IEDN.NET.

Industry 4.0 and

Institute for the Development of Public Digital Networks

Berlin 2021

How does the Internet work today?

Internet Governance

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GLOBALLY AND REGIONALLY

ICANN is a non-profit public corporation that sets policy for the allocation of number resources and domain names.

IANA is the number assignment authority on the Internet operates in accordance with with the policy system established by ICANN. It is responsible for managing the root zone of the Domain Name System (DNS), coordinating the global allocation of IP addresses and managing IP numbering systems. Since 2016, PTI (Public Technical Identifiers) Corporation has been performing IANA functions on behalf of ICANN.

RIRs are regional registries that operate within the legal framework of the countries in which they are registered and located. They are organizations with an open membership.

NATIONALLY AND LOCALLY

NIRs are national registries, which are subordinate to the state management system. The main role in them is played by line ministries and state telecommunications corporations.

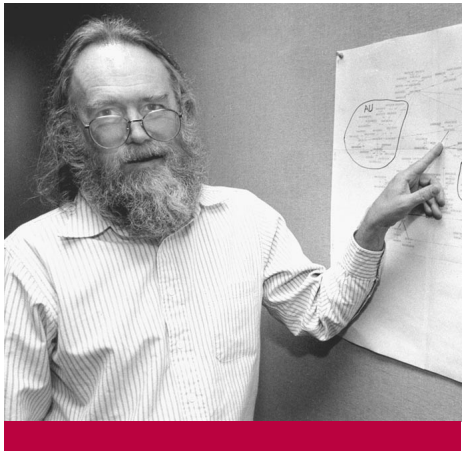
LIRs are local Internet registries, which are responsible for distributing IP address ranges among end users.

ISP - Internet Service Providers, provide nodes access to the Internet at the physical level.

End User - an end user. He creates objects within his allocated network ranges and announces them to the World Wide Web through his assigned Autonomous System (AS), which is also his identifier on the network. AS provides nodes access to the Internet at the logical level.

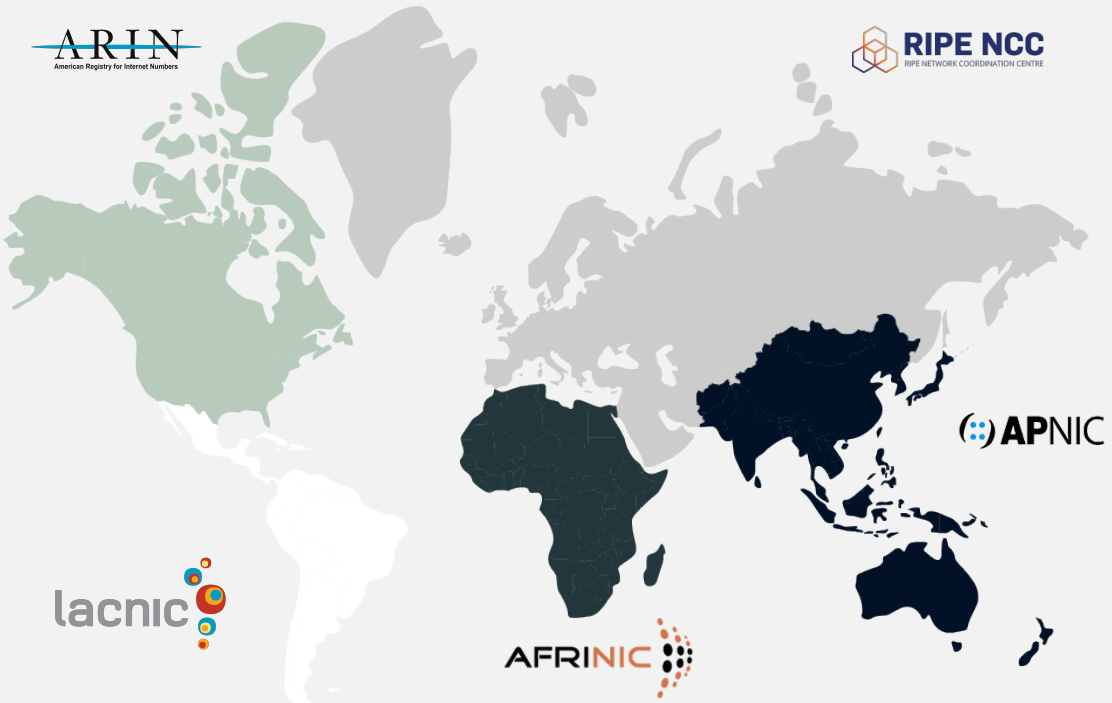
History

- IP addresses originally owe their origin to the University of Southern California as part of a research project of the U.S. Department of Defense (DARPA).
- Jonathan Bruce Postel - Jonathan Bruce Postel is best known as the manager of the top-level domains and IP allocation processes that governed the development of the Internet before ICANN came into existence in 1998. In addition to being the sole administrator of IANA, he was also the first member of the Internet community and the administrator of the U.S. national domain (.us).
- Between 1998 and 2016, the National Telecommunications and Information Administration (NTIA), part of the U.S. government's Department of Commerce, turned over the technical management role to ICANN, the Internet Corporation for Assigned Names and Numbers.
- ICANN is a global non-profit partnership organization. Since its inception in 1998, it has served as IANA on behalf of the global Internet community. The basic concept for these functions is defined by a series of contracts with the U.S. Government, signed in 2000.
- In 2016, the contracts with the U.S. government expired, and since then ICANN continues to manage the global pool of Internet addresses, numbers and names on its own. At the same time, ICANN is subject to the laws of the State of California.



