

Appendix - Building the e-scrache, a technical documentation

To build an e-scrache Wi-Fi hotspot like the prototype shown in paper, a protester would need a smartphone or a tablet running Android. The device does not have to be network unlocked, but it has to support Wi-Fi tethering and be “rooted” - a software procedure to enable the protester to access and modify important parts of the Android software. The procedures for “rooting” would differ on different devices, and there is a plethora of literature available online on how to “root” Android devices. The “rooting” procedures will not be covered by this documentation.

In addition to the Android device, the protester will also have to have the protest materials organised in the form of a website. Likewise website development is not going to be covered in the documentation.

With the phone and the website ready, the protester can follow the following steps to turn the phone into a working e-scrache portal. This is tested on Android 7.0.

1. Install required software packages on the Android device, including:
 - a. A server software to serve the website from the Android device. The server software should support [URL rewriting](#). The package used in the sample implementation is [HTTP Server powered by Apache](#). Alternative or additional software packages can be installed to enhance the functionality of the website - for example, a full PHP+Apache+MySQL installation provided by a package like [KSWEB](#) can allow the protester to include more sophisticated features in the website, such as a WordPress blog or a MediaWiki wiki. This documentation assumes that [HTTP Server powered by Apache](#) is used.
 - b. A terminal emulator that can run with root privileges. [Termux](#) is recommended.
 - c. A file manager and text editor that can run with root privileges. [FX File Explorer](#) is recommended.
 - d. A browser, which should already be included in most Android devices.
2. Deploy the website onto the Android device. For static HTML websites, the deployment will most likely only involve copying the content of the whole website directory into a

folder created by the server software on the Android internal storage. For the HTTP Server powered by Apache, the default folder is in the `/htdocs` folder in the root directory of system storage. For more complex websites such as a WordPress blog or a MediaWiki wiki, refer to the documentation of the server software for detailed installation instructions.

3. Start the server. The website will be ready at <http://localhost:8000>. Open the URL in the browser and check if the website is working.
4. Go to the Android device's configuration and start Wi-Fi tethering. Configure the password and the name of the Wi-Fi network if necessary. Connect to the Wi-Fi network just created by the Android device using another computer, phone, or tablet. Open the browser on the second device, and browse to <http://192.168.43.1:8000>. The website should show up. After verifying that the website is working, turn off the Wi-Fi tethering.
5. Modify the device's network settings so that all incoming connections will be captured and redirected to the website that has just been set up:
 - a. With root enabled, browse to `/etc/` in your file browser. Create a new file named `dnsmasq.conf`. Its content should be `address=/#/192.168.43.1`. By doing this, all DNS queries from connected devices on your Wi-Fi network is responded with the internal IP address of your Android device.
 - b. Open the terminal emulator, enter `su` to obtain root privileges. Then run the following command (in one line): `iptables -t nat -A PREROUTING -p tcp --dport 80 -j REDIRECT --to-port 8000`. This command uses Android's built-in firewall `iptables` to ensure normal HTTP traffic going to port 80 will be captured and redirected to port 8000, which is where the server is running on.
 - c. Modify the server's redirection settings so that the Wi-Fi portal handles the login redirect requests emitted by major operating systems, including Windows, OS X, iOS, and Android. Edit the Apache configuration file (`/storage/htdocs/config/httpd.conf`) as follows:

```
# apple
```

```
RewriteEngine on
RewriteCond %{HTTP_USER_AGENT} ^CaptiveNetworkSupport(.*)$
[NC]
RewriteCond %{HTTP_HOST} !^192.168.2.1$
RewriteRule ^(.*)$ http://192.168.2.1/captive/portal.html
[L,R=302]

# android
RedirectMatch 302 /generate_204
http://192.168.2.1/captive/portal.html

# windows
RedirectMatch 302 /ncsi.txt
http://192.168.2.1/captive/portal.html

# general
RewriteEngine on
RewriteCond %{REQUEST_URI} !^/captive/ [NC]
RewriteRule ^(.*)$ http://192.168.2.1/captive/portal.html
[L]
```

At this point the e-scrache Wi-Fi hotspot should be ready. Go to the phone's settings and turn on Wi-Fi tethering again. Give the hotspot a meaningful name. Connect another device to the hotspot. The captive portal should pop up automatically on the connected device.