

# NEXT GENERATION INTERNET



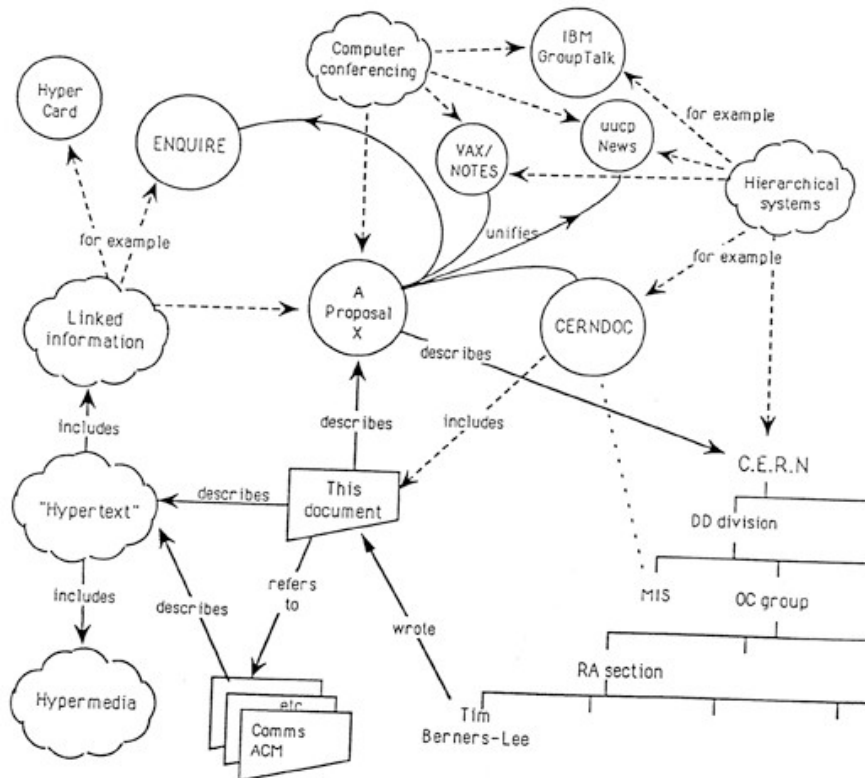
## NGI0: Come work for the internet

**NGI Forum, Helsinki, September 2019** Michiel Leenaars



## Abstract

**Keywords:** Hypertext, Computer conferencing, Document retrieval, Information management, Project control



... the world wide web was still a  
“vague but interesting” proposal  
inside CERN to manage  
information

... Stichting NLnet formally became a legal entity (a foundation), in an effort to scale up the adoption of the early internet in Europe (after 7 years of informal operations)  
... and it caught on

# “From utopia to dystopia in just 29 [30] short years”



“We demonstrated that the Web had failed instead of served humanity, as it was supposed to have done, and failed in many places.

The increasing centralization of the Web ended up producing—with no deliberate action of the people who designed the platform—a large-scale emergent phenomenon which is anti-human.”

