2019/07/interoperability-fix-internet-not-tech-companies.

Architecture for openness to change

Internet architecture describes the design principles that support highly scalable communication on the Internet.[30,31] It can be compared with physical architecture, which creates structures that are durable, usable, and beautiful.[32] Both physical and network architecture invents functional concepts that people get used to and take for granted: the idea of a corridor between rooms had to be invented.[33] There are similar design principles for the Internet, which may seem obvious, but are vital to allow for new uses over time.

Principles of Internet architecture allow for evolution

The Internet's core technologies are designed and developed primarily through openly shared **requests for comment (RFCs)** proposal documents.[34] RFC1122 and RFC1123 set out core design principles for a robust and evolving Internet.[35,36]

End-to-end: give users choices, not a set menu

The end-to-end principle gives control to users at each end of a network. Like sending a series of letters through the post, delivering information over a network takes time, and messages can get lost or damaged along the way. There are ways to make this more reliable, like requiring multiple copies to be sent, or calling back to confirm progress every time a message is handled, but doing so would make the network slower and more expensive for everyone using it. The end-to-end principle recognises that the people at the edge of the network are in the best position to efficiently manage sense-checks, retries, and security, because they know what they send, what they receive, and how important it is.[37] The network serves the users at the edge, rather than with traditional telecommunications networks, where the intelligence was in the network itself.

30 David Cheriton "Internet Architecture: Its Future and Why it Matters", https://www.sigcomm.org/sites/default/files/award-talks/cheriton-sigcomm03.pdf.
31 See W Brian Arthur "Path Dependence , Network Form , and Technological Change" (2000), which discusses railway gauges at p 18, and TCP/IP versus the OSI model at p 21.
32 See for example Bill Thayer, "Vitruvius on Architecture — Book I", http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Vitruvius/1*.html.
33 Judith Flanders The Making of Home (Atlantic Books Ltd, 2014), p 75.
34 Stephen D Crocker "Opinion | How the Internet Got Its Rules" The New York Times (6 April 2009), https://www.nytimes.com/2009/04/07/opinion/07crocker.html.
35 R Braden "RFC1122: Requirements for Internet Hosts - Communication Layers", https://tools.ietf.org/html/rfc1122.
36 R Braden "RFC1123: Requirements for Internet Hosts - Application and Support", https://tools.ietf.org/html/rfc1123#section-1.1.
37 Jerome H Saltzer, DP Reed and David D Clark "End-To-End Arguments in System Design" (1984) 2 ACM Trans Comput Syst 277.

