You Must Be Joking... Should the Internet have an ON/OFF switch?

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ABSTRACT

If despite your better judgment you decide to read this article, keep in mind that it was written during the summer, and this has been the hottest summer ever. To avoid such articles in the future, respond to the call below:

Request for Contributions: Do you have a news-item of interest? Social gossip? Do you have a pressing question that needs a serious answer? Don't procrastinate: send me an email with"CCR" in the subject.

Categories and Subject Descriptors

K.4 [**Computers and Society**]

General Terms

Management, Legal Aspects

To Switch or Not To Switch?

This was a question that was asked at the end of the Cerf and Kahn Turing award lecture. It seemed silly at the time, the room was hot, and some people practically laughed at the cute older gentleman that asked the question. However, the more I think about it, the more I wonder if it is actually a serious question. Ok, I am lying, what I am really wondering is whether I can write a small article on this topic.

Anecdote: One of my favourite jokes of "clueless computer-illiterate statements" is the one where, at the time of 9600 Baud modems, someone gives a floppy to his computer-savvy friend and tells him: "Can you put the Internet on this floppy disk for me?" Pretty optimistic request, don't you think? Clearly, the guy wants to get whatever programs are needed to access the Internet. However, isn't it intriguing: having the Internet on a disk. What would you do with such disk, and how much would it weigh?

Having no clue how to go about this, I will start by asking questions.

Why would we want the Internet to have a switch? Very good question, but I believe there is a plethora (note: greek word) of reasons.

Being Greek and all, the first thought that came to my mind was strikes. Striking in the US is frowned upon and used as a last resort action for blue-collar workers (do I have any facts? Of course not, what is with this obsession for truth?) In many countries, striking is considered a form of dialogue and/or a form of advancing your career. It not uncommon for professors, teachers, lawyers, policemen, doctors, students, high-school kids to strike and even occupy buildings. You see where I am going with this small detour, now. The government cuts the funding for research, the switch is OFF. NSF declares that it will primarily fund wireless and sensors research, the switch is OFF. The Union of Internet Researchers (UIR) supported by the Union of North American Network Operators Group (U-NANOG) places strict demands for increased funding and free child-care on a 24 hour basis (research never sleeps). I see most European colleagues thinking: "Is that a joke? Because me, I think this could actually work."

An Internet switch could act as a giant reset button. It is brilliant! There is a major misconfiguration, packets are flailing about, routes are flapping, TCPs are shutting down, and TPCs can't organize conferences. "Don't panic", says a voice. We press the button, count for 30 seconds[1], restart, and everything is peachy. I can sense your disbelief, but let me ask you something: did your engineering education prepare you for the above procedure, which seems to work for modems, computers, and laptops? At which point in the undergraduate curriculum, do we get into the Universal Recovery Method (URM[2]). I have to say that I will never forget the first time I saw the URM in action. When my older brother told me that apart from rebooting, we should also unplug the machine, I could not believe my ears. It worked. I have lost my hearing since.

Seriously now, with the viruses creating havoc, and costing millions, it is not a bad idea to have a switch. You power down for a couple of hours, analyze the signature of the virus, find an antidote, and make a patch. The only problem is how do you distribute the patch without the Internet. This idea needs work. How about the telephone network or the cellphone network? But wait, both networks use the Internet. Hmm..., I think we need to go back to pigeons that will carry CD-ROMs. Yes, pigeons are the only solution[3]. And they are edible too, I have been told.

Note that here we are talking about an Internet-wide switching off. However, partial switching off of the Internet is possible. There has been some work on "greening the Internet" by turning routers off when they are not in use by

[1]In this case, 30 seconds makes sense, unless of course, Tim, Anja or kc, increase the MRAI for BGP to more than 30 seconds.

[2]Many people believe that it is a coincidence that it only differs by one letter from URL, but this is not the right forum to talk about conspiracies.