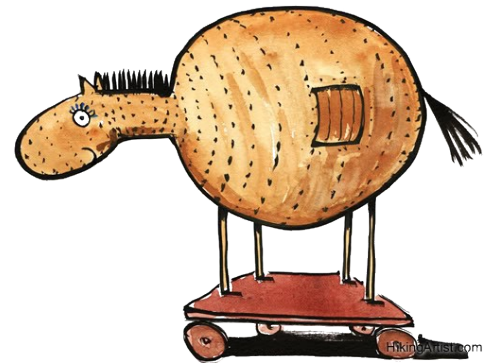
**Tim Berners-Lee**

# Problematic to the core

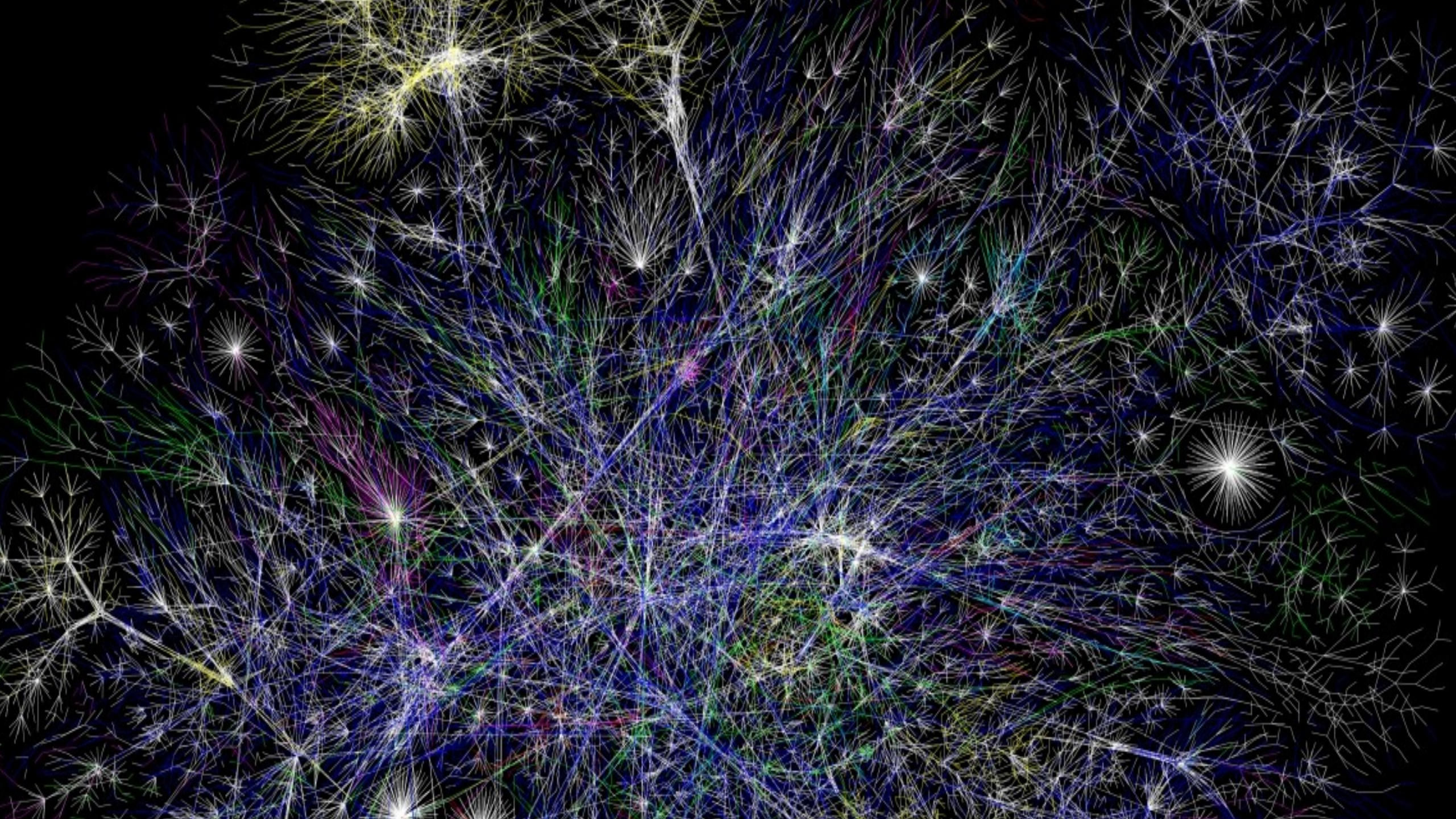
"The NSA has built an infrastructure that allows it to intercept almost everything. With this capability, the vast majority of human communications are automatically ingested without targeting."



Whistleblower Edward Snowden  
[Interview in The Guardian, 2013](#)









TODAY WE CREATE THE  
**INTERNET**  
OF TOMORROW



## An internet of human values

Resilient. Transparent. Sustainable.

The overall mission of the Next Generation Internet initiative is to re-imagine and re-engineer the Internet for the next generation. We envision the information age will be an era that brings out the best in all of us. We want to enable human potential and creativity at the largest possible scale – while dealing responsibly with our natural resources. In order to preserve and expand the European way of life, we shape a value-centric, human and inclusive Internet for all.

These ambitions need a solid foundation to become actual reality in the Next Generation Internet. A major way to enhance and control our digital lives is embedded in concrete, circling in space and time. The Next Generation Internet has to be a network where companies or parts of the network go down, the rest of us should be close to zero.

There is another important dimension to this: a **transparent** technological environment, where policies structure how entire societies and individuals speak and private enterprise and much more avoid any bias or systematic abuse of global resources, rising above international politics and competition, strengthen the health and autonomy of our societies.

The enduring success of the Internet lies in permission-free innovation, openness and interoperability. The Next Generation Internet is set up to create wider choice. It fosters diversity and decentralisation, and grows the potential for disruptive innovation. This extends far beyond the technical realm. The Next Generation Internet will achieve a **sustainably open** environment for our cultures and economies, celebrating our values and promoting creativity and well-being.

Let's re-invent Internet to reach the full human potential, for all generations.



