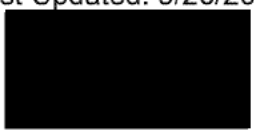
AMENDED Exhibit 743

PLAINTIFFS' OMNIBUS OPPOSITION TO DEFENDANTS' MOTIONS FOR SUMMARY JUDGMENT

YouTube School Access and HTTPS

Last Updated: 9/26/2012



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Background

With all of the valuable Educational content on YouTube, we have the potential have some real social impact by bringing YouTube into the classroom and providing access to the best teachers from around the world. The main impediment is that most schools block the domain YouTube.com because YouTube is perceived a) distracting (i.e. majority is not educational) and b) contains un-safe content for K-12.

In Q4 2011, we had implemented a solution whereby we allow schools to sign up for [HYPERLINK "http://support.google.com/youtube/bin/static.py?hl=en&guide=2592683&topic=2592688&page=guide.cs&answer=2695317" \h]. Because of the inherent complexity of this solution, only 350 tokens have been implemented worldwide (note: a token could represent an individual school, a school district, or potentially a county). Further, this filtering mechanism relies on the ability to modify the outbound HTTP request and thus is rendered ineffective by SSL.

In order to really get YouTube EDU to scale, the solution needs to be much more scalable to the point that requires minimal configuration by schools, and there are no simple workarounds such as switching urls from HTTP to HTTPS.

Specifics on current solution and issues

- **EDU-mode** support has been added to youtube.com at application level, which restricts which videos can play and disables other functionality
- Ask schools to mark outgoing HTTP traffic as **edufilter**, either as HTTP header or URL param
- When youtube.com app server sees edufilter param, **EDU-mode** is forced in the application
- HTTPS came along: students discovered that they could circumvent *EDU-mode* by navigating to [HYPERLINK "https://www.youtube.com/" \h]
- **edufilter** approach does not work for HTTPS, cannot modify outbound URL or HTTP headers
- Schools found that the only way to block https://www.youtube.com/ was to black hole DNS for www.youtube.com, blocking all youtube access and disabling the current

edufilter solution.

Goals

1. MUST Support a school specific YouTube experience - **EDU-mode** - that allows playback of whitelisted, school-friendly content
2. MUST be easily implementable by a significant fraction of schools.
3. MUST provide assurance to schools hat opening the door to **EDU-mode** won't create loopholes for access other YouTube content
4. SHOULD not encourage discrimination against HTTPS, as YouTube is preparing for move to HTTPS for logged-in users. Should allow **EDU-mode** to be accessible via HTTP and HTTPS.

Proposed Solution

Our proposal is to establish a new destination, youtubeedu.com, which is always forces the youtube app server into **EDU-mode.**

Requirements

- Maintain parallel youtubeedu.com in DNS, frontend configs, etc.
- A mechanism for school network administrators to block all youtube.com traffic
    - Recommend in the following order:
        - HTTP CONNECT blocking (ideal, but not widely viable, cannot be only option)
        - Block based on outgoing SNI header (sufficient if all clients are SNI-capable, WinXP is biggest hurdle)
        - Drop or forge DNS responses for youtube.com names, point to 127.0.0.1 or some other bogus IP (fallback option for WinXP, etc)
    - Explicitly will not:
        - Will not set up dedicated YouTube VIPs to accomodate blocking port 443 or blocking a youtube.com-specific certificate
            - Avoid creating new path to HTTPS discrimination
            - Avoid all the operational downsides of dedicated YouTube VIPs
- YouTube app server and embed player will keep all requests within this domain and always enforce *EDU-mode* on this domain

Pros

- Assurance for schools that youtube.com is clearly blocked
- Can roll app server support out incrementally on new domain (servlets/backends disabled on new domain by default until vetted to behave appropriately)
- youtubeedu.com can be used via HTTPS

- Don't encourage new forms of HTTPS discrimination

Cons

- Touches significant number of youtube backend components to eventually enable **EDU-mode** for full site.
- Maintaining parallel youtubeedu.com domain in DNS, frontend configs, etc.

Open Questions for LCE review

- **Which SSL cert / VIP to use for youtubeedu.com?**
  - **What if we want to accommodate other filtered versions of youtube using similar approach in the future? youtube.cn?**

Considerations

There are a number of alternative mechanisms we considered before settling on this proposal, a reference of these considerations is presented here.

