The Citizen Lab

Routing Gone Wild:

Documenting upstream filtering in Oman via India

KEY FINDINGS

- Data collected from Oman shows that web filtering applied by India-based ISPs is restricting access to content for customers of an ISP in Oman. While unusual, content filtering undertaken in one political jurisdiction can have an effect on users in another political jurisdiction as a result of ISP routing arrangements - a phenomenon known as "upstream filtering."
- Content found to be filtered includes news sites, political blogs and file sharing sites.
- Some variability in filtering was documented, potentially linked to certain measures to loosen filtering regulations in India.

BACKGROUND

The OpenNet Initiative[1] (ONI) has investigated Internet filtering and surveillance practices since 2003 and has documented national-level filtering of the Internet in over forty countries.[2] Traditionally, such filtering is implemented by Internet service providers (ISPs) at the request of governments for the purpose of restricting content available to domestic audiences. In general, conventional web filtering is designed for exclusively domestic impact, though other forms of content control, such as takedown requests, may affect access across borders.

However, content filtration is not always limited by jurisdiction. ISPs may engage in peering[3] or transit agreements[4] with other providers as a means of gaining access to the broader Internet. If ISPs peer with providers who filter the connection provided to their peers, that filtering may be passed on to the ISP's user base. While unusual, past ONI research has documented this practice, known as "upstream filtering," on several occasions. For example, in 2009, ONI research in Kyrgyzstan found that a number of websites, including news sites and blogging platforms, were inaccessible as a result of blocking by the state ISP in

Kazakhstan, which sells its service to KyrgyzTelecom.[5] Similar behaviour was observed in Uzbekistan in 2004, where content filtering on one Uzbek ISP closely matched that seen in China, a finding supplemented by evidence that this ISP was purchasing connectivity service from China Telecom.[6]

This brief documents and analyzes the upstream filtering of web content for users of Oman's Omantel ISP as a result of content restrictions implemented in India. Both India and Oman, it should be noted, already have domestic filtering regimes in place. Previous research by the OpenNet Initiative on Omantel has documented filtering of Internet content related to pornography, circumvention tools, gay and lesbian content, as well as content critical of religion.[7] Similar research by the OpenNet Initiative has found that ISPs in India selectively filter content relating to conflict/security and Internet tools, with a high degree of variability between ISPs.[8]

Omantel has existing relationships with ISPs in India. Omantel and Indian ISP Bharti Airtel have a traffic peering arrangement through ASNs[9] AS8529 and AS9498, respectively.[10] Bharti Airtel was in fact reported to be a leading contender to purchase a 25% stake in Omantel during that ISP's privatization process in 2008[11]; however, by 2011 the sale was reportedly on hold.[12] Also in 2008, Bharti Airtel and Omantel were among the 15 companies that partnered to build the Europe India Gateway, a 15,000 kilometer fibre optic cable project connecting 13 countries.[13]

METHODS

Data was gathered for this research from a number of sources. Access to the Omantel network was obtained through publicly available proxies and through testing undertaken by individuals located in Oman who are customers of Omantel's service. An automated process was run that attempted to access a list of several hundred URLs suspected to be blocked. The results of this process were analyzed to identify blocked content. The URLs that were identified as blocked were then manually confirmed by testers in Oman.

Lists of content suspected of being blocked were gathered from a number of sources. First, content suspected of blocking in past ONI testing in India was compiled. Second, Anonymous India made public a list of allegedly blocked URLs that the group claims were obtained by hacking of Indian ISP Reliance.[14] This list of content was also added to the list of tested URLs.

FINDINGS

Testing conducted on June 18-19, 2012 through an Omantel proxy confirmed that Omantel continues to filter the content categories found in previous ONI testing. This filtering is done transparently, as users are presented with an explicit block page as seen in Figure 1 when they attempt to access banned content.

Notice...

تم حظر هذا الموقع بسبب احتوائه على محتويات تتعارض مع قوانين السلطنة. عليه يرجى تعبئة الاستمارة أدناه إذا كنت تعتقد بان الموقع لا يتضمن أي من هذه المحتويات.

