Internet as a subject of study in political science: technological, legal and organizational aspects

Overview of the history of Internet technologies and their political implications

Michael YAKUSHEV

Security Issues in Cyberspace / MGIMO University / Moscow / November 2019
Internet Governance: global, regional, national layers.

Principle of multi-stakeholderism.

Global and regional organizations of the Internet Governance.

Michael YAKUSHEV
Security Issues in Cyberspace / MGIMO University / Moscow / November 2019
The most important things to remember

- Internet is just another technology of communications
- Internet is cross-border (transnational)
  - Though it was not designed to be like this
- Internet technologies were NOT developed either for freedom of speech or for the social engineering
- Internet consists of many different layers
- Internet governance is based on multi-stakeholders model
- Internet may NOT be regulated only by legal instruments
Brief history of the Internet (Key layers)
Level 5: **Internet Applications**
- Web-sites, social networks, e-mail services, search engines etc.

Level 4: **Domain Names System**
- Registries, Registrars, Domain names owners (administrators)

Level 3: **IP Adresses Space**
- IPv4 and IPv6 protocols (Regional Internet Registries)

Level 2: **Core DNS servers**
- 13 route servers DNS и 1400+ mirrors (instances) worldwide

Level 1: **Physical telecommunications channels**
- Fiber optics, satellite channels, frequencies allocations, last miles and end-users equipment, local area networks etc.
THE THREE LAYERS OF DIGITAL GOVERNANCE

No one person, government, organization, or company governs the digital infrastructure, economy, or society. Digital governance is achieved through the collaborations of MultiStakeholder experts acting through polycentric communities, institutions, and platforms across national, regional, and global spheres. Digital Governance may be stratified into three layers to address infrastructure, economic, and societal issues with solutions. For a map of Digital Governance issues and Solutions across all three layers, visit https://imap.netmundial.org

**ECONOMIC AND SOCIAL LAYER**
- **LAWS, POLICIES, AND REGULATIONS**
  - Governing bodies in local, national, regional, and international spheres are engaged with their citizens and with other bodies to develop and apply laws, norms, and regulations.

**LOGICAL LAYER**
- **THE ROOT ZONE**
  - The DNS infrastructure is administered by ICANN (ICANN, IANA) and ICANN. IANA performs the coordination of the Internet's namespaces. Domain name registrars such as GoDaddy, Network Solutions, Register,

**INFRASTRUCTURE LAYER**
- **INTERNET BACKBONE (IP NETWORKS)**
  - 90% is privately owned by global companies like level 3 communications, TeliaSonera International Carrier, CenturyLink, Windstream, Verizon, AT&T.

**MULTISTAKEHOLDER COLLABORATIONS**
- Solutions to issues in each layer include policies, best practices, standards, and specifications developed by the collaborations of expert stakeholders from actors in business, government, academia, technical, and civil society.

**KEY GOVERNANCE ACTORS**
- ICANN / IANA
- IETF
- ISO
- ITU
- OECD
- UNESCO
- World Economic Forum
- National Governments
- Civil Society
- Intergovernmental Organizations
- Law Enforcement Agencies

**ECOSYSTEM LAYER**
- **INFORMATION**
  - Newspapers, broadcast, personal & professional blogs, social media.

**SECURITY**
- Cybersecurity, cyber warfare, cyber espionage, cyber terrorism, and many more.

**MOBILE**
- Smart phones, tablets, cars. There are more mobile devices on the planet than people.

**EDUCATION**
- Online universities, pupils, business, classroom engagement.

**ENTERTAINMENT**
- Music, movies, television, games, Such as iTunes, Spotify, Netflix, Amazon, Netflix.

**APPLICATIONS**
- World wide web, email, cloud, IoT, mobile apps.

**USERS**
- There are over 3 billion users worldwide. Most users connect to the internet through their mobile phone.

**APPLICATIONS**
- World wide web, email, cloud, IoT, mobile apps.

**ROOT SERVICES**
- 13 organizations from 4 countries administering 35 different root servers that provide top-level DNS services to hundreds of machines in dozens of countries.

