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INSIGHT

A Revisit of the Domain Name System After Russia's Invasion of Ukraine

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Following Russia's invasion of Ukraine in February 2022, Ukrainian Deputy Prime Minister Mykhailo Fedorov asked the Internet Corporation for Assigned Names and Numbers (ICANN) to sanction Russia's internet access. Federov requested changes to the domain name system (DNS)—revoking the top-level domains ".ru," ".рф," and ".su" and shutting down four DNS root servers located in Russia—to "help users seek for reliable information in alternative domain zones." ICANN responded that (1) ICANN does not "take unilateral action to disconnect" domains, and (2) independent operators maintain the geographically distributed DNS root server system. Further, ICANN stated it has neither the authority nor ability to impose sanctions as it "does not control internet access or content."

Days after ICANN turned down Ukraine's request, two top-tier U.S.-based internet service providers terminated their services in Russia. In an open letter to the Biden Administration, 41 civil society organizations that advocate for digital rights cautioned against sanctions that would disrupt internet access for Russian users and inhibit their ability to access factual information and organize opposition to the war. The White House reportedly stated that "it would be ill-advised to limit the people of Russia's access to the internet, and the U.S. government has not taken any actions to block [their access]."

Domain Names and DNS Root Servers in Russia

Internet users can use domain names (see examples in **Figure 1** and **Figure 2**) to locate online resources (e.g., web pages, email servers, and files hosted by a server). The rightmost textual segment separated by the dot represents the top-level domain (TLD). TLDs fall into two classes—generic TLDs (gTLDs) such as ".com," ".org," ".gov," and ".edu," and two-letter country-code TLDs (ccTLDs) defined by the ISO 3166 standard. In Ukraine's request, ".ru" is the ccTLD reserved for use in Russia; ".su" was the ccTLD registered by the Soviet Union but that remains in use by Russia; and ".рф" (representing "rf" in Cyrillic) is another Russian ccTLD under ICANN's Internationalized Domain Name (IDN) program.

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Figure 1. A Domain Name in a gTLD

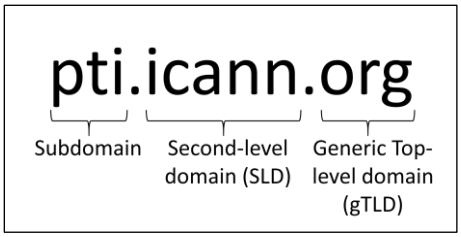
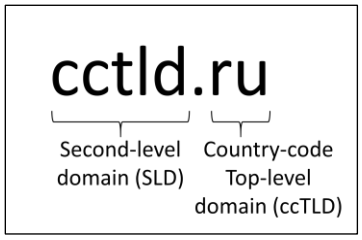


Figure 2. A Domain Name in a ccTLD



Source: Illustrations created by CRS.

ICANN manages TLDs by delegating administrative responsibilities (e.g., domain name registrations within a ccTLD) to independent TLD operators and maintaining the authoritative record of them. A Moscow-based organization is designated as the ccTLD manager of ".ru" and ".рф," and another Russian institute as the manager of ".su." According to the technical support center of the Russian managers, there are more than 5.8 million second-level domains (SLDs, the segment to the left of the TLD) under the three ccTLDs. ICANN has no precedent for revoking a ccTLD. Hypothetically, registrants would not be able to register new SLDs under a ccTLD if it ceased to exist, but existing domain names might continue to work unless ICANN coordinated a removal of all resource records within that ccTLD from the DNS.

In addition to a text-based domain name, a unique numeric identifier—Internet Protocol (IP) address—is assigned to each host server. To visit ICANN's website, for example, a user's device must know the server's IP address, 192.0.43.7. The DNS allows the user to enter the domain name, icann.org, instead of its IP address, making the internet easier to navigate.

The DNS works by a hierarchy of name servers that host databases containing records that enable the translation of domain names into IP addresses. At the top of that hierarchy are root servers that provide IP addresses for lower-level name servers for each TLD. Root servers are critical because a domain name/IP address query starts by querying the TLD and continues by querying lower-level SLD and subdomain name servers until a name server returns the IP address of the domain name (as illustrated by this example).

ICANN delegates the administration of 12 logical DNS root servers to 11 independent organizations, and operates another root server itself. The 12 root server operators together manage over 1,500 instances (or physical root servers) worldwide. The four instances that Ukraine asked ICANN to shut down are managed and controlled by ICANN but located in Russia. According to ICANN, these instances collectively receive about 2,000 DNS queries per second at their daily peak times. Shutting down these four instances in Russia might result in redirecting those queries to instances managed by other root server operators and slowing down network services for some Russian users.

Issues for Congressional Consideration

ICANN, a nonprofit public-benefit corporation headquartered in California, managed the DNS and related internet governance matters through contracts and agreements with the U.S. Department of Commerce (DOC) until late 2016. ICANN has since conducted those DNS functions independently. The National Telecommunications and Information Administration (NTIA, an agency within DOC) represents the U.S. government on ICANN's Governmental Advisory Committee, which provides public policy advice to ICANN's Board of Directors. Congress may consider whether to re-evaluate the U.S. relationship with ICANN and how to maintain U.S. leadership in ICANN.

Congress may also be interested in examining U.S. leadership in the International Telecommunication Union (ITU). Since 2012, Russia has pushed for a DNS governance mechanism at ITU rather than the private-sector-led ICANN. In response, Congress expressed its intent in 2012 that the Secretaries of State and Commerce "should preserve and advance" the ICANN multi-stakeholder model that governs the internet free from government control. In 2021, Russia renewed its request for the multilateral government approach at the ITU. NTIA Administrator Alan Davidson testified at a recent House oversight hearing that one of NTIA's priorities in 2022 was to "advocate for America's vision of free and open communications around the world" and to support the election of Doreen Bogdan-Martin, a U.S. candidate, to be ITU's next Secretary General. The Department of State also endorsed Bogdan-Martin's candidacy. Russia's efforts to move DNS governance from ICANN to ITU has heightened interest in ITU's September 2022 election, in which Bogdan-Martin is running against a Russian candidate. The outcome of the election may influence the scope and direction of ITU's internet governance policies and activities throughout the winner's four-year term.

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