Jonathan Bruce Postel (1943-1998)

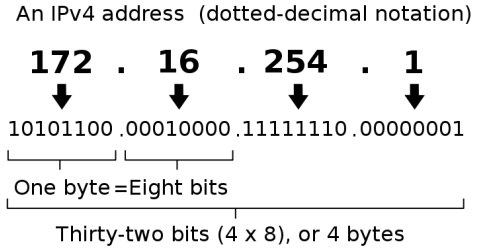
Global Regional Registries



- **AFRIK** (Africa)
- **APNIC** (Asia Pacific Region)
- **ARIN** (mostly USA and Canada)
- **LACNIC** (Latin America and the Caribbean)
- **RIPE** (Europe, Middle East and Central Asia)

IP address structure

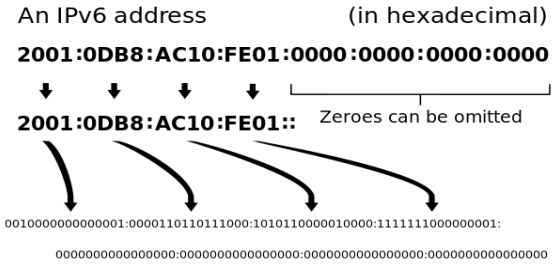
IPV4



IPv4: 100.200.100.200

IPv6: 2002:64C8:64C8::

IPV6



- IP addresses are unique (non-repeating) identifiers of devices on the network.
- IP addresses exist as a continuous range of numbers (registry) written in binary code for the convenience of users.
- There are two types of IP addresses 32 bit (IPv4) and 128 bit (IPv6). These are two independent global ranges that are the source for smaller ranges (networks).
- Using these networks, ISPs assign separate IP addresses to the end device (node)

Hierarchical allocation of names and IP addresses

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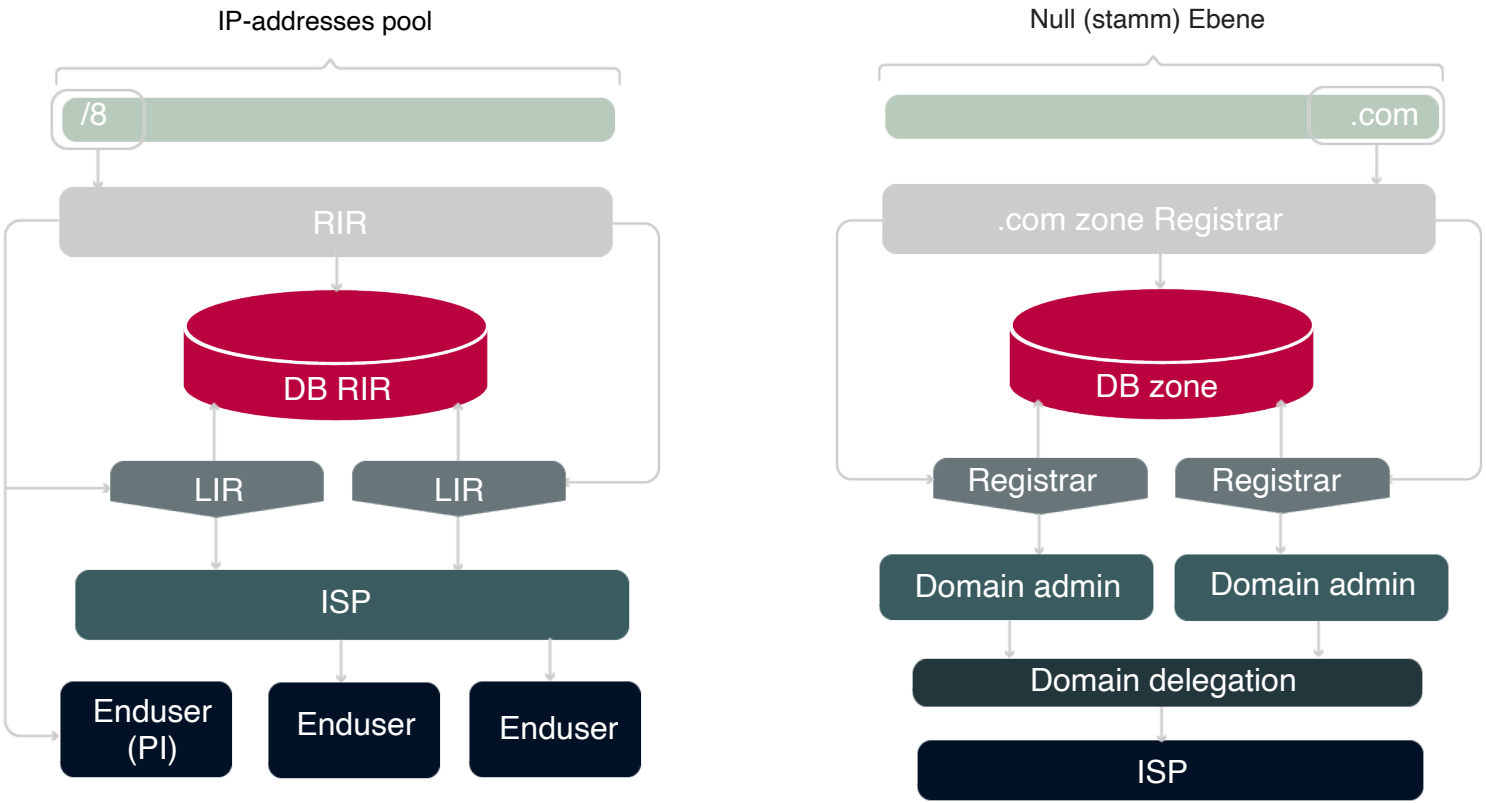