**DOMAIN NAMES**
- ~300 Country Code Top-Level Domains (ccTLDs), such as .fr, .br, .de, .uk,
- ~6000 Generic Top-Level Domains (gTLDs), such as .com, .net, .info, .web,...
- ~1500 Domain Name Registrars such as GoDaddy, Network Solutions, Register,
Physical Layer: example how it works

[for educational purposes only]
Route servers map

[for educational purposes only]
<table>
<thead>
<tr>
<th>Letter</th>
<th>IPv4 address</th>
<th>IPv6 address</th>
<th>AS-number[8]</th>
<th>Old name</th>
<th>Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>198.41.0.4</td>
<td>2001:503:ba3e::2:30</td>
<td>AS19836, AS36619, AS36620, AS36622, AS36625, AS36631</td>
<td>ns.internic.net</td>
<td>Verisign</td>
</tr>
<tr>
<td>C</td>
<td>192.33.4.12</td>
<td>2001:500:2::c</td>
<td>AS2149</td>
<td>c.psi.net</td>
<td>Cogent Communications</td>
</tr>
<tr>
<td>D</td>
<td>199.79.1.13</td>
<td>2001:500:2d::d</td>
<td>AS27</td>
<td>terp.umd.edu</td>
<td>University of Maryland</td>
</tr>
<tr>
<td>E</td>
<td>192.203.230.10</td>
<td>2001:500:a8::e</td>
<td>AS21556</td>
<td>ns.nasa.gov</td>
<td>NASA Ames Research Center</td>
</tr>
<tr>
<td>F</td>
<td>192.5.5.241</td>
<td>2001:500:2f::f</td>
<td>AS3557, AS1280, AS30132</td>
<td>ns.isc.org</td>
<td>Internet Systems Consortium</td>
</tr>
<tr>
<td>G</td>
<td>192.112.36.4</td>
<td>2001:500:12::d</td>
<td>AS5927</td>
<td>ns.nic.ddn.mil</td>
<td>Defense Information Systems Agency</td>
</tr>
<tr>
<td>H</td>
<td>198.97.190.53</td>
<td>2001:500:1::53</td>
<td>AS1508</td>
<td>aos.arl.army.mil</td>
<td>U.S. Army Research Lab</td>
</tr>
<tr>
<td>I</td>
<td>192.36.148.17</td>
<td>2001:7fe::53</td>
<td>AS29216</td>
<td>nic.nordu.net</td>
<td>Netnod</td>
</tr>
<tr>
<td>J</td>
<td>192.58.128.30</td>
<td>2001:503:c27::2:30</td>
<td>AS26415, AS366126, AS36628, AS36632</td>
<td>N/A</td>
<td>Verisign</td>
</tr>
<tr>
<td>K</td>
<td>193.0.14.129</td>
<td>2001:7fd::1</td>
<td>AS25152</td>
<td>N/A</td>
<td>RIPE NCC</td>
</tr>
<tr>
<td>L</td>
<td>199.7.83.42</td>
<td>2001:500:9f::42</td>
<td>AS20144</td>
<td>N/A</td>
<td>ICANN</td>
</tr>
<tr>
<td>M</td>
<td>202.12.27.33</td>
<td>2001:dc3::35</td>
<td>AS7500</td>
<td>N/A</td>
<td>WIDE Project</td>
</tr>
</tbody>
</table>
IP-addresses distribution

- IPv4 (32 bits): 192.10.81.114
  - $2 \times 10^{28}$ adresses
  - 300 billion IP-addresses for each inhabitant of the Earth 😊
- Distribution: 5 Regional Internet Registries worldwide
  - RIPE NCC (Amsterdam) for Europe, including Russia
IP RIR’s
198.41.0.4 (IPv4) =>
=> 2001:503:ba3e::2:30 (IPv6) =>
=>=> ns.internic.net [VeriSign Corp.]
Top-level domains

- Country Code TLDs
  - .ru, .uk, .de etc.

- Generic TLDs
  - .com, .org, .net, .info, .aero etc.

- Internationalized TLDs
  - .РФ, .中國 etc.

- ‘New Generic’ TLDs
  - .google, .facebook, .london, .kids etc.
Who’s Who in the DNS Ecosystem?

