# NGI Study - FIF meeting report

Gartner

nlnet

Next Generation Internet

### European Commission Directorate-General for Communications Networks, Content and Technology



**NGI FIF meeting** 

Study conducted by:

# **Soundation Gartner**

Non-profit set up in the eighties by pioneers of the European internet to support the creation of "an open information society". Research and advisory firm that is focused on trend analysis in information technology.



# First Generation Internet



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# The internet is a network of independent networks.

Not a coherent professional infrastructure but the sum of many independent networks, owned and operated by small and large organisations (and even individuals).

Plus some glue components:



.. like internet exchanges, owned by private organisations. ... like nameservers, also owned by private organisations. ... like spying equipment, also owned by private (and some public) organisations



# So the internet is really...

### Connections

- Physical links.
- Electrons. Light. Radio.
- Senders. Receivers.

### Conventions

- Standards
- Protocols
- Operational practises.

### Code + commodity

- Ubiquitous code (Open source)
- A lot of legacy hardware
- Including your devices



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### All previous 'Next Generation Internet' efforts failed.



## Moonshot ++ effort

- The internet is the **largest** and **most pervasive** technical construct ever made by humans
- And we need to change it with 3.5+ billion people 'on board'.
- High political stakes. High economic stakes. Highly critical users users.
- Severe risk of Parkinson's law of triviality. Everybody totally *knows* the #internet.





# Engaging the key communities



# Expertise in many different layers of internet

Privacy - Usability - Security - Social Science - Measurement - Freedom of expression - Security - Distributed computing - Startup - User perspective - Innovation - SME - Law making - Internet Governance - Law making -MEP (former) - Civil liberties - International relations - Diversity - LGTHI - Crime - Human rights - Network Stack evolution - Performance measurement - Academia - Security - IETF - delay/disruption-tolerant networking -Federation - Academia - Research - Identity - Mobility - Security - Innovation - Roaming - VPN - Feminist -Migrant - Refugees - Development - Art - DIY - Education - Whistleblowers - Anthropology - Philosophy - Anticorruption - Legal - Messaging - Privacy - TLS - Research - Industry - Measurements - Public transparency -Hardware - Cryptography - Civil liberties - Privacy - User perpective - Security - Ipv6 - Future Internet Programme - Hosting - ISP - Privacy - Peering - Packet filtering - High availability - Open source - Network robustness - Mesh networks - IDS - Academic - Youth - TLS - Hosting - DNSSEC - Identity management - RTC - Ipv6 - Cryptography -AAA - Identity management - W3C - User experience - Aesthetics - Startup - Youth - Human rights - Privacy -Open source - Alternative infrastructures - Academic - Security - Privacy - Youth





# Input from the member states

- Austria
- Iceland
- Latvia
- Norway

- Ireland
- Luxembourg
- Poland



## **Environment model**







# Establish sustainable operational conditions

Improving deployability and maintainability Solution integration and precompetitive bundling

Management of high volume of updates/ changes

Best practises and bundled expertise

Improving multilingual support

End-user service deployability





By Peter Craven - Prograde screen and 4 stockpile conveyors. CC BY 2.0, https://commons.wikimedia.org/w/index.php?curid=25687509





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# Building trust from the ground up



Decentralised internet-wide identity mechanisms	]
Distributed reputation mechanism(s)	-
Transport layer security	+
End to end confidentiality of traffic metadata	┤└─
Verifiability of routing paths	-
Security transparency	

Engineering Trustworthiness

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### Alternative infrastructure





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# Dealing with legacy middleware







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# **Empower and protect user environment**

Safe (passive) content profiles		
Declarative interaction	Redesign insecure standards	
Strenghten encryption		
Secure software/scripting distribution and updating		
Domain isolation	Browser environment	
Open (user-defined and controlled) security		
Sensor data firewalling		
Security proofs		environment
Background process transparency	Mobile operating systems	
Open (user-defined and controlled) security		
	Protecting users during nomadic access (e.g. wifi)	
	Contain digital spillover in physical world	
	(Hardware) Isolation of cryptographic material	





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# Use commons to counter proprietary dominance













# Mapping continued





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# And some procurement and legislation suggestions



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# Our design goals

Establish the long term vision

Create the main vision document for the Next Generation Internet initiative.

Prioritarisation and intervention logic Evaluate the key funding priorities identified through our stakeholder consultation, as well as notions on how to (not) design and organise the overall processes.

Help plan ahead

Create a roadmap guidance document that will help to understand the relationships between the various activities

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# "Criteria for success"

A first criterion is to ensure that the NGI research will bring the technologies to make the internet **Result-oriented** free, interoperable and open. The second criterion is that the study provides **double loop learning** by identifying blocking Lessons learned issues with historical 'next generation internet' efforts in these areas, and (per topic or across topics) propose **relevant new instruments and approaches** through which these may best be addressed. Thirdly the study should also establish if there are **significant interdependencies** that can be Actionable identified among the topics as well as **known dependencies** that need to be practically addressed – and how these are best dealt with, including the need for R&D efforts aimed at transitional technology. This may impact the **definition of priorities** and **timing** for specific parts of the NGI initiative (e.g.: some R&D results are a precondition to other R&D). A fourth criterion for success is broad **recognition for the holistic approach** for our study Inclusiveness methodology, among the very wide range of key actors and stakeholders.