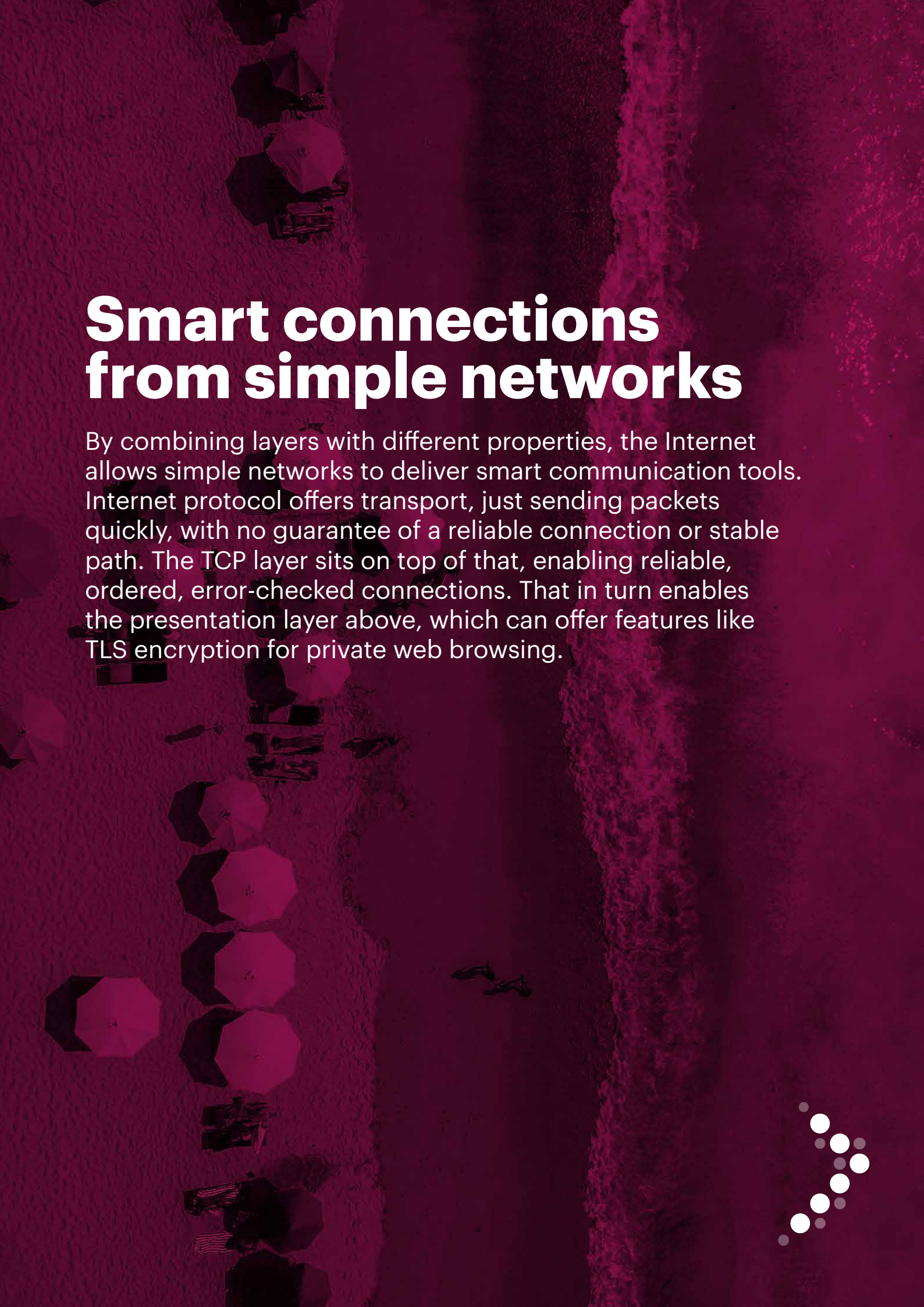
Robustness: eat what's on your plate, serve what others want

The robustness principle favours designs which work despite mistakes, attacks, and changes over time. Robust services and protocols reduce uncertainty by being open-minded and polite, accepting diverse and varied inputs, while sending consistent and predictable outputs.[38]

Layering: one job each

The principle of layering favours designs with functionally independent parts. A system where each part does one job each is easier to understand and improve, and over time can be far more reliable and adaptable.[39,40] It is also much more open to sustaining innovation at each layer than a complicatedly integrated design.

38 Summed up as "[b]e liberal in what you accept, and conservative in what you send", R Braden "RFC1122: Requirements for Internet Hosts - Communication Layers", https://tools.ietf.org/html/rfc1122.
39 Christopher Yoo "Modularity Theory and Internet Regulation" [2016] Faculty Scholarship at Penn Law, p 18.
40 Postel, Jon (1977), Comments on Internet Protocol and TCP, https://www.rfc-editor.org/ien/ien2.txt.



Smart connections from simple networks

By combining layers with different properties, the Internet allows simple networks to deliver smart communication tools. Internet protocol offers transport, just sending packets quickly, with no guarantee of a reliable connection or stable path. The TCP layer sits on top of that, enabling reliable, ordered, error-checked connections. That in turn enables the presentation layer above, which can offer features like TLS encryption for private web browsing.

Governance for open participation

Governance is about decisions, including who makes them and how they do so. But how can decisions for the global Internet reflect the full diversity of the people using it and the ways they do so? No one business, country, or even a body like the United Nations includes everyone the Internet affects.[41,42] The answer has been a principle of inclusion: **if none of us can make good decisions for the global Internet alone, maybe all of us should participate in these decisions**.