PROBLEMS WITH THE CURRENT INTERNET MODEL

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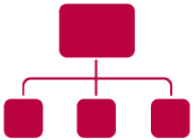

Political risks

Restriction of public and personal freedoms of citizens. Creation of isolated registries, setting boundaries on the Internet. Sovereignization and nationalization of the Internet. The registry is effectively under the control of one organization. Lack of understanding among political decision-makers.

Legal risks

Jurisdiction of countries where ICANN and RIR are registered as legal entities.The issue of ownership and transfer of dedicated IP address ranges.

Technical risks

Hierarchical system of registries. Low crashworthiness. DEFICIT of IPv4 resources. Difficulty in implementing new IPv6 network protocols. Interconnection in the Internet of Things (IoT) is limited.

Issues. Political risks

- The current global pool of IP addresses is managed centrally by five transnational organizations, the Regional Internet Registries (RIRs).
- ICANN and RIRs are private organizations and are subject to the legal systems of the country in which they are located.
- Extending the legal framework of the country in which the RIR is located to all the countries it serves.
- Countries such as China, North Korea and now Russia are creating their own isolated registries that guarantee complete control over network users in each region.
- Hierarchical system of the registry, allows you to essentially either significantly limit, to isolate its part, for local use, or build a reduced copy in the form of an intranet.
- Due to the existing Hierarchical structure of the Internet, totalitarian States can restrict access to information by using the system of blocking IP addresses. Here there is a conflict between the voluntarism of the decision-maker of the blocking decision and the principles of civil rights and freedoms in legal democratic states.

Problems. Legal risks

- The governance structure of the global IP pool means that the jurisdiction of countries in which ICANN and RIR are registered as legal entities extends to all other countries they serve. For most countries in the world, the management of IP addresses, a critical resource, is done within the legal framework of another country, making the resource subject to the laws of the foreign country
- ICANN and RIR are private organizations that operate under the laws of the countries where they are located. However, each of them manages IP addresses for a large number of other countries.
- There is a mismatch between the geographic scope in which legal, operational, or even political decisions are made (the countries in which RIRs are based) and their implications for the entire region.

Problems. Technical risks

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- A hierarchical registry system has bottlenecks that can cause the entire distribution system to fail. Attacks that will take out large segments of the network can easily be orchestrated.
- Low crashworthiness and non-compliance with modern information security requirements.
- DEFICIT of IPv4 resources. Difficulty in implementing new IPv6 networking protocols.
- Interconnectivity in the Internet of Things (IoT) is limited and does not allow for optimal calculations.

CONCLUSIONS

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- The existing hierarchical IP addressing system on the Internet was built in the middle of the last century on the principles of mail forwarding. It is extremely vulnerable to modern technical threats and does not meet the requirements of the fourth generation technologies that are the foundation of the industrial revolution - Industry 4.0.

- The development of the new IP Internet Protocol standard becomes part of Industry 4.0's strategy to eliminate the current archaic routing systems, BGP, DNS and ISP systems in general, by moving the route information inside the packet and using a Blockchain registry located in each node of the network and containing all information about its state at the moment the packet is sent to the recipient.

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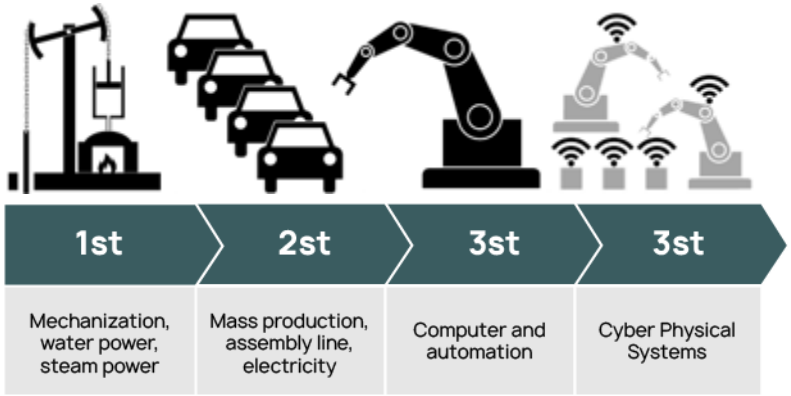
How will the Internet work tomorrow?

