MAC address randomization

draft-ietf-mac-address-randomization-02

IETF 114 – MADINAS WG

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Introduction and goals

- Privacy, an increasing concern
  - Layer-2 globally unique identifiers (MAC addresses) have been assigned to devices and are transmitted in the clear in, for instance, beacons, probe requests, or after association
  - MAC addresses can easily be intercepted and used to track location or behavior

- Several projects in IETF, IEEE 802 and among mobile OS vendors to deal with plain-text, unique, permanent MAC addresses
  - Assigning a random MAC address to a device per connection, per SSID, after some time period
  - Area of extensive research (see reference Martin et al (2017) in draft for more comprehensive list of research in this area, or IEEE 802.11 RCM TIG final report in 11-19/1442r9, also in draft)

- Goal of this draft: document Current State of Affairs regarding MAC address randomization
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Since this content can evolve with time, it is now hosted at https://github.com/ietf-wg-madinas/draft-ietf-madinas-mac-address-randomization/blob/main/OS-current-practices.md
OS current practices

Most modern OSes (especially mobile ones) do implement by default some MAC address randomization policy. Table 1 summarizes current practices for Android and iOS, as the time of writing this document (original source: Private MAC address on iOS 14, updated based on findings from the authors of draft-ietf-madinas-mac-address-randomization).

<table>
<thead>
<tr>
<th>Device</th>
<th>Practice Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Android 10+</td>
<td>The randomized MAC address is bound to the SSID</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The randomized MAC address is stable across reconections for the same network</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The randomized MAC address does not get randomized when the device forgets a WiFi network</td>
</tr>
<tr>
<td>iOS 14+</td>
<td>The randomized MAC address is bound to the BSSID</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The randomized MAC address is stable across reconections for the same network</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>The randomized MAC address is reset when the device forgets a WiFi network</td>
</tr>
<tr>
<td></td>
<td>MAC address</td>
</tr>
</tbody>
</table>
MAC randomization-related activities at the IETF

- Early work as far as back as IETF91
  - Joint W3C/IAB privacy tutorial
  - Testing MAC randomization and technical features (i.e., collisions, DHCP, etc.)
  - Thoroughly documented

- Led/linked to a number of other initiatives (see draft), e.g., RFC7217, RFC8947, RFC8948

- MAC randomization is now a default privacy feature in major mobile OSes (see later slide)
Recent RCM activities at the IEEE 802

- IETF work inspired a new privacy research project, P802E

- Discussions about randomized MAC for different types of devices (industrial, sensors, personal, etc.) in e.g., 802C (“SLAP”)

- Currently, two task groups in IEEE 802.11 are dealing with issues related to Randomized and Changing MAC addresses (RCM)

Juan Carlos has updated us today on this
Recent MAC randomization-related activities at the WBA

- The Wireless Broadband Alliance (WBA), the Testing and Interoperability Work Group has been looking at the issues related to MAC address randomization.

- WBA has documented a set of use cases that a Wi-Fi Identification Standard should address in order to scale and achieve longer term sustainability of deployed services.
<table>
<thead>
<tr>
<th>OS current practices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Android 10+</td>
</tr>
<tr>
<td>The randomized MAC address is bound to the SSID</td>
</tr>
<tr>
<td>The randomized MAC address is stable across reconnections for the same network</td>
</tr>
<tr>
<td>The randomized MAC address does not get re-randomized when the device forgets a WiFi network</td>
</tr>
<tr>
<td>MAC address randomization is enabled by default for all the new WiFi networks. But if the device previously connected to a WiFi network identifying itself with the real MAC address, no randomized MAC address will be used (unless manually enabled)</td>
</tr>
</tbody>
</table>
**Starting in Android 12, Android uses non-persistent randomization in the following situations: (i) a network suggestion app specifies that non-persistent randomization be used for the network (through an API); or (ii) the network is an open network that hasn’t encountered a captive portal and an internal config option is set to do so (by default it is not)**

<table>
<thead>
<tr>
<th>OS</th>
<th>Linux</th>
<th>Android 10</th>
<th>Windows 10</th>
<th>iOS 14+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Random per net.</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Random per connec.</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Random daily</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>SSID config.</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>Random. for scan</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
</tr>
<tr>
<td>Random. for scan</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>by default</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Changelog

- **ietf*-00:**
  - Adopted version

- **ietf*-01:**
  - Addressed comments from Hai Shalom

- **ietf*-02:**
  - Move section 7 (OS current practices) to GitHub