- Manage top-level domain (TLD) databases and generate TLD zone files
- Registry operators may be
  - Large corporations,
  - For- or non-profit organizations
  - Departments in universities
  - Government agencies
- May outsource back-end operations
Finally, how Internet should be defined???

- No legal definition so far
- 2005 г., Working Group on Internet Governance under U.N.Secretary General: «Self-explanatory. No need for any definition».
- The most accurate wording: an information (-communication) networks, that unites computer systems worldwide (= in different countries), where the information flow is regulated by rules and standards, approved by a non-commercial Internet Society (Washington, DC)
- Technological, not purely legal, regulation (RFC, RFP)
Internet Governance: notion

- 2005 г., Working Group on Internet Governance under U.N. Secretary General:
  - The development and application by Governments, the private sector and civil society, in their respective roles, of shared principles, norms, rules, decision-making procedures, and programs that shape the evolution and use of the Internet.
  - New Stakeholders: technical community, Academia, international organizations
  - Formats of IG: multi-stakeholders mechanisms (IGFs and other conferences), multilateral diplomacy (U.N. agencies etc.)
Multi-stakeholderism

- Hard to translate to any foreign language

- Interaction of all possible multistakeholders and groups of multistakeholders
  - Governments + Private Sector + Civil Society (+ Technical Community + Academia + International Organizations)
  - Not to be mixed with multi-lateral diplomacy
  - Not to be mixed with e-democracy
  - Not to be mixed with multiculturalism

- Applicability to other spheres is still under consideration (outer space, pharmaceuticals, nuclear energy for civil purposes)
Milestones of the Internet Governance

- 1999-2000: Okinawa Charter on Information Society (G8), creation of ICANN
- 2004-2005: WGIG
- 2006-....: Internet Governance Forums (global, regional, national, local)
- 2009-2011: Cross-border and freedom online initiatives of the Council of Europe
- 2016: end of ICANN stewardship by U.S.Department of Commerce
- 2019-....
- ?
Regulating Internet: non-legal norms

• Request for Comments // Request for Proposals
  • Supported by IETF
  • Full list see https://www.ietf.org/download/rfc-index.txt
ASCII format for Network Interchange

For concreteness, we suggest the use of standard 7-bit ASCII embedded in an 8-bit byte whose high order bit is always 0. This leads to the standard code given on the attached page, copies from USAS X3, 4-1968. This code will be used over HOST-HOST primary connections. Break characters will be defined by the receiving remote host, e.g., SRI uses "" (ASCII X'2E' or 2/14) as the end-of-line character, where as UCLA uses X'OD' or 0/13 (carriage return). USA Standard Code for Information Interchange

1. Scope

This coded character set is to be used for the general interchange of information among information processing systems, communication systems, and associated equipment.
Technical organizations of Internet governance

- Internet Society, [www.isoc.org](http://www.isoc.org)
- Internet Engineering Task Force [www.ietf.org](http://www.ietf.org)
- Internet Engineering Steering Group
- Internet Research Task Force
- Internet Architecture Board

- {World Wide Web Consortium [w3.org](http://w3.org) }
Vinton Cerf
Robert Kahn
Jon Postel
Tim Berners-Lee
Our Vision

The Internet is for everyone.

Read about our mission.

Our Beginning

The Internet Society was founded in 1992 by a number of people involved with the Internet Engineering Task Force (IETF). From those early days, one of our principal rationales is to provide an organizational home for and financial support for the Internet standards process.

Read about how we started and our relationship with the IETF.
WHAT DOES ICANN DO?

To reach another person on the Internet you have to type an address into your device—a name or a number. That address must be unique, so computers will know where to find each other. ICANN maintains and administers these unique identifiers across the world. Without ICANN’s management of this system, known as the Domain Name System (DNS), we wouldn’t have a global, scalable Internet where we can find each other.
ICANN is a not-for-profit corporation dedicated to keeping the Internet secure, stable and interoperable. ICANN coordinates:

- Allocation and assignment of three sets of unique identifiers of the Internet: domain names, IP addresses, and protocol parameters
- Operation and evolution of the DNS root name server system
- Policy development reasonably and appropriately related to these technical functions
Public Technical Identifiers (PTI) = Internet Assigned Numbers Authority (IANA), iana.org

### Root Zone Database

The Root Zone Database represents the delegation details of top-level domains, including gTLDs such as .com, and country-code TLDs such as .uk. As the manager of the DNS root zone, we are responsible for coordinating these delegations in accordance with our policies and procedures.

