

Special report:
China and the internet

The Great Firewall

The art of concealment

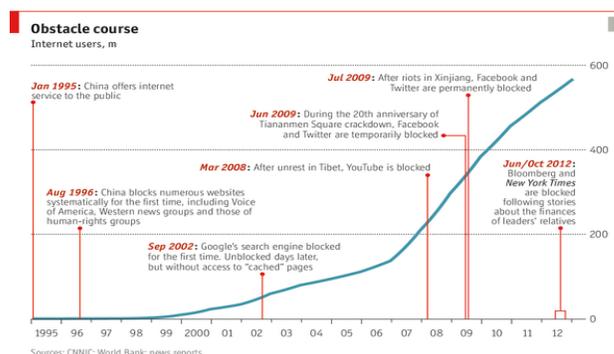
Chinese screening of online material from abroad is becoming ever more sophisticated

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ON FEBRUARY 9TH, Chinese New Year's Eve, Fang Binxing, known in China as the father of the Great Firewall, wished his followers on Sina Weibo a happy Year of the Snake. As always whenever Mr Fang tweets, thousands of fellow microbloggers sent messages along the lines of "get lost". They could not reply directly: Mr Fang gets so much abuse for his role in engineering China's censorship technology that the "comments" function on his microblog page had to be disabled long ago. Nor can users easily find the comments on the 35,000 retweets of his new-year post: Sina has blocked access to those as well.

Mr Fang is used to being, in the parlance of the system he helped create, a "sensitive keyword". He is one of the most important figures in the history of the Chinese internet, and perhaps its most reviled. In 2011 several students in Wuhan, in central China, said they threw eggs and a pair of shoes at Mr Fang when he visited their campus to give a speech. There was not a little irony in their spreading the news of their action (and a photograph of one student's shoeless feet) on Twitter, which thanks to Mr Fang's work is accessible to China's internet users only with special circumvention tools.

Exactly how Mr Fang constructed his wall is a state secret and the subject of much speculation and academic research. Although China's entire system of internet controls is often described under the heading "the Great Firewall" (a term that first appeared in a *Wired* magazine article



in 1997), in reality the Great Firewall is probably the simplest part of a complex effort involving many different agencies and companies. China's cyber-police have their own much larger and more expensive system of domestic filtering and surveillance, Golden Shield, and internet sites employ lots of people to censor their own content and implement government directives.

The Great Firewall that Mr Fang helped build stands separately, guarding a handful of gateways through which all foreign internet content and communications enter the country, sniffing through small packets of data to detect and block access to "harmful" foreign content. It is the world's most advanced national firewall, having evolved from crudely blocking entire web domains (though it still does some of this) to blocking just particular pages within websites (see chart above).

Mr Fang's work on this system started in 1999, at the National Computer Network and Information System Security Administration Centre, under what is now the Ministry of Industry and Information Technology. It created the modern infrastructure for filtering foreign sites. In the early years China's efforts at blocking web domains had been straightforward. From August 1996 routers filtered out a list of foreign websites, including those of Voice of America, human-rights groups, Taiwan and Tibet independence advocates and some foreign newspapers. But the early blocks did not take account of the content of individual web pages, and savvy users could easily get round them.

Now the firewall is far more capable. If users try to get on Facebook, Twitter or thousands of other websites, or if they search for a banned keyword such as "Falun Gong" or the name of one of the many jailed Chinese dissidents, they are taken to a dead end with an error message (such as "web page not available"). The system can intercept messages containing banned terms sent across China's borders on chat software. It can also block access to many circumvention tools, and in December last year it began more intensive disruption of private commercial services, called VPNs, that are widely used to "tunnel" under the firewall. It also subtly and intermittently "throttles" websites such as Google's search engine to slow them down.

Degoogled

Google has been one of China's favourite targets over the years, making it a useful measuring stick for the way that filtering technologies have developed. In September 2002 the firewall blocked Google entirely, using a technique called "DNS poisoning" that intercepts requests for web pages. The blocking made global headlines. The service was restored after nine days, but Google's "cache" pages (snapshots of web pages stored and delivered by the company), which had been a convenient way for Chinese users to find banned content, remained blocked. The Great Firewall was getting smarter. Today searches for banned keywords on Google will take users to a dead end and leave them in a virtual sin bin, blocking access to the search engine for

about 90 seconds, though other parts of the internet will remain readily available.

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The centrepiece of this sophisticated filtering effort had been the National Information Security Management System, named Project 005 after its starting date in May 2000. Mr Fang and other engineers worked on it until 2002. The project won a national prize for science and technology in 2003. It had cost \$60m to build and is believed to be the most critical and most expensive component of the Great Firewall.

Mr Fang, who in 2007 became president of Beijing University of Post and Telecommunications, has sometimes played down his involvement in such efforts, but he has clearly had a big part in them. For example, he helped develop filtering technology used for domestic search engines, according to the summary of a study (itself not in the public domain) he co-wrote in 2005. The system "has yielded good results", the summary states, and will help in "purifying the domestic internet space".

Many Chinese internet users are less keen on these advances. In January Han Weili, a professor at Fudan University in Shanghai, was attacked for inviting doctoral students to conduct research on China's Great Firewall (GFW, as Chinese users abbreviate it). His notice on the university's online bulletin board read: "Anyone interested in improving the GFW. Their team is recruiting PhD students. If interested, get in touch with me."

Mr Han felt compelled to defend himself. "So in your opinion the scientists who studied nuclear bombs should be ashamed of themselves throughout history? The launch button for nuclear weapons is controlled by the politicians of a country," Mr Han wrote in a reply that was later deleted. "As for how to use [the GFW], it's not something scientists can handle. You can be the king of morality and refuse to do it, but you don't have to condemn those who try to improve it." Mr Han later wrote that he has not worked directly on the firewall. His last word on the matter was that authorities had asked to meet him: "Both sides hate me. Damn it." That comment too was deleted.

Mr Han has a point. It is generally senior bureaucrats, not engineers like Mr Fang, who decide what foreign sites are unfit for Chinese users, such as YouTube (blocked permanently in 2009), Facebook and Twitter (blocked since riots in Xinjiang in 2009) and Bloomberg and the *New York Times* (blocked in 2012, after publishing detailed reports on the finances of Chinese leaders' families).

The engineers' job is to fine-tune the instruments. Michael Robinson, an American network engineer who in 1996 worked on some of the early infrastructure of commercial internet access

in China, says that “most of the development of the technical capabilities of the Great Firewall over the past 15 years has been toward an ability to minimise the impact of the government’s content-control policies through more precise mechanisms.” Such improvements often aim to minimise not the censorship itself but the sense of being censored. One technique is to leave tweets that have been removed from public circulation visible to those who posted them.

To most Chinese internet users, though, exactly who is responsible for what in the machinery of censorship matters much less than the idea of censorship itself. Mr Fang is a symbol, and the term GFW has become a hated archetype. It is shorthand for the restriction on their experience of the internet and for the increasing number of Chinese words that have become too sensitive to use, including many innocuous ones that happen to be homophones for sensitive ones. This prompted one user to write a science-fiction parody in which a new project, GFW Turbo, becomes self-aware and runs out of control, banning almost the entire Chinese language. The parody looks ahead to 2020 when a “National Anti-GFW Ministry” adds “2,000 more Chinese characters to meet the people’s ever-increasing needs for means of production, only to find them censored within two seconds.” Finally, in 2025, there is only one phrase left in the Chinese language: “sensitive word”.

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