An open Internet needs inclusive institutions

Key Internet institutions operate under a multistakeholder model, which enables interested people to participate in decisions affecting the Internet:[43]

- The Internet Engineering Task Force (IETF) hosts the RFC process to develop Internet technologies and make decisions for its architecture, and is hosted by the Internet Society.
- ICANN operates the root nameservers at the heart of the Domain Name System (which were initially operated by the US government) and coordinates global policies for Internet naming and numbering systems.[44]
- The United Nations Internet Governance Forum, and the related national and regional initiatives such as New Zealand's NetHui, provide spaces where people who make a range of decisions which affect the Internet come together to share, learn from each other and connect to work together about Internet policy and issues.
- Regional Internet Registries (RIRs) manage allocation and registration of Internet addresses in a particular region of the world.[45]
- The Internet Architecture Board (IAB) guides high-level technical direction for development of the Internet, to ensure the Internet continues to grow and evolve as a platform for global communication and innovation.[46]

41 Milton L Mueller, Ruling the Root, (Link?), p 5.
42 "What if we all governed the Internet? Advancing multistakeholder participation in Internet governance - UNESCO Digital Library", https://unesdoc.unesco.org/ark:/48223/pf0000259717.
43 "Internet Governance - Why the Multistakeholder Approach Works" Internet Society, https://www.internetsociety.org/resources/doc/2016/internet-governance-why-the-multistakeholder-approach-works/.
44 J Postel "Newdom Archive, October 1, 1995 through December 31, 1995: A 'Proposal for an ISOC Role in DNS Name Space Management'" (18 August 2000), https://web.archive.org/web/20000818183301/http://www.iiia.org/lists/newdom/1995q4/0154.html.
45 "Number Resource Policy Manual", https://www.arin.net/participate/policy/nrpm/.
46 "Internet Architecture Board", https://www.iab.org/.

The multistakeholder model has broadened participation in key decisions, evolving from the history of the Internet developed and hosted by the US government. It has also ensured over time that those who take the time to know about the subject matter are influential in decision-making. This stands in contrast to diplomatic or multilateral approaches for governance. As the Internet grows even more inclusive and diverse, even multistakeholder approaches may need to change over time to ensure inclusion of important perspectives, and capacity to deliver responsive and responsible decisions.

Processes to include and enable people in decisions

The ideal of participatory decision-making for the Internet needs work to function in practice. A report by UNESCO identifies criteria for processes that support this ideal, addressing who is included (being inclusive, diverse and collaborative), how they are run (being transparent, flexible and equal), how they address risks to people (being private and safe), and how they relate to people impacted (being legitimate, accountable and responsive).[47]

Alongside that challenge, we also think that reconciling local and global aspects of decisions about the Internet is a key tension that needs to be considered in the next decade. For global aspects of the Internet, network effects can drive cycles of increasing growth. But for local communities, which depend on the trust, attention, and commitment of real people, global growth may come at a cost to these finite resources. While we do not have definitive answers, we think it is worthwhile to consider the design principles for effective community management of local resources, developed through the work of Elinor Ostrom and others.[48]

47 "What if we all governed the Internet? Advancing multistakeholder participation in Internet governance - UNESCO Digital Library", https://unesdoc.unesco.org/ark:/48223/pf0000259717.
48 Elinor Ostrom "Beyond Markets and States: Polycentric Governance of Complex Economic Systems" (2010) 100 American Economic Review 641.

These principles require:

1. **a clearly identified resource and users**, so people know who can use it
2. **balanced give & take**, so people only use more if they contribute more
3. **inclusive rulemaking**, so users are included in making rules
4. **monitoring of resource and users**, so problems can be noticed
5. **graduated sanctions**, which start low and increase
6. **conflict resolution**, which is low cost and local
7. **external recognition**, so governments and others support local control
8. **nested governance**, so decisions are made at the right scope and scale.

Having been developed for physical resources and local communities, these are probably not the principles we need to balance interests for the Internet. For example, local filters or monitoring may be turned against openness by states or businesses. Identifying a relevant community becomes difficult, when it might be one linked by common interests and globally dispersed rather than physical location. These principles are only a potential direction, and more work is needed to identify and reconcile the local and global decisions about Internet openness.

Markets for open access

To access and use the Internet, people generally rely on commercial devices and networks, from cell towers to optical fibres, exchange points, satellites, and undersea cables. Market competition drives investments that deliver and improve Internet access, but can also impact who can access these connections and how they are used. People rely on their local Internet service provider (ISP) for a connection, but also on international providers of connectivity, and increasingly on the commercial content-delivery networks (CDNs) that support efficient, fast data transfers and protect against some types of attacks that would otherwise block online services. Overseas examples show that market decisions can challenge Internet openness, for example by locking mobile users to phone networks.[49]

Internet markets reflect economic principles...