Industry 4.0



Industry 4.0 is the next stage of the industrial revolution that humanity is already facing.

The transition from existing automated systems to cyber physical systems will require not only a general shift to wireless communication systems, but also a complete change in the logical structure of the Internet itself.

The existing network structure was built in the seventies of the last century and by its principle does not meet the requirements of new technologies, holds back development.

Industry 4.0

Industry 4.0 is already happening
in the global economy processes belonging to the fourth industrial revolution.
It directly relates primarily to industries such as:

- Internet of Things
- Artificial intelligence, machine learning
- Robotics
- Cloud computing
- Big Data
- Additive manufacturing
- Cybersecurity
- Integration System
- Mathematical modeling
- Augmented reality

THE NEW INTERNET FOR INDUSTRY 4.0

Basic principles

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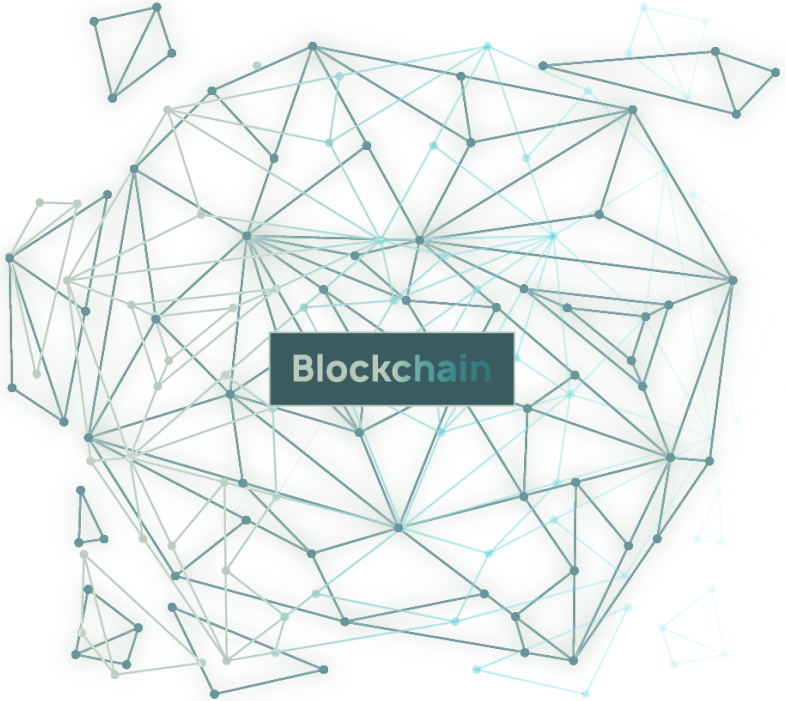


Abandoning ISPs. Using inside **the IP-blockchain platform**, Neural Network routers, which will allow, due to the mechanism of interconnection within the blockchain registry, to abandon Internet service providers as conductors of services to the end user**.**

Mech-network. Using the **IPvX** protocol in conjunction with a mesh network topology will provide a completely independent network architecture.

IoT. Using **IPvX** protocol to form Smart Contracts in the Internet of Things interconnection process.

The new IPvX network protocol , and its use in the blockchain registry.

A single IP blockchain platform supporting a duplicate IP registry gives all Local Registries (LIRs) the ability to become nodes in a decentralized system, each containing a complete IP registry and their states.

Uniqueness: addresses must be globally unique, which is the main purpose of registration. Ease of identification and availability of each device on the network directly.

Fairness: Policies must be fair. It should apply equally to all parties regardless of their location, nationality, size, or any other factor.