**NGI Study**  
**NGI Vision**

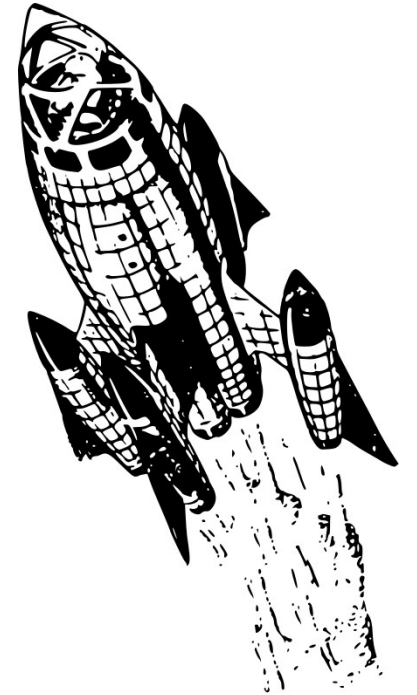


“The overall mission of the Next Generation Internet initiative is to re-imagine and re-engineer the Internet for the third millennium and beyond. **We envision the information age will be an era that brings out the best in all of us.** We want to enable human potential and creativity at the largest possible scale. In order to preserve and expand the European way of life, we shape a value-centric, human and inclusive Internet for all.”