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# Vision: Process and results



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# The NGI framework identifies drivers for change

### The framework captures a **user's perspective**:

- **user moments** typical activities which will take placeand which are related to the use of the Internet.
- **user's expectations** regarding how the Internet should work in relation to these moments.
- These user moments and expectations are derived from stakeholder feedback and desk research on the issues regarding the use of the internet such as security or fake news issues.

User expectations form four homogeneous groups which then define the **drivers for change from a user's perspective**.

The drivers for change also form the key messages of the Vision for a Next Generation Internet.

Ideas for R&D	Ideas for R&D	Ideas for R&D	Ideas for R&D	Ideas for R&D	Ideas for R&D	Ideas for R&D	Ideas for R&D	Ideas for R&D	Ideas for R&D	Ideas for R&D	Ideas for R&D
User moments and expectations	User mon expect	nents and ations	User moments and expectations		User and expectations		User moments and expectations				
Driver for change: technology reliability and resilience Driver for change: trustworthiness and transparency			Driver for change: sustainability and openness			Driver for change: creativity and human potential enabler					

### Vision for an NGI



An internet of human values Resilient. Transparent. Sustainable.

The overall mission of the Next Generation Internet initiative is to re-imagine and reengineer the Internet for the next generations 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.

These ambitions need a solid foundation to build on. The legendary robustness of the Internet

### Preamble

"The overall mission of the Next Generation Internet initiative is to re-imagine and reengineer 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."

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There is another important dimension to trust, which liek above physical availability. We need a transparent locationological environment, that is trustworking. The architecture, governance and policies structure how entire societies and economies interact. By design it should protect free speech and private enterprise and much more. The level Generation intermet is to be designed to avoid any bias or systematic abuse of global trust in the intermet. It shall be aru global commons rising above international policits and competition. It will guarantee the safety of citizens and strengthen the health and automorp of our markets and accidents.

The endinging success of the internet lies in permission fee innovation, openness and interoperability. These Generation Internet is set up to create which choice. It forest 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 economics, celebrating our values and promoting reastivity and well-being.

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



# Key goal I: high resilience.

"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 companies or parts of the network go down by some natural or other disaster, the effects on the rest of us should be close to zero. "

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# Key goal II: Transparency and trustworthiness

There is another important dimension to trust, which lies above physical availability. We need a transparent technological environment, that is trustworthy. The architecture, governance and policies structure how entire societies and economies interact. By design it should protect free speech and private enterprise and much more. The Next Generation Internet is to be designed to avoid any bias or systematic abuse of global trust in the Internet. It shall be a true global commons, rising above international politics and competition. It will guarantee the safety of citizens and strengthen the health and autonomy of our markets and societies.

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# Key goal III: Sustainably open.

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# **NGI Internet Core**

Different options

#### **Standalone calls**



# **NGI Internet Core**

Different options





# Prioritization criteria

The prioritization process of the technology topics to be included in the NGI work programme is important for the success of the whole effort – not just novelty or popular topics.

There are many cross-links and interdependencies that make the traditional funding problematic.

- If the rocket doesn't fly, the whole effort is moot.
- If the rocket explodes, the whole effort is moot.
- If the rocket is hacked, the whole effort is moot.



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Among alternatives, select multiple projects and let them compete on quality.

Audit and benchmark them externally.

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Optimise the support for the drivers for change independently– to maximise and speed up the outcome for end users.





### **Research topics**

# Establish trustworthiness



The original core architecture has been exposed as rather fundamentally untrustworthy. A key rationale for creating a Next Generation Internet.

As one interviewed expert succinctly put: "we need trust built from the ground up". Every technical primitives from the current internet needs to be re-evaluated in terms of the complete threat catalog.



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# Benefits

Establish a secure technological base that can be assumed reliable for all purposes.

Convergence mechanism for all NGI subprojects to establish quality and deliver proven solutions to others.

Transparency about guarantees on business continuity and social connectiveness.

Contributes to professional culture required for internet as a mature strategic infrastructure.

Systematic and comprehensive approach re-enables trust in the system.





# **Research topics**

# Service portability and data decoupling

The availability of quality generic alternatives for all important classes of internet services will provide an enormous boost towards development and user mobility. Users need to be able to separate their content and data from internetbased software and services.



# Benefits

Increase competitiveness of European vendors Users can choose service providers and/or host services themselves Allow incremental innovation and diversity to cater for minority needs Launch a competitive ecosystem of strong solution providers with a level playing field Contribute to standardisation to reduce friction More resilience: huge increase of redundancy Possibility for bottom-up localisation in minority languages Inclusiveness/design for all for people with disabilities and special needs



# **Research topics**

# Architecture renovation



The ability to re-engineer and/or replace core protocols known to be unreliable or untrustworthy, to structurally increase the resilience and robustness at a systemic level. This would provide a lasting answer to the threats from the threat catalog, for instance changing the whole dynamics of currently 'undefeatable' threats such as distributed denial of service by botnets and mass surveillance. Open the path to introducing exciting new capabilities to further evolve the internet.



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# **Benefits**

Ensuring business continuity and social connectiveness.

Increase operational efficiency of the Internet.

Introduce new capabilities at the core of the internet, enabling further innovation.

Replace suspect technologies with technologies that have security and privacy by design.

Simplify new technology by being able to relegate responsibilities.

Lower environmental footprint of internet technologies.







# The internet is a system

It is essential to increase the flexibility and responsiveness of the internet as a *system*; no secure system is able without "convenient mechanisms and procedures for maintaining it"

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