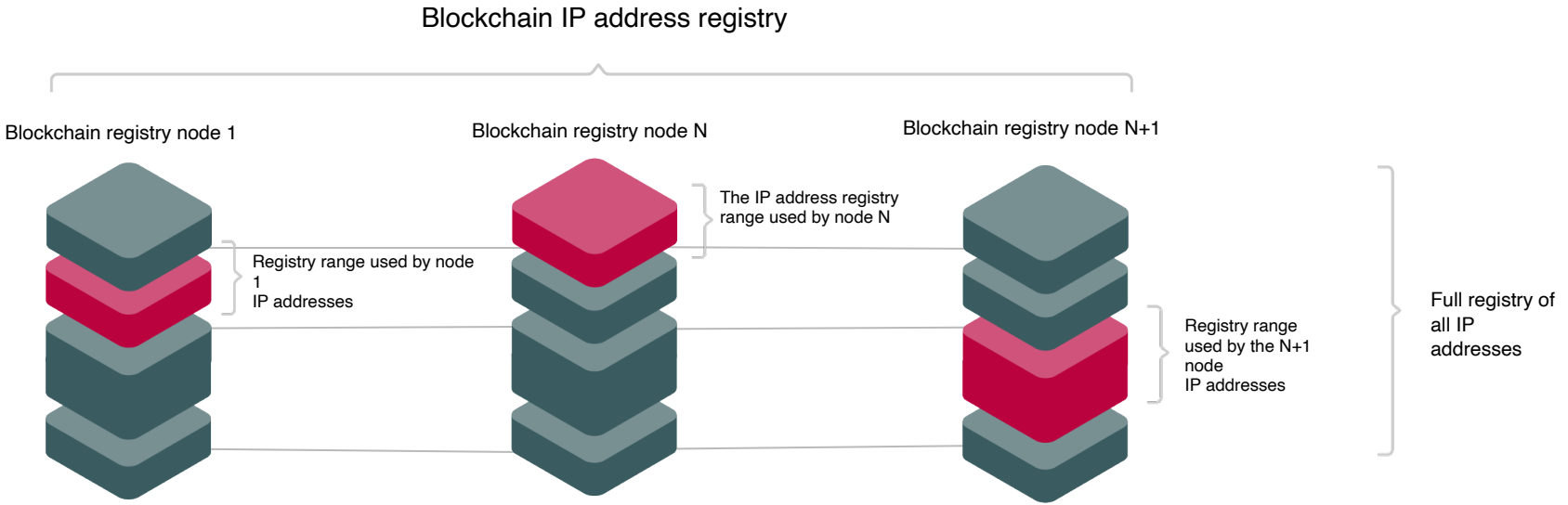
Saving: rational use of Internet resources, avoid wasteful actions.

Aggregation: To perform the global routing function, routers on Internet networks exchange information about address space of each network.

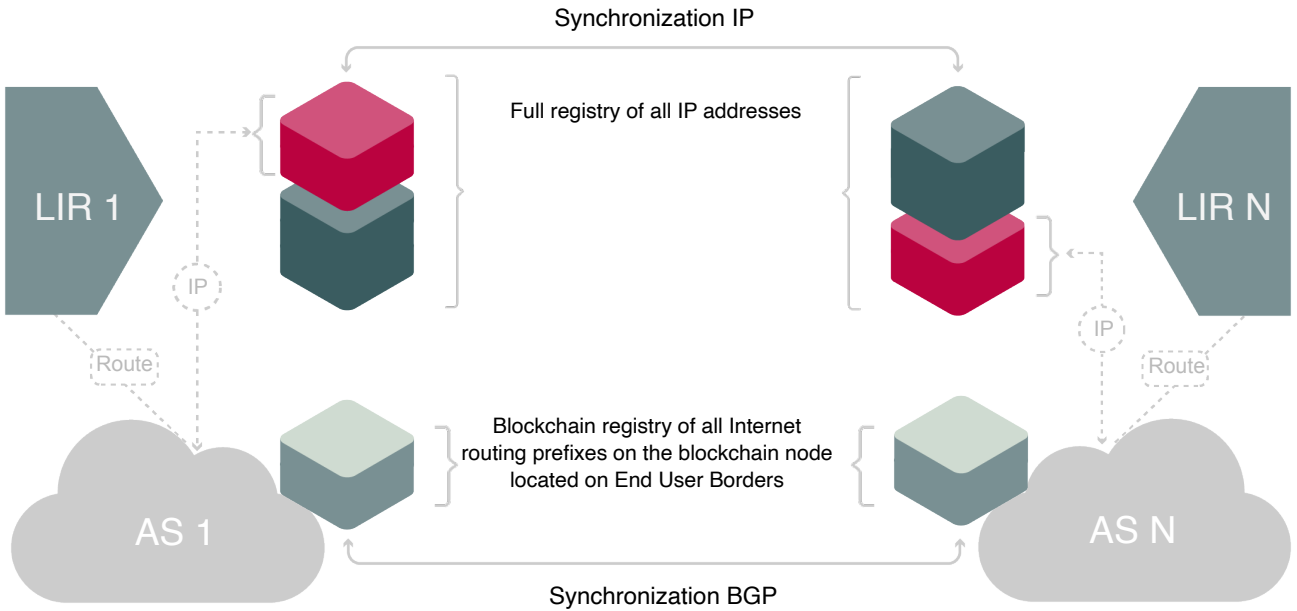
Registration: securely store contact and other distribution-related information to keep the Internet running smoothly.

