An Empirical Study of Third-Party Tracking by Mobile Applications in the Wild

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Goals
To understand how real consumers are being tracked by third-parties while using mobile apps

Motivation
- Widespread privacy concerns
  - iPhone location tracking, CarrierIQ, Applications leaking personal information
- Higher privacy risks on Mobiles
  - A wealth of personal information, long-lived identifiers
- Tracking on mobile phones is less well understood.

User Study
- 20 participants use instrumented phones for 3 weeks (Nov. 2011)
- Nexus S running dynamic information flow tracking using TaintDroid (modified Android)


Tracking Identifiers We Monitor
- Cookies in Embedded Browser (Webview)
- System IDs (AndroidID) – bound to OS
- Device IDs (IMEI, Build.Serial) – bound to device
- Simcard IDs (IMSI, Phone Number) – bound to SIM

Findings: Tracking in the Wild
- Tracking is widely distributed
  - 75% (168/223) of apps, 38% (224/591) of domains were tracking
- Many use persistent IDs (AndroidID, IMEI, Phone Number, ICCID)
  - 90% (152/168) of tracking apps, 42% (93/224) of tracking domains

Popular Advertisers & Analytics

<table>
<thead>
<tr>
<th>Advertiser</th>
<th>Apps / Participants</th>
<th>Token</th>
<th>Location</th>
<th>Apps / Participants</th>
<th>Token</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>DoubleClick.net</td>
<td>65 / 20</td>
<td>Md5(AndroidId)</td>
<td></td>
<td>GoogleAnalytics</td>
<td>49 / 18</td>
<td>Cookie</td>
</tr>
<tr>
<td>Admob.com</td>
<td>46 / 19</td>
<td>Md5(AndroidId)</td>
<td>Y</td>
<td>Flurry.com</td>
<td>28 / 17</td>
<td>AndroidId Y</td>
</tr>
<tr>
<td>Mydas.mobi</td>
<td>9 / 10</td>
<td>IMEI</td>
<td>Y</td>
<td>Scorecardresearch</td>
<td>13 / 14</td>
<td>Md5(Serial, salt)</td>
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<tr>
<td>Jumptap.com</td>
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<td>Y</td>
<td>Quantserve.com</td>
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<td>Medialytics.com</td>
<td>6 / 6</td>
<td>Md5(AndroidId) Y</td>
</tr>
</tbody>
</table>

User view