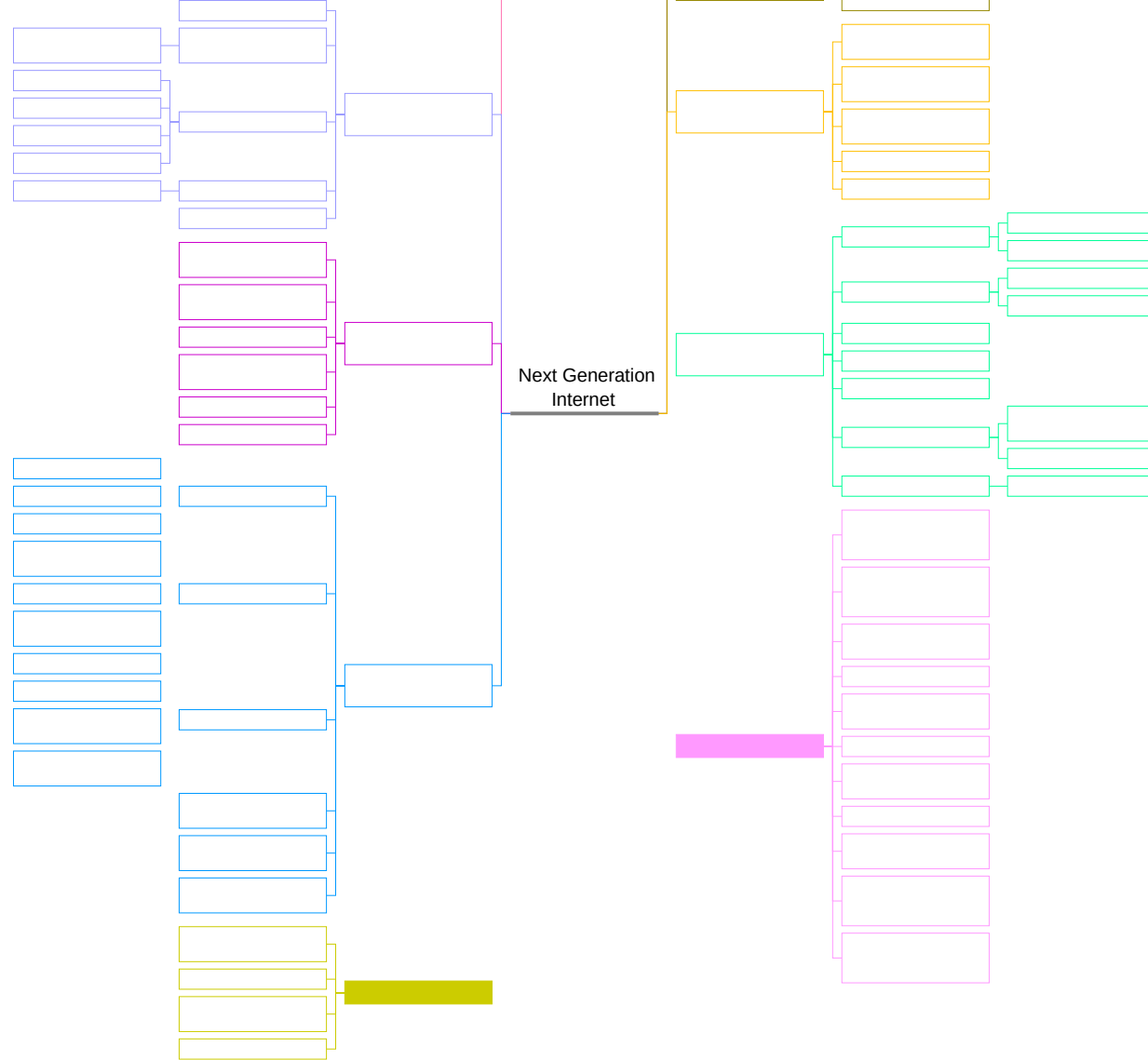


# NGI is a moonshot ++ effort

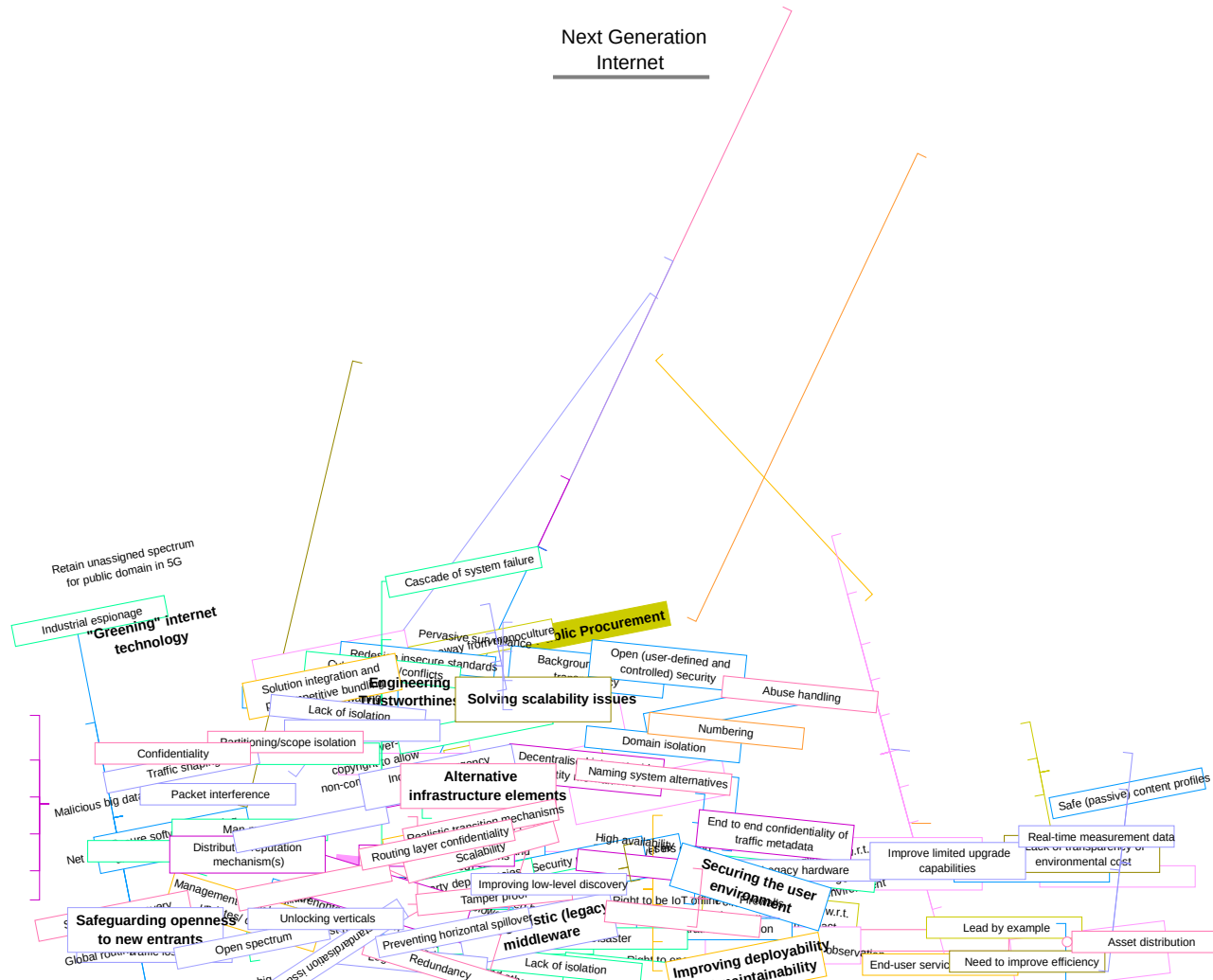
- The internet is the **largest** and **most pervasive** technical construct ever made by humans
- And we need to change it with almost 4 billion people 'on board', on a shoe string budget
- High political stakes. High economic stakes. Highly critical users users. Overloaded with expectations. From everybody.
- Work consistent and forward-thinking.  
**No time to lose.**







## Next Generation Internet







**RIPE NCC**  
RIPE NETWORK COORDINATION CENTRE



**W3C**<sup>®</sup>



**fsfe**



**eco**



**DIGITALEUROPE**



**Internet  
Society**

**The larger ecosystem**



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These ambitions need a solid foundation to build on. The legendary robustness of the Internet must become actual reality in the Next Generation Internet. A massive global fleet of connected devices is on its way to enhance and control our homes, factories, offices and vehicles. Technology is embedded in concrete, circling in space and is increasingly entering the intimacy of our human bodies. The Next Generation Internet has to be highly adaptive and **resilient**. Whatever parts of the network go down by some natural or other disaster, the effects on the