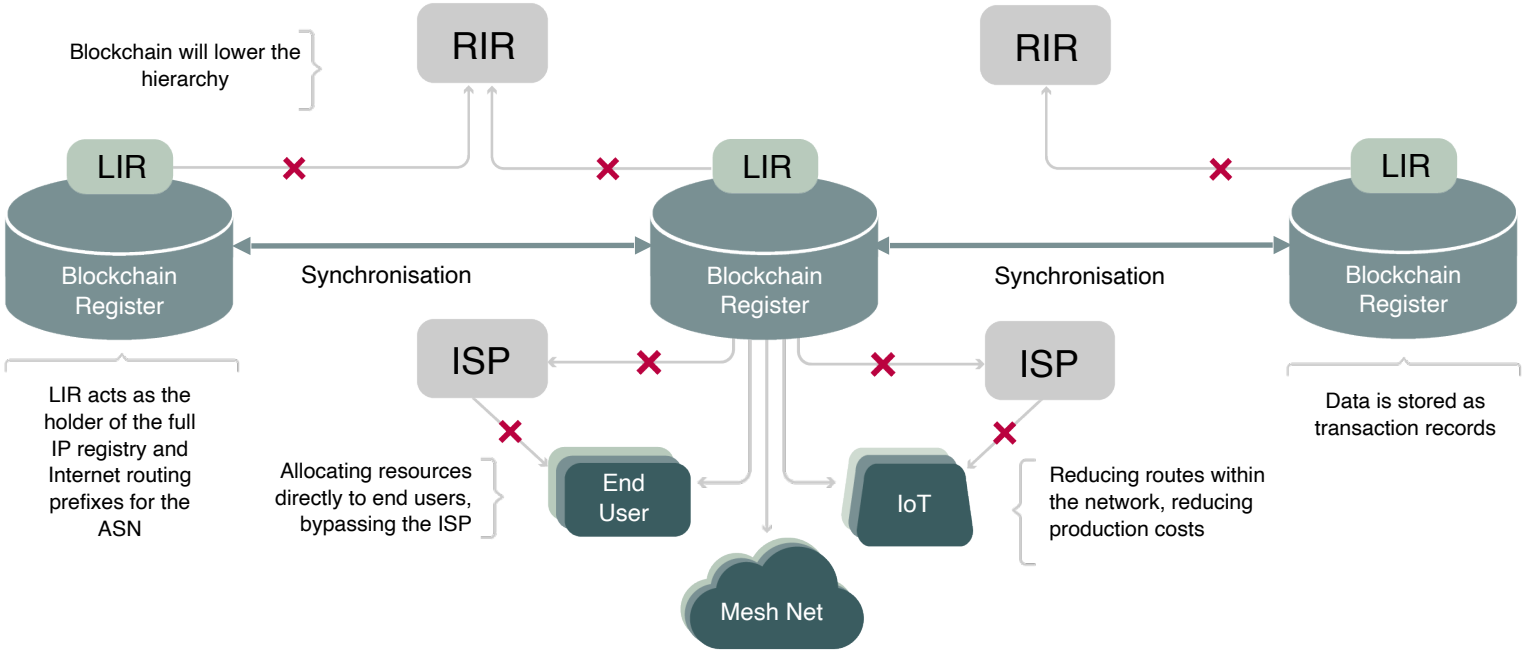
Independence: the elimination of legal dependence on the legislation of participating countries.

In a blockchain registry, unlike the existing allocation scheme, each node maintains the entire existing address range and exchanges information about changes with all nodes in the blockchain network. In this case, the IP address range allocated to a node will be the property of each node owner, the registry holder, as long as it complies with the principles adopted by the community and maintains the entire range. The question of ownership and transfer of allocated ranges, is an open legal issue that requires careful elaboration and a separate study.



Local LIR registries and routers through which End User Autonomous Systems (ASN) are announced to the global network (END USER) can also be Blockchain registry nodes, which in addition to the IP registry can store records of all existing global Internet routing policy prefixes. Thus, routes between ASN and routing errors and, consequently, the cost of information transfer will be significantly reduced.





Development of the technology will simplify the process of network routing and will allow to transfer it to the LIR and ASN owners, which will essentially become a node of the new network and will allow to give up the existing system of Internet Service Providers (ISP). Since inherently all autonomous systems (ASN) supported by LIR will contain a complete registry of Internet routing, which in turn will give the development of technologies with mesh networking (Mesh-networks) and the Internet of Things (IoT).

Who will do it and how?

Institute for the Development of Public Digital Networks

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For the transition to the new physical
and logical structure of the Internet to meet the needs of Industry 4.0, a whole pool of strategic objectives must be implemented.
To achieve the result, we create a socially useful organization
"The Institute for the Development of Public Digital Networks (IEDN)*.

* German abbreviation for Institut für die Entwicklung der öffentlichen digitalen Netze

The mission of the institute

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- Development of the existing IT landscape to support the next stage of the industrial revolution - Industry 4.0.
- Dissemination of knowledge about the structure and principles of the Internet.
- Development, implementation and support of a new model of the Internet -an alternative to the existing hierarchical system of management and distribution of domain names and addresses.
- Preparing the transition from a hierarchical Internet system to a new distributed, democratic system with equal rights and freedoms for all in governance and access to information on the Internet.