Public goods and core Internet protocols

Public goods are shared resources which offer benefits shared by many and exclude no-one, like sunlight or language. The Internet includes some public good aspects, like the core Internet protocols, which may not get enough investment if market decisions are the only way to invest resources.

Network effects

Network effects describe resources which become more useful to people when more people use them, like the Internet itself, and particular uses of it like social media platforms. When people's colleagues and friends want to be on the same network, popular networks grow even more popular.

49 Jon Brodkin "FCC lets Verizon lock cell phones to network for 60 days after activation" (26 June 2019) Ars Technica, https://arstechnica.com/tech-policy/2019/06/fcc-lets-verizon-lock-cell-phones-to-network-for-60-days-after-activation/.

Common pool resources

Common pool resources are shared resources which can be damaged by overuse, like fisheries or forests. We think this applies to aspects of the modern Internet. For example, healthy online communities need shared resources of social trust, which can be damaged by bad behaviour or polluted by spam.

...but Internet markets can work in particular ways

Vertical integration can challenge neutral networks

Business interests can drive an Internet service provider to favour traffic from its own services, or based on deals with third-parties, in ways that are not open to transparent inspection by competitors or people using those connections.

Consolidation can limit open choice and competition

Though the Internet was designed to be distributed and resilient, markets for global Internet connections are increasingly consolidated, with fewer businesses controlling higher proportions of Internet connections. These organisations are in a position to influence global Internet traffic, as demonstrated when mistakes by a single ISP or CDN cause broad impacts to services and people on the Internet.[50]

Are Internet markets working well for New Zealanders?

InternetNZ has advocated for competition and innovation in the access markets which serve our country. New Zealanders now benefit from government-supported and future-proof fibre access, and from structural separation of Telecom, which historically dominated our access markets. However, with more use of mobile networks for Internet access, and online delivery of content like the Rugby World Cup, we need to monitor relevant markets for challenges to Internet openness.

50 Jim Salter "The Internet broke today: Facebook, Verizon, and more see major outages" (3 July 2019) Ars Technica, https://arstechnica.com/information-technology/2019/07/facebook-cloudflare-microsoft-and-twitter-suffer-outages/.

Online services: what the Internet does

The Internet goes beyond infrastructure

The Internet's infrastructure is open to any use, but like a city's buildings and sewers, its technology, design and governance only matter if people actually use it. People can use the Internet in varied ways: browsing and building websites, writing and reading emails, playing games and checking earthquake sensors. Increasingly, the ways people use the Internet are enabled and shaped by **online services** like social media, search, app stores, online markets, and cloud computing platforms. These online services have become a major part of how people use and understand the Internet in New Zealand.[51]

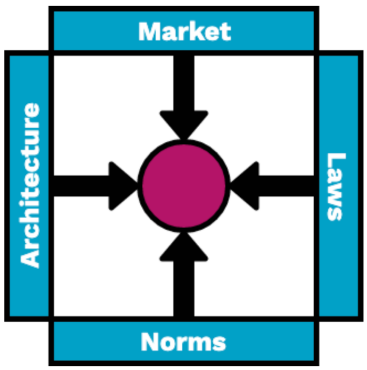
Online services provide architecture for people's choices

The most obvious bit of the Internet are the technologies that make it work, but the ways people build and use the Internet also depend on a range of other factors. We now have a world with influential online services, whose code structures the ways billions of people interact and access information online. One model of how these forces combine to influence behaviour is Dot Theory (see **Figure 3** below).

Figure 3: Dot Theory on the influence of laws, norms, markets and architecture

Dot theory describes four key forces that regulate people's interactions with and through technology: laws, norms, markets, and architecture.[52] Each influences people's behaviour by reinforcing expectations and offering different types of response:[53]

- **Laws** set formal rules and penalties
- **Norms** guide social praise and scorn
- **Markets** negotiate prices and products
- **Architecture** structures choices by changing what is practical.



