SECOND CURVE INTERNET

superstructing today's internet for tomorrow

Almost a half-century ago, a few engineers laid the conceptual foundations for a highly disruptive communication system: an open, peer-to-peer network that could be independent of any centralized technology, commercial entity, or sovereign government. This concept evolved into what we currently think of as the internet: a complex, evolving platform for access to information, entertainment, computing, and people. This platform, in turn, has generated vast amounts of wealth, connected people around the world, spurred revolutions, extended the reach of criminals, and given governments and advertisers alike the tools to peer into the daily lives of people everywhere all the time. But today's platform is not actually *the* internet. It is merely one implementation—and some would say a distorted implementation—of the idea of an open, peer-to-peer network. As this First Curve Internet becomes increasingly flawed and vulnerable to collapse, perhaps now is the time to jump-start a new Second Curve Internet.

10YF
2014

THE FIRST CURVE INTERNET: STRATEGIES OF ENCLOSURE

From its launch in the early 1990s, the World Wide Web quickly became the face of the internet and a platform that organizations (almost as quickly) began to enclose in order to turn access into new economic value. People began to think of the internet as pages, domains, search engines, and storefronts. Governments began to think of it as infrastructure—a system of servers and clients, connected by the familiar pipelines of cable and cellular wireless services, all to be both regulated and subsidized under incumbent policies.

While innovators have leveraged the concepts of an open, peer-to-peer network to "tap the crowd" and create new efficiencies of scale and coordination, traditional business models and governance strategies have just as rapidly centralized key resources, building private platforms and walled gardens and applying what we might think of as incumbent First Curve strategies for what is fundamentally a Second Curve concept. The result? A global internet that is increasingly brittle, vulnerable to abuse by criminals and governments alike, and weakened in its ability to provide the open flows of information, innovation, and wealth that could help us address some of the world's most urgent social, economic, and environmental problems.

THE SECOND CURVE INTERNET: THE SEARCH FOR RESILIENCE

The original concept of an open, peer-to-peer-network emerged specifically as a strategy in the search for resilience in the face of global threats, and many of the nascent forms of socialstructing—from crowdfunding to the sharing economy, from social media to open publishing—build on this concept. Yet this resilience remains elusive in the First Curve Internet.

WHAT IF ...

we could superstruct today's internet to create a truly resilient Second Curve Internet?

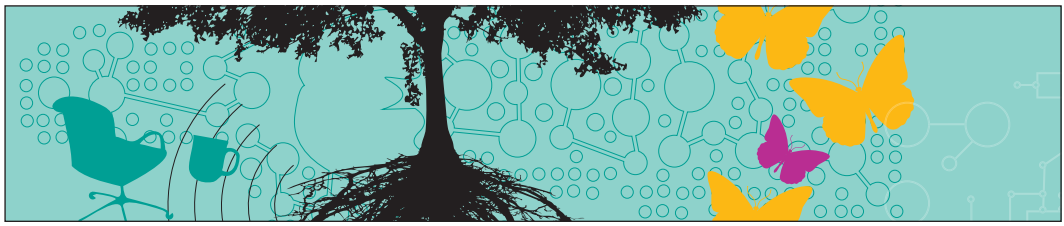
INSTITUTE FOR THE FUTURE

PROJECT

Jump-start a resilient Second Curve Internet that realizes the original vision of an **open, peer-to-peer network** while overcoming **present-day flaws** and adapting to an increasingly complex future of **networked matter**.

This project seeks to convene diverse stakeholders across four aspects of network design in a program of staged innovation with the following **core principles** (listed in bold below):

- **Technology:** The network can run over **diverse open channels**, including both present and future physical substrates such as fiber, radio spectrum, and not-yet-invented alternatives. **Secure transactions and communication at every node** assure security at the moment of transaction, with ability to shift security protocols and including multi-factor biometric identities. **Open source hardware and software,** with forking of code, designs, and ultimately matter, as well as robust mechanisms to test and validate critical code, provide rapid innovation in an open development community. **Easy-on networks** allow communities to quickly establish nodes and networks within the network, without recourse to a centralized structure of domains. **Parallel testbeds** create prototype internets without jeopardizing any unified system. The vision of **no single point of failure** guides all design.
- **Applications:** **Decentralized discovery** guarantees that the resources of the internet are searchable and accessible without recourse to a centralized platform. **Sandboxing** assures that devices such as smart cars, robots, and instrumented buildings can be isolated to avoid catastrophic hacking.
- **Engagement:** Communities define standards of behavior and monitor compliance as the condition for **reputation-based access**. **Algorithmic transparency** reveals the social and material implications of participation. **Trusted transactions** are provided by a chain of trust that cannot be sole-sourced. **Commons-based digital rights management** assures access to internet resources (including computation, data, and matter), subject to well-defined rules for **non-enclosable commons**. A no-monopoly rule governs access to the foundational technologies to provide **competitive access**. **Open standards for terms and conditions** help users (human and non-human) quickly recognize, understand, and situationally accept or reject sets of terms and conditions for engagement.
- **Governance:** **Digital civil rights** are based on three principles: Own my personal data. Use my data only with my informed consent. Explicit permission is required for all secondary uses of my data. **Transboundary governance** is achieved through coordinated policy practices across stakeholder communities.