The goals of the institute

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Public

- Ensure that the principles of fairness, equality and public freedoms are upheld online;
- Make it impossible to limit user access to the world's information resources;
- To ensure the independence of the Internet from the legal norms of elected states;
- Enable the user to participate in the democratic governance of the Internet;
- Increase user confidence in information on the Internet;
- Increase the literacy of public servants in understanding the functioning of the Internet and the interaction between its basic components.

Scientific-Technical

- Support the development of the Internet for Industry 4.0;
- Eliminate the lag in the development of the Internet from the modern processes of development of society;
- Promote the development of global information networks, information infrastructure in society and the introduction of modern information technology;
- Identify developments, ideas, projects and other achievements promising for application in telecommunication networks and promote their implementation;
- Promote projects aimed at protecting information on the Internet;
- Support for research in telecommunications and information technology.

Institute projects

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IPvX Blockchain Registry

- Creating a decentralized blockchain registry of domain names and numbers.
- Creation of a new IPvX network protocol standard, based on the blockchain registry and IPv6 network protocol.
- Creating a network of IPvX blockchain nodes on the platform of the existing Local Internet Registries (LIR) system.

IPvX Blockchain Routing

- Development of network routing technology based on IPvX blockchain registry and blockchain node network
- Development of Mesh-networks, Internet of Things, Neural Network routers with AI based on the new IPvX protocol.

The Internet in Science and Education

- Educational program on the principles of the World Wide Web for schools and institutions of higher education.
- An educational program on the fundamentals of the World Wide Web for government employees.

Internet Industry 4.0

- Development of principles of functioning and basics of application of the next generation Internet based on the protocol IPvX and Blockchain domain name and number registry as the main technology for the "New Internet" Industry 4.0.
- Policy and legal standards governing the activities of Blockchain Registry participants for the Internet (rights of ownership and management of Internet resources).

Structure of the Institute

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Founders of the Institute

Individuals and organizations that share and support the goals of the Institute

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Institute Council

The highest collegial management body

Chairman of the Board of the Institute

Elected from among the members of the Board of the Institute, Plans the work of the Board

Director of the Institute

Executive body in charge of operational management

Board of Trustees

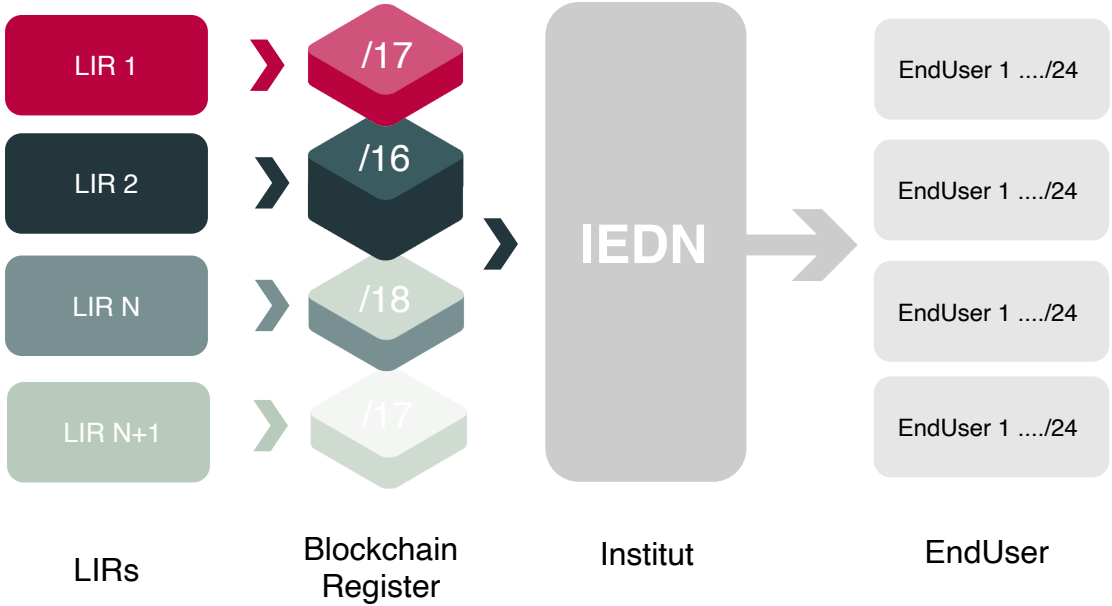
The body supervising the activities of a public organization

Preparing the existing structure

IEDN

- The development of blockchain infrastructure requires the consolidation of a large number of Local Internet Registries into a consortium or association, in which participants' shares and contributions are formed by placing their IP address ranges under a single coordination.
- The Institute acts as a single focal point for the efficient allocation of idle IP address blocks to end-users.
- Each participant receives an appropriate number of votes depending on the size of the available range.
- Network ranges united under unified management can become the basis for the formation of a new regional Internet registry on the blockchain technology.
- Technical coordination is implemented on a single platform, a group of technological Local Registries and technological resources located in different regions.
- Funds received from end users can be used for the purposes of the Institute and the implementation of plans to create a new protocol and blockchain registry.