A solution breaks down into two parts:

1. How does a client signal to youtube that EDU-mode should be used?
2. How does a school ensure that only EDU-mode requests are getting through and regular youtube requests are blocked, even when using HTTPS?

Capabilities of School Filtering Tools

School filtering market is dominated by two companies: M86 and Lightspeed. Both provide appliances which operate as stateful filters. They observe, intercept, and inject traffic at network choke points. They are **not** explicit HTTP intermediaries.

Potential ways to signal school-ness in HTTPS requests to YouTube

1. **[Likely solution]** Use a separate domain for **EDU-mode** youtube
   a. youtubeedu.com
2. **[Looking for LCE feedback, is there potential or is this crazy?]** Piggyback into outbound DNS requests?
   a. *Any unused header fields or other extension options we could define?*
3. **[Looking for LCE feedback, is there potential or is this crazy?]** Piggyback into outbound SSL/TLS negotiation messages
   a. *Any unused header fields or other extension options we could define?*
4. **[Looking for LCE feedback, is there potential or is this crazy?]** Piggyback into outbound IP headers
   a. Safe to assume we can't depend on arbitrary changes to option fields surviving

across ASN domain boundaries?

5. **[Bad precedent]** Change target IP or port if packet is known to be destined for Google.
    a. How to know packet is destined for Google?
    b. ...ask schools to forge DNS response for www.youtube.com to point at specific IP
        i. This would be similar in implementation to search's "nossl" solution for schools
        ii. Encouraging DNS forgery indefinitely sends the wrong message. *Potentially inhibits DNSSEC rollout, what are Google DNSSEC plans?*
6. **[Not viable]** Schools provide validated list of client IP ranges
    a. Many different types of school network configs to deal with
    b. Common configuration: dynamic IPs from upstream connectivity, results in low precision over time
    c. Requires buy-in from schools to maintain and get adoption, high effort for school admin => expect low adoption rate

<u>Potential ways to block HTTPS requests to YouTube</u>

1. DNS forgery
    a. Repointing to bogus ip (127.0.0.1) or dropping outbound DNS packet requires no Google cooperation
        i. **This is what schools / filtering appliances are likely doing today**
    b. HTTPS Discrimination?
        i. Low risk, forces all-or-nothing block of both HTTP and HTTPS
        ii. Already possible today, not a new vector
2. **[Not viable as complete solution for schools]** Block based on outbound SNI
    a. SNI: server name indication, cleartext field with requested hostname send by client in SSL/TLS negotiation
    b. WinXP and earlier not SNI-capable (OS issue, upgrading browser won't fix)
    c. Observed SNI-capable traffic from schools today: X%
    d. "Just upgrade all of your computers" not financially realistic for schools (unless Google wants to foot the bill?)
    e. HTTPS Discrimination?
        i. Medium risk, can be used to discriminate against HTTPS but technically complex, requires packet inspection and stateful packet filtering
        ii. already possible today and can't prevent it, not a new vector
3. **[Not viable for most schools]** Block in HTTP intermediaries based on CONNECT string
    a. Most schools don't have full physical control over network or clients, want filters to be effective even on uncontrolled clients
    b. Thus, almost no school filtering configurations use explicit HTTP proxies
    c. We can offer this, but expect adoption will be low
    d. HTTPS Discrimination?
        i. low risk for broad discrimination, requires ability to control client proxy

config
   ii. already possible today in networks that can control clients, not a new vector there
4. **[Many downsides]** Block Port 443 to VIPS used by YouTube.com
   a. Likely impacts other Google properties today
   b. **what is exact impact in current GFE serving architecture and configuration?**
   c. Could set up dedicated VIPs for YouTube.com
      i. Increased SRE overhead and complexity in critical path of ALL youtube access
      ii. Potential latency impact for ALL youtube access (limited VIP availability in many L0/L1 GFE locations?)
      iii. HTTPS Discrimination?
         1. High risk, makes it very easy to discriminate against HTTPS access to youtube.com
         2. Introduces a new vector for discrimination which is not possible today
5. **[Many downsides]** Blocked based on response certificate
   a. Assume we had a special youtube.com cert for responding to SNI requests
   b. For non-SNI requests, would currently return the *.google.com cert, obviously not an option to block that cert
   c. Could have a dedicated youtube.com cert with a dedicated youtube.com VIP
      i. See downsides of Option 4

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