IFTF

As the material of daily life begins to interact through internet protocols, this project asks: How can we stage future internet innovation to assure a network—indeed a connected material world—that is as resilient as it is essential to the planet's well-being?

TIMELINE OF TRANSFORMATION

a scenario of milestones

2014
PROJECT LAUNCH

The project begins with a proposal to the crowd—a statement of the problem and a call to action using a crowdsourcing platform to create a Digital Citizenship Bill of Rights that recognizes both human and non-human citizens.

2015
EARLY DESIGNS

Tackling the most pressing problems first, a series of open design studios engage computer scientists, materials engineers, biotechnologists, entrepreneurs, environmentalists, and legal experts in blueprinting solutions to everything from distributed discovery to open standards for terms-of-service agreements and easy-on networks of people, things, and matter.

2015
FORKING THE CODE

A series of hacker studios launch development efforts for the initial blueprints, with teams of citizen programmers competing to find the most robust solutions to the critical design requirements.

2016
THE DARKNET TEAM

Darknet users are enlisted to test early designs in a protected and parallel network of committed friend-to-friend (F2F) users, documenting a set of protocols for more extended development and testing of parallel mesh networks.

2017
SANDBOXES OF SECURITY

Industry-by-industry workshops define the requirements for sandboxing systems (such as self-driving automobiles or medical devices) as they connect to the larger internet.

2017
NEW BUSINESS PROTOTYPES

MBA students from 10 well-regarded programs around the world are tasked with designing business models that explicitly incorporate the core principles of the Second Curve Internet, from the technical layer through the engagement layer.

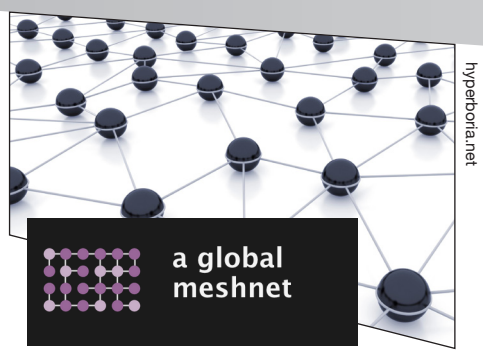
2018
ENGAGED ECONOMY OF THINGS

Complex simulations model the emergent Second Curve Internet to anticipate the economic opportunities and risks of various innovations in the technical, applications, engagement, and governance layers.

2019
PARALLEL POLICY

A set of policy guidelines, informed by practices in parallel networks, leads to the establishment of a new internet governance structure.

SIGNALS



hyperboria.net

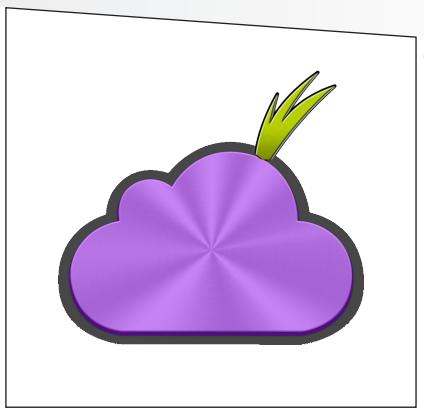
PROJECT MESHNET SEEKS TO CREATE AN ALTERNATIVE INTERNET

Tapping technologies that support the darknet, Project Meshnet is working to build-out a network called Hyperboria: a global decentralized network of nodes running the cjdns networking protocol that is designed for easy-on, scalable, and secure networks.

RESET THE NET CALLS FOR CROWD-BASED ACTS OF PRIVACY PROTECTION

Reset the Net is one of the growing number of online movements calling for participatory action to respond to government surveillance of internet communications. It is rallying application developers to enhance software security, implement NSA-resistant privacy tools, and join a social media protest of online surveillance.

resetthenet.org



github.com/Miserlou/OnionCloud

ONIONCLOUD SUPPORTS DARKNET-STYLE ANONYMOUS WEB SERVICES

OnionCloud is a software service that would allow single-command deployment of anonymous web services, enabling any node in the network to support anonymous communication and services to vetted members of a "marketplace."

VOICES OF CHANGE

Dewayne Hendricks
Tetherless Access

"The challenges ahead to achieve a Second Curve Internet are many. Chief among them is learning to deal with technologies, which allow us to implement a world no longer based on scarcity, but upon abundance. As an example, for over a hundred years, we've managed the radio spectrum as if it were a scarce resource, which we're constantly in danger of running out of. We've carved up the spectrum into little channels and we fight over them constantly.

"Moving into the Second Curve Internet, we'll come to the realization that we can treat the radio spectrum as an open commons, where new wireless devices are deployed which are designed with that notion of abundance at their heart."

–Personal correspondence

David P. Reed
MIT Media Lab

"The internet is an abstract noun, not a physical thing. It is not a frequency band or a 'service' that should be regulated by one of the service-specific offices of the FCC. It is not a 'product' that is 'provided' by a provider. The internet is itself, and it includes and is defined by those who have used it, those who are using it, and those who will continue to use it."