Remedy the IPV4 address resource shortage



Combining Local Registries to achieve the technological goals of distributing their existing idle IPv4 addresses and creating a consolidated platform for blockchain registry deployment

Involvement in Internet governance today

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To achieve public policy goals in the existing system of Internet governance, it is possible to implement the collective use of votes required to select governing bodies in regional Internet registries on the basis of the Institute. This will allow the formation of decisions and creation of policies of superior organizations for the implementation of the strategy of transition to blockchain technology. This will accelerate the transition to free and democratic public networks.

Nomination

- Nominating Independent LIR Candidates
- Nomination of LIR Collaborating Institute Candidates (IEDN) in Resource Redistribution

Election campaign

- Running an election campaign and supporting candidates who share IEDN's mission
- Providing information support through the Institute's resources
- Working with IEDN member government organizations

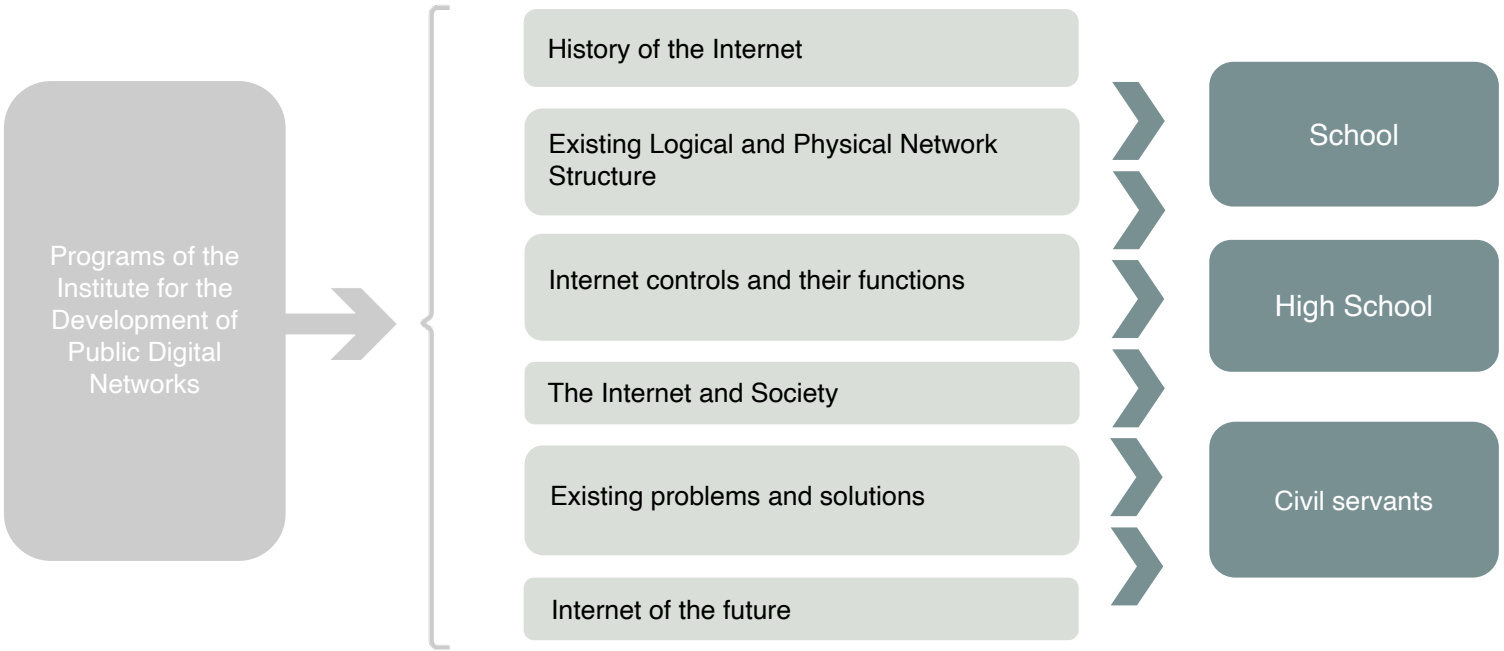
Elections

- Coordination of voting for candidates who share IEDN's mission
- Involvement of the maximum number of participants in the voting process (now no more than 5-10% of community members vote)

Work on the board

- Obtaining a majority to adopt new rules
- Replacing old members with new members with IEDN ideology
- Development and adoption of new rules for Internet governance

The educational program of the institute



The pan-European and global significance of the project

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- The development of the new blockchain-based Internet will create a truly independent and free information environment for all of humanity, where the equality of participants and an innovative approach to routing will set the stage for industry to move to a new technological level of Industry 4.0.
- It would be impossible to block or disrupt any part of the network and stop any group of people from sharing and exchanging information in a voluntaristic way. Limiting user freedom in decentralized networks is by definition an impossible task.
- In a system where each participant holds a blockchain registry containing the entire list of domain names, numbers and existing routes, it would be impossible to limit the management of IP addresses and domains to the decisions of an individual state, since all participants can track all changes.