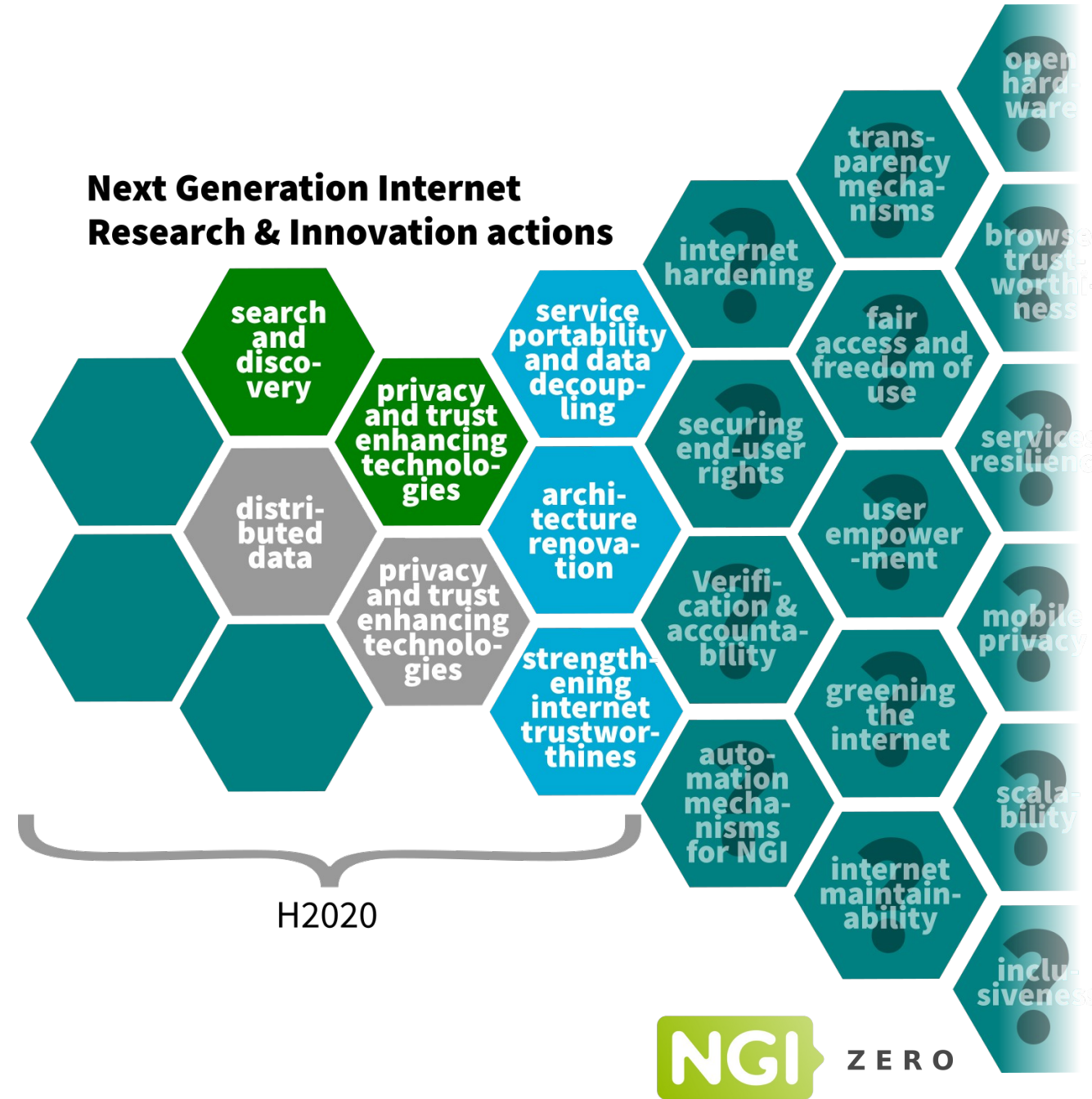
Each project has to be aligned with the key NGI pillars. These represent the European social and cultural values and long term economic interests:

- Resilience
- Transparent
- Sustainably open





Z E R O









5.6 million euro  
in small grants  
until 2021

**43 active  
projects already  
running**

**> 90% new to  
H2020**

Competitive calls every  
**two months** until the  
budget is allocated.