This site has been blocked due to content that is contrary to the laws of the Sultanate. if you believe that the website you are trying to access does not contain any such content, please fill in and submit the form below:

WebSite*

Email Address*

Comments*

Submit

Figure 1: Block page on Omantel

However, for a number of URLs tested in Oman, a different block page was displayed, as seen in Figure 2:

http://indybay.org/

http://indybay.org/

"This website/URL has been blocked until further notice either pursuant to Court orders or on the Directions issued by the Department of Telecommunications"
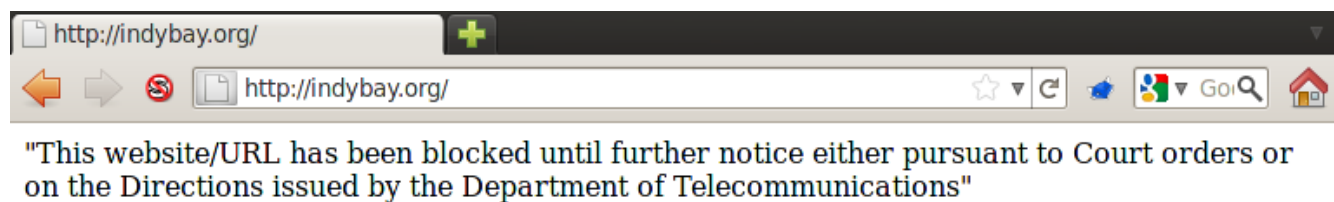
Figure 2: Block page found during testing on Omantel

The text of this block page is consistent with numerous reports of block pages employed in content filtering in India.[15] A list of several hundred URLs was then tested, with 41 of these found to display the block page seen in Figure 2 (the "India block page"). These URLs were also accessed from the Citizen Lab in Toronto, with no sites found to display the block page text seen in Figure 2.

The following URLs were found to be blocked with this block page on Omantel:

- http://desihits.net
- http://freeplaymp3songdownload.com
- http://mp3feelings.com

- http://hinduexistence.wordpress.com/2012/03/oh-not-again.jpg
- http://bollywoodmp4.com
- http://mastmag.com
- http://bollywoodstop.com
- http://indianmasti.net
- http://absongs.com
- http://123tamilforum.com
- http://desiden.mobi
- http://imagessearchyahoo.com
- http://smashits.com
- http://ragalahari.com
- http://gogrumogru.com
- http://merrimusings.typepad.com
- http://dacoolsite.com
- http://karachimag.com
- http://songbox.pk
- http://rkmania.com
- http://desijammers.com
- http://apunkabollywood.com
- http://zinkwap.com
- http://topupmp3.com
- http://hindimirchi.com
- http://mazafm.com
- http://www.indybay.org
- http://www.bloggernews.net/124029/
- http://downloadprovider.me
- http://desimusic.com
- http://wapmaza.mobi
- http://imamali8.com
- http://town67.com
- http://fun1001.com
- http://thenisai.com
- http://freeindisongs.com
- http://www.bloggernews.net/124029
- http://playlist.pk
- http://www.chakpak.com/find/images/kamasutra-hindi-movie
- http://vmusiq.com

Many of these URLs are sites dedicated to Indian and Pakistani culture and entertainment, including file sharing sites with links to Bollywood movies and Indian and Pakistani music. Others are blogging platforms or media/free expression sites. The URL http://www.indybay.org is the website of the San Francisco Bay Area Independent Media Center, while http://www.bloggernews.net/124029 is a blog that discusses Internet censorship in India.

A number of factors lead to the conclusion that this is in fact upstream filtering in Oman as a result of content filtering in India. First, the block page seen in Figure 2 refers to the 'Department of Telecommunications'; India's telecommunications regulator is called the Department of Telecommunications,[16] while Oman's sector is regulated by the Telecommunications Regulatory Authority.[17] Second, traceroutes of attempts to access blocked content demonstrate that traffic passed through India, as shown in Figure 3.

```
traceroute to mastmag.com (174.123.156.106), 64 hops max, 72 byte packets
1 192.168.1.1 (192.168.1.1) 66.044 ms 3.935 ms 6.683 ms
2 x.x.x.x (x.x.x.x) 16.477 ms 17.197 ms 15.524 ms
3 x.x.x.x  (x.x.x.x) 15.885 ms 18.995 ms 37.940 ms
4 x.x.x.x (x.x.x.x) 18.393 ms 48.191 ms 19.736 ms
5 x.x.x.x (x.x.x.x) 17.494 ms 26.801 ms 17.966 ms
6 x.x.x.x (x.x.x.x) 39.703 ms 78.192 ms 25.148 ms
7 82.178.33.105 (82.178.33.105) 19.412 ms 200.110 ms 124.045 ms
8 82.178.33.98 (82.178.33.98) 70.734 ms 20.072 ms 18.317 ms
9 aes-static-249.114.144.59.airtel.in (59.144.114.249) 41.916 ms 41.412 ms 42.236 ms
10 182.79.255.33 (182.79.255.33) 321.556 ms 321.245 ms 321.875 ms
11 te1-7.bbr01.tl01.nyc01.networklayer.com (198.32.160.27) 325.944 ms 376.773 ms 326.187 ms
12 ae7.bbr02.tl01.nyc01.networklayer.com (173.192.18.177) 365.984 ms 326.544 ms 353.520 ms
13 ae1.bbr01.eq01.chi01.networklayer.com (173.192.18.132) 348.768 ms 347.037 ms 361.358 ms
14 ae20.bbr01.eq01.dal03.networklayer.com (173.192.18.136) 335.994 ms 336.300 ms 340.848 ms
15 ae0.bbr01.sr02.hou02.networklayer.com (173.192.18.219) 338.933 ms 340.935 ms 340.020 ms
16 po31.dsr01.hstntx2.networklayer.com (173.192.18.233) 339.038 ms 350.036 ms 344.592 ms
17 p01.car06.hstntx2.networklayer.com (74.55.252.82) 344.123 ms 343.790 ms 344.693 ms
18 6a.9c.7bae.static.theplanet.com (174.123.156.106) 338.620 ms 348.246 ms 338.432 ms
```