–dpr blog post, 2013

THE BIG SHIFT

engagement with networked matter

The opportunities for creating new value from open flows of the material components of our daily lives, in scales that range from the microbe to the planet, are almost beyond imagination. And yet that is the imagination we will tap in the coming decade to create a truly resilient Second Curve Internet, in which social networks engage with biological networks, and networks of things engage with networks of information.

As we begin to understand the dimensions of this transformation, we will confront a basic dilemma. Openness is a driving force of expanded engagement in a scale-free Second Curve economy. Yet our business models, and indeed our global economy, are built primarily on First Curve principles of enclosure: of laying claim to a resource, setting up boundaries around it, and charging fees for rights to access it. The next decade, then, will be a period of prototyping alternative business models and reinventing the global economy to promote our human vitality and prosperity while securing both our human safety and the viability of our biosphere. The project to jump-start a Second Curve Internet is nothing less than a bold intention to grapple with both the opportunity and the risks of this vision.

IN TEN YEARS, WE MIGHT EXPECT TO SEE:

- **An engaged economy of things** that rewards participation with a diversity of node-appropriate benefits, from information to energy, materials, and security. The internet has created new flows of value by diversifying the rewards of engagement. The engaged economy of things is likely to further extend this diversity.
- **Scale-free open services** that allow us to use generic protocols to interact with natural and artificial intelligence across scales from data and molecules to devices, people, households, cities, and even large biological networks, such as watersheds.
- **Second Curve digital rights management** (DRM) that distributes rights for optimum point-of-use ownership and control. As implanted medical devices and self-driving cars join the internet conversation, new Second Curve models will emerge to reward human and non-human contributions while reserving control for those most directly affected. Think of it as user-defined digital rights management.
- **Systems visualization frameworks** that make it easy for humans to navigate and discover the resources of a much more complex internet—visualizations that make the choices (and their consequences) more apparent. Designing for transparency becomes the mantra.

THE CHALLENGES?

Although there will be technical challenges in assuring the security of a Second Curve Internet and the material world that depends on it, equal challenges will emerge from incumbent business models and policies that still depend on the First Curve Internet. Long-term trade agreements that lock in existing DRM strategies, a vast backlog of terms-of-service agreements that may obligate users for decades, and policy that draws on precedents for a system which has no precedent are just the most obvious. As we create abundant new flows of value, how do we gracefully dismantle the structures that block these flows?

WHAT IT MEANS FOR ...

INFRASTRUCTURE: HUBS OF INFORMATION, ENERGY, AND MATERIAL

The vision of the Second Curve Internet is one in which both every*one* and every*thing* is a node in the network. And further, every node has the ability not only to relay data, but also to process it. This is a vision of truly distributed information and computing. In such scale-free networks, hubs emerge as some nodes preferentially attach to others. In this sense, a hub of nodes may come to organize a city or a service or a household, each using a different mix of flows of information, energy, human activity, and material production. In the same way that roads have organized flows of not just cars but newspapers, fuel, and manufactured goods, the Second Curve Internet will organize flows to create a dynamic, continuously-reconfigured infrastructure of life on the planet.

Of course, a key material underpinning of this newly imagined infrastructure is the continued decline in cost and size of the processors, including—eventually—the ability to program molecules of living matter as dedicated node processors.

ECONOMIES: SELF-ORGANIZING ABUNDANCE

The First Curve Internet has produced an abundance of information and continues to do so at staggering growth rates. Abundance tends to disrupt markets that are based on relative scarcity, and so we've seen challenges to traditional publishing models, educational models, and information-based products, such as software and media.

The Second Curve Internet will produce an abundance of material goods. Not only will inspired DIY makers start using 3D printers to make objects out of everything (from carbon fiber to fiberglass, concrete, and Kevlar), we might also reasonably expect, within the next decade, to begin to see long-anticipated nanoscale machines that can replicate themselves and manufacture materials from the molecule up. If these machines are organized by the Second Curve Internet, with the kind of edge-growth that open, peer-to-peer systems tend to produce, the result is likely to be vast new self-organizing commons of material goods and the systems to produce them.

It will take decades to for this level of abundance to reorganize our social and economic institutions, but the choices we make about internet architectures and policies may determine our ability to tap this abundance for centuries to come.

POLICY: DISTRIBUTED GOVERNANCE

And so we come to policy. Over the next decade, and especially over the next five years, policy choices will focus on strategies to save the First Curve Internet in the face of security threats of all kinds and at all levels. Government and commercial intrusions into privacy will vie for our attention with vulnerabilities in our hardware and software that allow government agencies and criminals alike to access our information, our money, and our even our intentions. "Greater good" arguments will collide with individual privacy rights.

Perhaps the most important policy choice we make over the next decade is where governance should reside. Does it make sense, in a radically distributed internet, for a handful of central governing institutions (either independent organizations or governments) to control it? Or would it make more sense to design governance into the nodes, creating processes for them to negotiate their own governing rules, and aggregating those rules into new "islands" with distinctive forms of governance?