Projects between 5k-50k  
Follow-up possible

**Walk the talk:**

Inclusion

Security

Localisation

Open Standards

Free & Open Source

Deliver to deploy



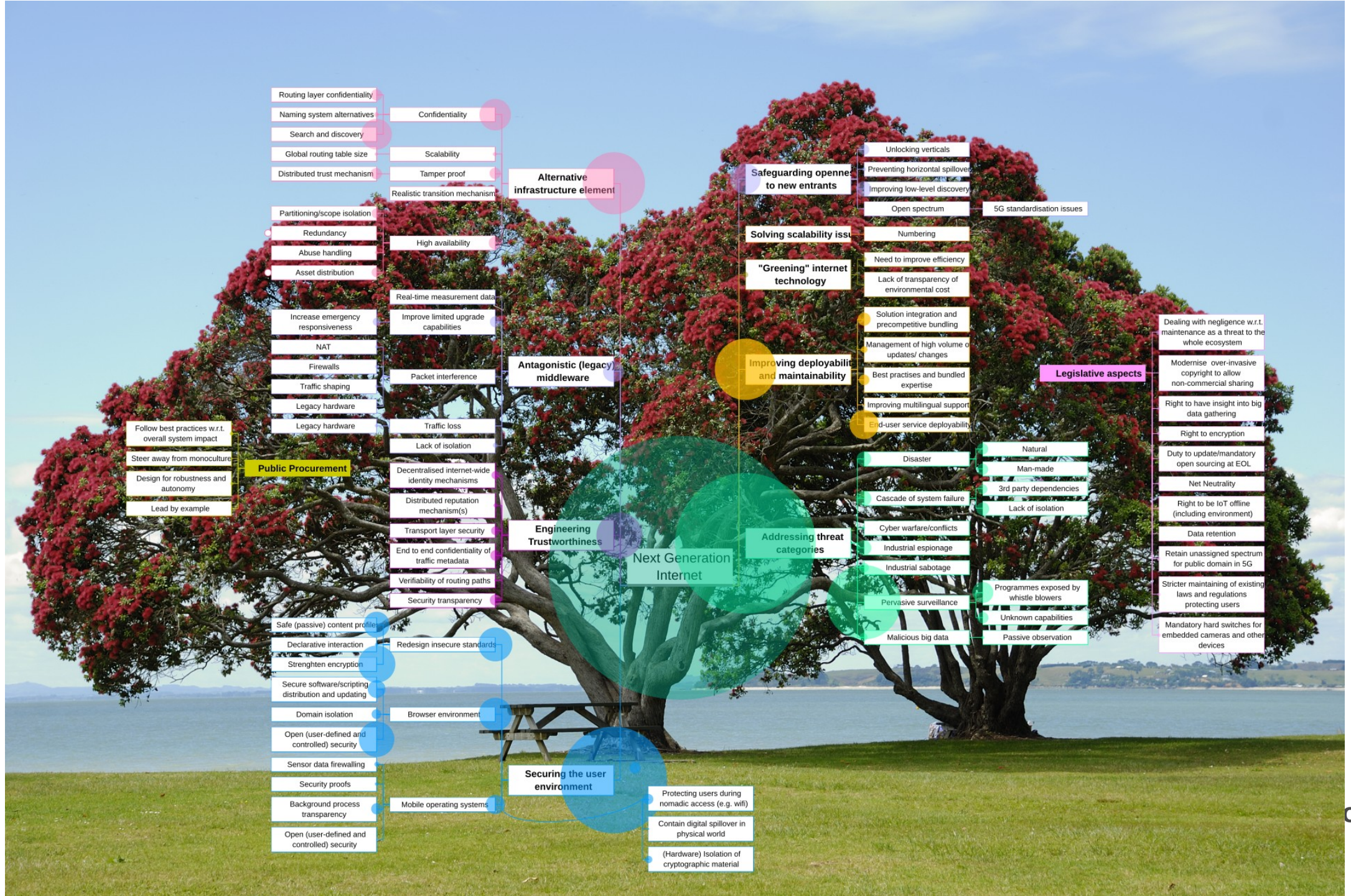
5.6 million euro  
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**69 active  
projects already  
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## Key characteristics