Figure 3: Trace route from Oman to mastmag.com, a restricted website ('x.x.x.x' refers to redacted IP addresses)

In this trace route, it can be seen in hop #9 that traffic from Oman, where the URL was requested, to the hosting provider in the United States, passes through Bharti Airtel in India. This website, which is an Indian music and movie download site, was blocked with the India block page in Oman. While the passage of network traffic through another country is not in itself unusual, the return of an India block page in Oman would not occur without the passage of network traffic through India.

Next, much of the content found to be blocked is related to India and does not seem consistent with past filtering practices observed in Oman. This primarily includes file sharing and multimedia sites relating to Indian culture, including Bollywood movies and Indian music. Further, as mentioned above, many of the

URLs found to be blocked with the India block page have been reported elsewhere as prohibited content in India. Finally, the text seen in the India block page is widely reported by Indian Internet users and media in discussions of blocked content in India, which content includes many of the URLs found to be blocked in Oman.[18]

VARIABILITY IN RESULTS

These experiments were run over multiple days from June 18-28, 2012. Testing up to June 24 found that the above list of URLs was blocked consistently. However, testing after June 25 revealed some variability in the results. Testing conducted through a public Omantel proxy on June 25 found that none of the URLs listed above were blocked with the India block page. This result was confirmed by an Omantel user in Oman, who found that none of the URLs listed above were blocked. These results were again confirmed by additional proxy testing on June 27, 2012.

It should be noted that this change in filtering behaviour followed a June 22, 2012 ruling by India's Madras High Court, which modified a previous court order regarding blocking of websites through which certain Bollywood films were shared. The new ruling requires ISPs to block the pirated content on a per-URL basis rather than restricting access to an entire site.[19] It is plausible that a loosening of filtering in India as a result of this court order was reflected in upstream filtering in Oman. However, testing conducted through an Omantel proxy on June 28 again confirmed many of the URLs listed above blocked with the India block page.

There are a number of possible explanations for this variability in behaviour. First, it is possible that factors including how Omantel routes traffic, and the network status of available routes at the time of testing, may cause packets from Omantel to take a different path to their destination that does not pass through a filtered connection from India. If this is the case, it is possible the change in filtering seen in Oman that coincided with the Indian court's ruling on filtering was merely a coincidence. Second, it is possible that filtering in India is not consistently applied at all times, a trend seen in other countries.

LIMITATIONS

The majority of testing results referenced here were gathered from the use of public proxies in Oman. While testing was done with IP addresses registered to Omantel, it remains possible that this proxy connection provides connectivity that does not reflect the experience of the average user in Oman. However, the results found through the proxy were confirmed by individual users of Omantel on multiple occasions.

DISCUSSION

The practice of upstream filtering raises a number of questions, including jurisdictional issues and the lack of recourse available to users in Oman. The application of filters in India restricts Internet users in Oman from

accessing content, potentially even content produced in Oman itself, as a result of actions taken for domestic purposes within India. Users in Oman did not consent to this blocking, are left with little recourse for challenging these actions, and have limited means of accessing this content, which may or may not be in violation of Omani regulations. Combined with the significant filtering implemented by Omantel itself, this practice places Internet users in Oman behind multiple layers of national-level filtering.

ACKNOWLEDGEMENTS

DATA

Raw data for the proxy test results cited here can be found in the following formats:

- Summarized results [Google doc]
- Summarized results [csv]
- Raw data [zip - html, csv, txt]

The data presented is from a June 18, 2012 test run of a URL list through two Omantel proxies, as well as from the Czech Republic as a control. There are three types of block pages that have been highlighted in the columns:

- oman_block_social - An Omani block page that specifies that the blocking was due to "societal and cultural norms of the sultanate."
- oman_block_laws - An Omani block page that specifies the reason for blocking was a violation of the law.
- india_block - An Indian block page that specifies the reason for blocking was a court order.