51 See World Internet Project NZ, "Internet Trends in New Zealand 2007 - 2015" (2016), https://workresearch.aut.ac.nz
52 Lawrence Lessig, CODE 2.0, http://codev2.cc/download+remix/Lessig-Codev2.pdf, p 122-5.
53 Lessig, CODE 2.0, p 124.

Digital economics can favour dominant online services

By opening new ways for people to connect, the Internet enables new business models which may fall outside some conventional economic assumptions.[54] It is true that the popularity, profitability, and power of global online services is driven by people's choices. The economics of online services mean that popular past choices can put particular services in a position of power, due to the following:

- **Network effects favour dominance by the first and biggest online services**. People want to use the social network their friends use. Advertisers want to use popular platforms. This dynamic can favour powerful incumbents.[55]
- **The Internet enables growth in two-sided markets**. Online businesses can profit by connecting people with complementary interests, linking up people who have something and people who want it. There may be a physical world aspect, as with restaurant bookings, selling unwanted possessions online, and ride or house sharing. These two-sided markets can have strong network effects that drive growth.[56,57,58]
- **Markets in data can grow quickly and without physical constraints**. The largest online services are those which buy and sell information, enabled by:[59]
    - **global economies of scale**, because it costs relatively little to scale a data-brokering business from millions to billions of users.
    - **life-spanning economies of scope**, because behavioural data is often highly correlated across areas of life, meaning any data about a person has valuable applications to any prediction about them.

54 J Bauer and M Latzer, "The economics of the Internet: an overview" in Bauer and Latzer (eds), Handbook on the Economics of the Internet (Edward Elgar Publishing, 2016), p 3.
55 C Handke, P Stephan, R Towse, "Cultural economics and the Internet" in Bauer and Latzer (eds), Handbook on the Economics of the Internet (Edward Elgar Publishing, 2016), p 156.
56 "What Is Consolidation?" Internet Society 2019 Global Internet Report, https://future.internetsociety.org/2019/consolidation-in-the-internet-economy/.
57 David S Evans and others Platform Economics: Essays on Multi-Sided Businesses (ID 1974020 Social Science Research Network 2011).
58 C Handke, P Stephan, R Towse, "Cultural economics and the Internet" in Bauer and Latzer (eds), Handbook on the Economics of the Internet (Edward Elgar Publishing, 2016), p 155.
59 Andrew Bloomenthal "World's Top 10 Internet Companies" Investopedia, https://www.investopedia.com/articles/personal-finance/030415/worlds-top-10-internet-companies.asp.

Do online services control Internet use?

How web browsers influence our web experience

The web is the most visible online service. For most people, using the Internet means clicking the icon for Chrome, Firefox, Safari, Internet Explorer, or Edge. These are web browsers, the software which translates web protocols and code into pages and apps that people can use.[60] Browsers implement open standards for connection protocols (HTTP, HTTPS), content presentation (HTML, CSS), and code (JavaScript).[61] Browsers determine how people use and access the web, and this has been a focus of concern for decades.[62] For example, people who use browser extensions to block ads online were concerned by changes to the Chrome browser, which removed a feature that ad-blocking extensions relied on.[63]

How social media influences our information diets

Technologies offer options, and the design of those options can structure and influence the ways people behave and the choices they make.[64] Online services like search and social media are now central to most peoples' experience of the Internet. These services have become part of the social infrastructure which structures people's lives. Whether catching up with friends, organising events, or seeking news online, lots of people spend lots of time doing so through large online providers of search, social media, or video, whose technology then structures the advertisements and other information available to the people doing so. While in principle people can choose to avoid this influence, in practice that choice faces some barriers. Competing services may offer the same technology, but cannot offer the established social connections. Exporting your own data does not help you reach friends who stay with a service.

60 "What is a web browser?" Mozilla, https://www.mozilla.org/en-US/technology/what-is-a-browser/.
61 "The Web Standards Project: Mission", https://archive.webstandards.org/mission.html.
62 Aaron Gustafson "Our Work Here is Done - The Web Standards Project", https://www.webstandards.org/2013/03/01/our-work-here-is-done/index.html.
63 Kate O'Flaherty "Google Confirms Timeline For Controversial Ad Blocking Plans" Forbes, https://www.forbes.com/sites/kateoflahertyuk/2019/06/25/google-confirms-timeline-for-controversial-ad-blocking-plans/.
64 Niels ten Oever "Notes on networking standards and politics", https://tools.ietf.org/html/draft-irtf-hrpc-political-04.