# Privacy and Trust Enhancing Technologies

Increasing the trustworthiness and privacy of the technology we depend on



# 69 projects ongoing in 22 countries



[ 5G ] [ AccessControl ] [ Accountability ] [ ActivityPub ] [ Android ] [ Anonymity ]  
[ AttributeBasedAuthentication ] [ Attributes ] [ AuditTrail ] [ Auditability ] [ Backup ] [ BinarySeed ]  
[ Biometric ] [ Blockchain ] [ Bootstrap ] [ Browser ] [ CMS ] [ Classification ] [ Client-side ]  
[ ClientSideEncryption ] [ Clientside ] [ CodeGeneration ] [ Collaboration ] [ CommunitySetup ]  
[ Configuration ] [ Cross-Device ] [ Cross-Implementation ] [ Cryptography ] [ DAT ] [ DCnet ]  
[ DNS-over-TLS ] [ DNSSEC ] [ Data ] [ Datastore ] [ Deanonimisation ] [ Decentralised ]  
[ Deepfake ] [ Desktop ] [ DesktopOS ] [ Device ] [ E-mail ] [ E2E ] [ ENUM ] [ EdgeComputing ]  
[ Education ] [ EmbeddedSystems ] [ Encryption ] [ Federation ] [ FiatCurrencies ]  
[ Fingerprinting ] [ Firmware ] [ FormalProofs ] [ FormalVerification ] [ Framework ]  
[ Fundamental ] [ GDPR ] [ Geo-localisation ] [ HSM ] [ Hardware ] [ IETF ] [ IRTF ]  
[ IdentityBasedEncryption ] [ IdentityManagement ] [ ImageProcessing ] [ InclusiveDesign ]  
[ InformationQuality ] [ InstantMessaging ] [ Interoperability ] [ KSK ] [ Kernel ] [ Key-Recovery ]  
[ KeyManagement ] [ Live-Distro ] [ ML ] [ MachineReadability ] [ MalwareAnalysis ] [ Messaging ]  
[ Metadata ] [ Middleware ] [ Minimisation ] [ Misinformation ] [ Mixnet ] [ Mobile ] [ MobileApp ]  
[ MobileInfrastructure ] [ MobileOS ] [ Modularity ] [ Monitoring ] [ MultiPartyComputation ]  
[ Notary ] [ OSM ] [ Observability ] [ Offgrid ] [ OnionRouting ] [ Online ] [ Ontology ] [ OpenData ]  
[ OpenHardware ] [ OpenSource ] [ OperatingSystem ] [ P2P ] [ PGP ] [ PKI ] [ POSIX ]  
[ PasswordStore ] [ Payment ] [ PersonalServer ] [ Policy ] [ Portal ] [ Post-Quantum ] [ Privacy ]  
[ PrivacyScore ] [ PrivacySettings ] [ ProfileManagement ] [ Profiling ] [ Protocol ]  
[ QuantumNetworking ] [ Real-time ] [ Recovery ] [ Refactoring ] [ Reproducibility ] [ Reputation ]  
[ Resume ] [ Revocation ] [ Risk-V ] [ SASL ] [ SaaS ] [ Scanning ] [ Security ] [ Self-SovereignIdentity ]  
[ SelfSovereignIdentity ] [ Selfhosted ] [ Selfhosting ] [ Sensors ] [ SocialNetworking ]  
[ SocialProtest ] [ Solid ] [ StandardSetting ] [ SystemsProgramming ] [ TLD ] [ TLS ] [ Tamper-  
proof ] [ TextEditor ] [ Transparency ] [ Trust ] [ TrustDelegation ] [ Trustmark ] [ UI ] [ UX ] [ Usability ]  
[ VPN ] [ Videocalling ] [ VisualPrivacy ] [ Visualisation ] [ Voicecalling ] [ Voting ] [ W3C ] [ WebRTC ]  
[ Webserver ] [ XMPP ] [ ZeroKnowledgeProof ] [ e-healthcare ] [ iOS ]

# Different layers of trust

- New **end user applications** bringing Privacy and Trust to users
  - Conversations, Sylk, Briar, Autocrypt, Cryptpad, Manyverse, Wireguard client, Katzenpost, Ricochet Refreshed
- Human-centric middleware/**Enablers**:
  - IRMA, node-TOR, ValOS, Rocket CWMP, SCIM, ARPA2 ACL/SASL, dhcpanon, Solid Data workers, Offen, PowerDNS/DNSdist, Robur DNS, Web Shell
- OS level improvements, **alternative** OS-es and integration
  - Replicant OS, Mobile Nixos, Qubes, Spectrum, Wireguard, Reproducible Builds
- New **standards** and **protocols** to solve critical issues under the hood
  - DID\*, GNU Name System\*, IMSI Pseudonymisation, TLS-KDH, SASL XMSS, Reowolf

# Different layers of trust

- Technical and fundamental **building blocks** for trustworthiness and security assessment
  - e.g. Verifpal, Libre-RISCV SoC, IMSI pseudonymisation, Identity Based Encryption, Tor Padding, GNU Mes, Etesync, Vita, Opaque Sphinx, OpenPGP CA, F-Droid tracking the trackers, GNU Taler, Virtualising device firmware
- Open **Hardware** and physical isolation
  - Nitrokey, Betrustrusted, ZsipOS, Zerocat Chipflasher, Mega65 Phone
- **Explorative**
  - Distributed private trust, ValOS, Vframe





