

Geo-ranking the Internet

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The Internet is a critical component of modern communication for billions of people and businesses. But, how resilient is it to sabotage, accidents and political abuse? Writing in the *International Journal of Networking and Virtual Organisations* this month, researchers in Germany explain how geography is one of the most prominent factors in how well the Internet might cope with such issues particularly in terms of misuse for political ends. Specifically, in their research paper, Annika Baumann and Benjamin Fabian of the Institute of Information Systems at Humboldt-Universität zu Berlin, describe a new metric for assessing resilience at a national level.

The internet is commonly defined as a global system of computer networks interconnected via the standard internet protocol suite (TCP/IP) with servers routing data through approximately 70 000 [autonomous systems](#). Business and commercial users quickly become aware of problems at the individual site level when their favorite web destination is taken offline by a malicious denial of service (DoS) attack or other problem; this can be mission critical if the target is an email provider or cloud computing service. On the wider scale there have been issues of personal and private data, including usernames, passwords, and [credit card details](#) being released into the public domain unwittingly or more often than not by hackers. Additionally, whole regions can succumb to problems when there are problems with the Domain Name Systems (DNS) that convert a web address into the corresponding IP address as well as malware and net bots. Then there are the outages caused by natural disasters, hurricanes, earthquakes and volcanic eruptions, for instance.

The structure of the Internet, initially developed as a military tool and designed on a distributed network basis to avoid global problems, is yet to fail completely. One must assume that for the whole Internet to fail, there would have to be significant problems across the globe that would be shaking civilization at a much deeper level than even war. As such, it is on the local and national level of problems that Baumann and Fabian focus.

"We aim to develop a metric that measures the geographical internet resilience based on a country level," the team reports. "This metric encompasses several geographic, technological, as well as control-based, indices, combining them into a single, rank-based score that estimates the internet resilience of a particular country compared to others." The team adds, that, "Such a comparison could serve as an indicator for regions at risk, which could support international politics, internet businesses or freedom activists in improving internet resilience and censorship resistance by focusing their activities."

The team pulls together nine factors it considers critical to internet resilience at the national level:

1. Absolute number of autonomous systems per country
2. Number of autonomous systems per a square kilometer per country
3. Ratio of the number of autonomous systems to the number of inhabitants per country
4. Number of autonomous systems in relation to the population density of a country
5. Absolute number of IP addresses per country
6. Ratio of the number of ASs per number of IP address per country
7. Number of IP addresses per capita per country
8. Risk score of becoming a target for cyber attacks

9. World press freedom index for that country

"A combination of these metrics will balance the geographical characteristics in such a way that only those countries will be on the top of the final lists which are superior in all areas," the team asserts. The team has now used their resilience metric to rank various nations. The most resilient countries are in order of decreasing strength: Latvia, Switzerland, Romania, Poland, Austria, New Zealand, Ukraine, Slovenia, USA, Sweden. At the bottom of their list are the following nations: Reunion, Turkmenistan, Cape Verde, Chad, Ethiopia, South Sudan, Guinea-Bissau, Eritrea, Yemen, Senegal, North Korea.

Given economics, social, political and technical considerations it is, the teams suggest, not surprising that European nations fill the top spaces, while African nations and others with poorly developed economies rank very poorly for internet resilience. They suggest that an important question must now be answered by further research: What factors play the key role in the development of the network structure on a country level?

More information: Baumann, A. and Fabian, B. (2013) 'Towards measuring the geographic and political resilience of the internet', *Int. J. Networking and Virtual Organisations*, Vol. 13, No. 4, pp.365-384.

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