The presented zip file contains the html contents and headers returned during the course of this test run. To view this data, extract the zip file and open the contained index.html. Please exercise caution when following any links in this file, as the file contains contents of website data returned and we can make no guarantee as to what these sites contain. This data is presented for informational purposes only and we make no claims regarding the ownership of website content.

There were two redactions made in the data. The IP numbers of proxies used were obfuscated and the website contents of the site songdad.com were removed, due to the fact that during the time of testing this site contained the JS/Blacole exploit kit.

FOOTNOTES

[1] The OpenNet Initiative is a collaborative partnership of three institutions: the Citizen Lab at the Munk School of Global Affairs, University of Toronto; the Berkman Center for Internet & Society at Harvard University; and the SecDev Group (Ottawa). Research, analysis, and writing of this report was undertaken by the Citizen Lab.

[2] For a description of the ONI testing methodology see http://opennet.net/about-filtering

[3] Peering is the name of an agreement whereby ISPs agree to station hardware in the same location for a mutually beneficial transfer of data.

[4] Transit agreements are agreements in which ISPs allow data from another ISP to move through their infrastructure or network either by consent or for a fee.

[5] OpenNet Initiative, "Kyrgyzstan," http://opennet.net/research/profiles/kyrgyzstan

[6] OpenNet Initiative, "Internet filtering in the Commonwealth of Independent States 2006-2007" http://opennet.net/studies/cis2007

[7] OpenNet Initiative, "Oman", http://opennet.net/research/profiles/oman

[8] OpenNet Initiative, "India", http://opennet.net/research/profiles/india

[9] ASN stands for "Autonomous System Number" and refers to a collection of routing prefixes (groups of IP addresses) that are under the control of a single network operator, company or actor.

[10] Fixed Orbit, "Information for AS8529" http://www.fixedorbit.com/AS/8/AS8529.htm

[11] Rishi Raj and Anandita Singh Mankotia, "Signals are strong on Bharti's Omantel bid," Octoboer 17, 2008, The Financial Express, http://www.financialexpress.com/news/signals-are-strong-on-bhartis-omantel-bid/374505/0

[12] TeleGeography, "Government plan to sell Omantel stake still 'on hold' January 4, 2011, http://www.telegeography.com/products/commsupdate/articles/2011/01/04/government-plan-to-sell-omantel-stake-still-on-hold/

[13] Bharti Airtel, "Bharti Airtel to partner with 15 global telecom majors to build Europe Indian Gateway (EIG), a cable system from India to United Kingdom, http://bit.ly/NPEXsd

[14] Rossi Fernandes, "Anonymous India releases blocked sites list, plans peaceful protest," May 28, 2012, Tech2, http://tech2.in.com/news/general/anonymous-india-releases-blocked-sites-list-plans-peaceful-protest/310682

[15] Anand Rai, "After defacing govt sites, hackers' group Anonymous prepares for peaceful protests in top cities; Will you attend," June 4, 2012, Tech Circle, http://techcircle.vccircle.com/500/after-defacing-govt-sites-hackers%E2%80%99-group-anonymous-prepares-for-peaceful-protests-in-top-cities-will-you-attend/, Namit Gupta, "How to access blocked torrent sites in India," June 5, 2012, The ITech blocg, http://theitechblog.com/2664/access-blocked-torrent-sites-india/ , Subir Ghosh, "Who ordered Vimeo to be blocked? Not DoT, says RTI reply," June 13, 2012, Daily News & Analysis, http://www.dnaindia.com/bangalore/report_who-ordered-vimeo-to-be-blocked-not-dot-says-rti-reply_1701666

[16] See http://www.dot.gov.in/

[17] See http://www.tra.gov.om/newsite1/Default.aspx?Lang=1

[18] Vikas SN, "Reliance communications blocks The Pirate Bay and Vimeo," May 4, 2012, Medianama, http://www.medianama.com/2012/05/223-reliance-communications-blocks-the-pirate-bay-vimeo/ ;

[19] BBC News, "India unblocks the Pirate Bay and other sharing sites," June 22, 2012, http://www.bbc.com/news/technology-18551471 Prasad Krishna, "No more blocking of entire websites?" The Centre for Internet & Society, June 26, 2012, http://cis-india.org/news/no-more-blocking-of-websites

----

MEDIA COVERAGE

- *Government restrictions on websites resonate in Oman*, The Hindu, 22 July 2012
- *Omani web hit by India filter "snag"*, Times of Oman, 15 July 2012