## **Search and Discovery**

The very fabric of sharing

## 43 projects ongoing in 17 countries



[ AI] [ AR] [ ActivityPub] [ Agents] [ Annotation] [ Archiving] [ Art]  
[ Attribution] [ AugmentedReality] [ Automation] [ Blockchain]  
[ BrowserPlugin] [ CMS] [ CPU] [ CVE] [ Citations] [ Collaboration]  
[ Contacts] [ Crawling] [ CreativeCommons] [ Crowdfunding]  
[ Cryptocurrency] [ Cryptowallet] [ DANE] [ DAT] [ DHT] [ DNS]  
[ DataPlacement] [ Dataset] [ Decentralised] [ Discoverability]  
[ Discovery] [ Education] [ Environment] [ EventTickets]  
[ Federation] [ FraudPrevention] [ GDPR] [ Geo-localisation]  
[ Graph] [ Hardware] [ IETF] [ IPFS] [ Indexing] [ InformationQuality]  
[ KeyExchange] [ LocalContent] [ LocalSearch] [ MachineLearning] [   
Malware] [ Measurement] [ MetaSearch] [ Metadata] [ Metasearch]  
[ Middleware] [ Misinformation] [ Mobile] [ Monitoring]  
[ Multimedia] [ NamingSystem] [ OSM] [ Obfuscation] [ Offchain]  
[ OpenAccess] [ OpenData] [ OpenHardware] [ OrganisationID]  
[ Overlay] [ P2P] [ PKI] [ PeerEndorsement] [ PersonalArchive]  
[ PersonalSearch] [ Policy] [ Provenance] [ Proxy] [ QuantifiedSelf]  
[ Recycling] [ Routing] [ Scraping] [ SearchData] [ SecurityUpdates]  
[ Self-hosted] [ SemanticWeb] [ Services] [ SocialNetworking]  
[ Software] [ Spyware] [ Study] [ TextEditor] [ TextMining] [ Traffic]  
[ UI] [ UX] [ Video] [ Visualisation] [ VoiceAssistants] [ Webmention] [   
Workflow][ e-Payments] [ education]

# Discovery is everywhere...

- End user applications
  - Searx, Plaudit, Blink RELOAD, Sonar, El Repo, Transparency Toolkit, CoinDiscovery, Peertube, Explain, Search and Displace, Discourse, Mailpile, Lizard, Mynij
- Technical building blocks
  - GNU Name System, Software Vulnerability Discovery, IPFS Search, DID Resolver/Registrar, Variation Graph, Neuropil, P2PCollab
- Community infrastructure
  - StreetComplete, Fediverse.Space, SCION Geotagging, DeltaBot, In Common, SCION-SWARM, Fediverse Space, PoliFLW, WebXRay, OpenKI, Perspectives
- Explorative search and discovery
  - Decentralized privacy preserving search



- What if we can empower users to apply their ethical preferences to search results?
  - For instance Open green web
- What if we can let users know which site abuse their privacy before they visit the that site?
  - For instance WebXRay

Example:  
**Ethical  
search**

What if we can give a unified search interface without having to share data with anyone

- For instance **private Searx**

Including their own email and the devices in their own house...

- For instance **Mailpile** and **neuropil**

Example:  
**Private  
search**



the next generation internet initiative cordially invites you to

# work for the internet

**Full time and part-time paid and unpaid positions available.**

- 👉 Work from home (or anywhere you like)
- 👉 Collaborate with people from all over the world
- 👉 Challenge your talents to the extreme
- 👉 Help save future generations





# Where does **your** idea fit?

We are searching for awesome projects to fund.

The next deadline is October 1<sup>st</sup>.

What can **you** do for the open internet, for the privacy and security of users?

What better alternative can **you** create, or add to?

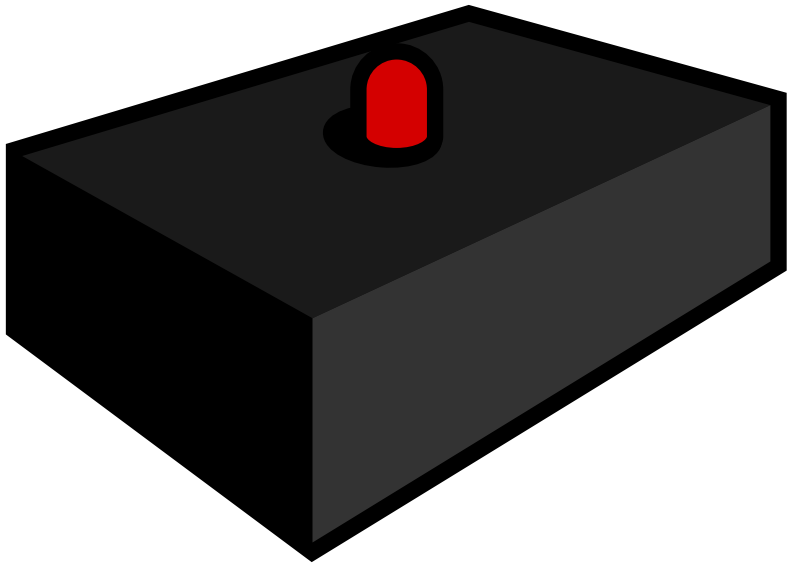


Image courtesy of VerifPal



join us and help discover and shape the next generation internet  
**and claim your spot in human history**

**Full time and part-time paid and unpaid positions available.**

Read all about it on  
👉 <https://nlnet.nl/discovery>  
👉 <https://nlnet.nl/PET>  
👉 <https://ngi.eu>



ZERO



ERO



# Questions? Enjoy Helsinki!



NGI Zero project has received funding from the European Union's Horizon 2020 Research and Innovation Programme under Grant Agreement No 825322 and 825310. Visit: <https://NLnet.nl> for more information.