Are open online services possible?

Open information and open source on the Internet

The Internet allows people to connect and share information globally, enabling new social and volunteer activities. One familiar example is Wikipedia, the online encyclopedia which anyone can use and contribute to, built collaboratively into a resource with 400 million articles in over 300 languages.[65] The open source model is a similar way of developing software, including much of the code the Internet runs on.

Though these are open information technologies and platforms, in practice they can form communities which are closed-off to some people and perspectives. Communities focused on openness deliver value through **letting people observe and use information,** but could do even more by extending inclusive and positive participation.

Lessons from online services

The value of Internet openness depends on being open to new choices and possibilities. Online services that are opt-in can still attain a dominant position, influencing how people use the Internet, access information, and participate in social life. Communities focused on open information and technology can still be closed to participation which reflects the full diversity of people now online.

We think delivering the value of Internet openness requires extending the ability for people to **observe** how they work, to **participate** as equals, and to **innovate** to major online services. Some of the most common concerns about online services reflect these elements of openness. A lack of transparency means people cannot **observe** the way online services operate. The business of monitoring behaviour and serving advertising can treat people as targets rather than letting them **participate**. Finally, enabling new **innovations** may be vital to balance the dominance of a few large global online services in how people use the Internet.

65 Wikipedia (2019) Wikipedia, https://en.wikipedia.org/w/index.php?title=Wikipedia&oldid=907533323.

We need the Internet to be open to observe, participate in & innovate on

We aimed to unpack and understand Internet openness for a more global, inclusive, and complicated Internet. Looking at the core infrastructure, we found design principles which we think support Internet openness, enabling people to observe how technologies work and decisions are made, to participate by connecting devices and joining communities, and to innovate by applying the open-ended nature of the Internet in new and beneficial ways.

Having discovered those principles at the core infrastructure, we explored how they apply to the most important ways people use and experience the Internet, including online services. In practice, people depend on commercial services to access open Internet connections, and on the communities they facilitate to fully benefit from them. We think aspects of Internet openness apply from the core to these communities.

> **Internet openness enables people to observe, participate, and innovate, on both the core Internet infrastructure and major online services.**

Open for people to observe

- Internet technologies are developed in the open.
- Decisions and institutions for the Internet are transparent and inclusive.

Open for people to participate in good faith

- Anyone can connect to and through the Internet.
- People can use the Internet without facing interference or attacks.
- Internet markets are open to people participating and choosing.

Open for people to innovate

- Internet technologies are open to new uses.
- Anyone can build on Internet protocols and infrastructure.
- Large online services support effective exit rights and interoperability.

We are opening up a discussion

To develop and test our ideas about Internet openness, we need an inclusive discussion. We invite you to join us in that discussion, and propose key questions below to guide it.

What does Internet openness need for the next decade?

1. **Does our draft definition capture the elements of Internet openness? What, if any, important aspects might be missing?**
2. **Should the idea of Internet openness be able to meet new challenges? Should it continue to address past concerns? How should it do so?**
3. **What do you see as the key challenges for Internet openness over the next decade?**
4. **Do you agree that the elements of Internet openness apply to online services as well as to core Internet infrastructure? Why?**

Join the conversation

Our goal is to open up a conversation, to help New Zealanders hear and share perspectives on what Internet openness means for the next decade. You can join that conversation, and help us refine our thinking. Does our definition identify the right elements? Does it go far enough? Our conversation on Internet openness will start with a discussion at **NetHui** in October 2019, and will continue from there. Below are some of the ways you can join the conversation, to help us understand what Internet openness means and needs for the next decade.

Join our online discussion

InternetNZ will be offering online ways for people to discuss our work and share ideas. Check out our website at **internetnz.nz**, where we'll be sharing how to join the conversation on Internet openness.

Email our policy team

We invite you to ask questions and share feedback directly with our policy team, by emailing **policy@internetnz.net.nz**.

We will be using your feedback

With this paper and the definition it proposes, we are starting a conversation. We will draw on the ideas and questions you share to inform our thinking, and develop our definition of what Internet openness requires.

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