Much of this data is also available via the WHOIS protocol at whois.iana.org.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Type</th>
<th>TLD Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td>.aaa</td>
<td>generic</td>
<td>American Automobile Association, Inc.</td>
</tr>
<tr>
<td>.aarp</td>
<td>generic</td>
<td>AARP</td>
</tr>
<tr>
<td>.abarth</td>
<td>generic</td>
<td>Fiat Chrysler Automobiles N.V.</td>
</tr>
<tr>
<td>.abb</td>
<td>generic</td>
<td>ABB Ltd</td>
</tr>
<tr>
<td>.abbott</td>
<td>generic</td>
<td>Abbott Laboratories, Inc.</td>
</tr>
<tr>
<td>.abbvie</td>
<td>generic</td>
<td>AbbVie Inc.</td>
</tr>
<tr>
<td>.abc</td>
<td>generic</td>
<td>Disney Enterprises, Inc.</td>
</tr>
<tr>
<td>.able</td>
<td>generic</td>
<td>Able Inc.</td>
</tr>
<tr>
<td>.abogado</td>
<td>generic</td>
<td>Minds + Machines Group Limited</td>
</tr>
<tr>
<td>.abudhabi</td>
<td>generic</td>
<td>Abu Dhabi Systems and Information Centre</td>
</tr>
<tr>
<td>.ac</td>
<td>country-code</td>
<td>Network Information Center (AC Domain Registry) c/o Cable and Wireless (Ascension Island)</td>
</tr>
<tr>
<td>.academy</td>
<td>generic</td>
<td>Binky Moon, LLC</td>
</tr>
<tr>
<td>.accenture</td>
<td>generic</td>
<td>Accenture plc</td>
</tr>
<tr>
<td>.accountant</td>
<td>generic</td>
<td>dot Accountant Limited</td>
</tr>
</tbody>
</table>
What should be kept in mind if we really want a safe Internet

- Different participants (governance actors) in different layers
  - Not coincide in all layers, should be differentiated!

- New “dimensions” of the governance
  - for ICANN: traditionally triad ‘security/stability/resiliency’
  - NEW: interoperability (?)
  - NEW: trust (!)

- Different set of ‘documents’ for different layers
  - Not only formal ‘standards and regulatory documents (incl. legislation), but also informal interaction between governance actors

- Mixture (intentional or un-intentional) of governance methods, actors and documents -> over-politicization 😞 -> low efficiency in countering cybercrime
What may be done better (or in addition to what is already done)

- **Multi-layer nature of the Internet Governance** should **ALWAYS** be taken into consideration

- **Awareness raising** (education, trainings, discussions etc.) efforts are the crucial factor
  - Should be done continuously // Primary importance for keeping cybersecurity

- **Be ready for over-politicization**
  - Even for terminology issues

- **Trust** = new dimension
  - Should be taught/explained in the same manner, as it was managed with ‘Cross-border nature of the Internet’ dimension

- **Ungrounded** (or badly prepared, or not agreed with other stakeholders) decisions on the Internet Governance => just another risk factor (threat to the Cyber Security)
• **Openness** of decision-making process
  • Access to all materials on-line
  • Fixing and announcing all deadlines
  • Regular reporting

• **Professionalism** участников процесса выработки решений
  • May be fully revealed during discussions («all opinions should be listened, all statements should be grounded»)

• **Continuity** of all processes: discussions -> decisions -> implementation -> control
  • Not only procedures itself, but also instant control over their implementation on regular basis (review process)

• Possibility of **personal communications** of the participants
  • Regular (or, at least, initial and final) f2f meetings of all interested stakeholders
  • Use of modern collaboration tools (online, e-mails, distribution lists, video calls etc.

• **Institutionalisation** of decision-making process on international level
  • **Confidence measures** (as by international law)
  • Feasibility of an international legal instrument (agreement, convention, regulation)
Thanks for your attention!