[3]Apparently, there has been an actual RFC 1149 "IP over Avian Carriers", inevitably followed by RFC 2549 "IP over Avian Carriers with QoS". Thanks Jennifer Rexford for pointing this out. They are going straight to my top ten reading list.

some folks in Portland State University. Or we could switch off particular areas selectively, as punishment, for example. Too much spam coming from this country, switch them off. That will bring some self-regulation: people will be encouraged to physically clobber misbehaving users based on geographical proximity. Is this the way to network accountability? Although these ideas could be interesting, they are beyond the scope of this article.

Who should control the switch? Another excellent question. I have to say I am impressed.

My gut reaction to this question was that inevitably we need to have the King of the Internet. Yes, the Father of the Internet (see previous article for a meaningless discussion on this topic) could be also the King, but it does not have to. Of course, it could also be the Queen of the Internet, or more generally the Royal Person of the Internet. If you have seen the Planet of the Apes, and you are easily impressionable like me, we can directly go to Royal Mammal of the Internet. But I am diverging. The problem with this solution is of course the selection: who gets to be Royal Mammal? It is clearly a very prestigious title, and the responsibility that comes with it is non-trivial. Should the King be elected or appointed? Or inherited? Should it be for life or have a term? If you are ridiculously rich, can you buy the position? Money can't buy happiness, it should at least be able to buy you a switch.

Look no further. We have the solution. We will create a reality show titled: "So, you think you can be the King?" or "Internet's Next King". We get an "interesting" group of people to compete for the position. Each week we have various tests to see which person is more suitable or to simply humiliate them in public. For example, a test could be to create a small home LAN, or unjam an office printer using only your tongue. You know the rest: each week one person gets voted off. We will have a panel of judges (NSF-style), which provides evaluations and commentary, and the public votes using their cellphones. It is brilliant. I will be the host, of course, since this is my idea. We can even have the group to vote for the elimination, form groups, and rat on each other for added drama.

Don't tell me that you fail to see the main goal here. The proceeds from the show and part of the lucrative book and movie deals, go back to Internet researchers. We are talking about self-sustainable research here.

Where should the switch be located? Another fundamental question. The obvious reaction to this question is to put it in a safe place. Say, like Camp David which is where the president goes, when the going gets tough. It has to be safe, or at least safer than where everybody else is. But there is a flaw in this argument: why would anyone trust the switch to be on US soil? Why would any one country be trusted with the switch?

I was about to give up on the whole scheme, when inspiration hit me like a bucket of cement. "Most problems in computer science can be solved with indirection or hierarchy". It has worked time and time again. Here we will go with **indirection**:

We decide on a place that contains the address of the switch. The actual switch is in an different place. The first place is a "pointer" to the switch. Brilliant, just like in the Guinness advertisements. Clearly, we can use indirection as many times as we want.

Robustness against accident or malice. There are several other issues I thought of while taking a shower this morning.

a. Physical protection. We need to make sure that no one physical action like an explosion or a tsunami can destroy the switch and power everything down. The solution to that would be to have a switch designed in such a way that if the room or box it resides in are blown up, the switching capability is also destroyed. Intuitively, we can think of this as a collocated fuse, which when destroyed it disables the capability of the switch to switch off. I am working on the actual design with a group of selected designers, although most of them turned out to be interior designers.

b. Single point of failure. I am sure you have been wondering about this. The truth is that this is not a problem. Whatever we said about one switch so far can without loss of generality generalize to k switches. For the case of $k = 2$, we can have the switches work as a 3-way switch like a XOR logical gate: both ON or both OFF and the Internet is ON. This way, if one switch gets stuck in OFF, we can still turn the Internet ON or OFF accordingly. This easily generalizes to k switches. Say, for example, that all the countries that have a veto in the United Nations have a switch.

A problem we have not solved yet is what happens if someone takes control of a switch and starts flicking it back and forth. At least, in this case the requirement is that the "attacker" has to physically be near the switch.

Acknowledgments: I would like to thank Mark Crovella for suggesting the topic. I would also like to apologize for what I did to it.