

GERS No Time At All: Opportunity Cost of Android Permissions

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Android Permissions

Android applications have to request permission to access privacy-sensitive functions on phones.

- Internet
- Read/write messages
- SMS messages

All-at-once model leads to contact harvesting by several companies, including large multi-national and consequent investigations by regulation authorities.

Questions

Given the potential dangers to privacy, questions pop up: - What investment is required from users to read all the permissions for the applications they download?

- What is the opportunity cost for Android smartphone users if they would actually read all the user permission screens?

- How do different Android permission models change the cost to privacy?

- What is the opportunity cost to the United States?

Rough Estimation Methods

$Cost = T_R \times wage$

Cost, the opportunity cost T_R , the time it takes to read permissions wage, the average hourly wage

 $T_R = n \times Words \div R$

n, the average number of applications downloaded Words, the number of words on a permission screen R, the average reading rate

See more details in the paper, available from the FTC workshop website and at:

http://www.winlab.rutgers.edu/~janne

See also

elasticpathing.org and securegestures.org for other work.



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Evolution of Permission Screens

| 4 | op permissions | | | |
|----------|--|-----|---|-------|
| ~ | needs access to: | | Network communication | |
| | torage | | Google Play billing service | |
| | lodify or delete the contents of your USB torage | | Allows the user to purchase items through Google Play from within | |
| | letwork communication | | this app. Receive data from Internet | |
| | hone calls ead phone status and identity | | Allows apps to accept cloud to device messages sent by the app's service. Using this service will incur data usage. Malicious apps | |
| F | lide ^ | | could cause excess data usage. | |
| | our applications information | | View Wi-Fi connections | |
| s | strate access to protected storage | | Allows the app to view information about Wi-Fi networking, such as whether Wi-Fi is enabled and name of connected Wi-Fi devices. | |
| | letwork communication | | View network connections | |
| G | oogle Play billing service, receive data from iternet, view Wi-Fi connections, view network | | Allows the app to view information about network connections such | |
| | ACCEPT | | | |
| | Explicit | | Explicit II | |
| | | | | |
| \$ | In-app purchases | ~ | | |
| 8 | Identity | × 🔾 | Allowto acc | |
| 9 | Location | ~ | this device's locat | ion? |
| E | Photos/Media/Files | ~ 🗆 | Never ask again | |
| • | Wi-Fi connection information | ~ | | |
| 8 | Bluetooth connection information | ~ | DENY | ALLOW |
| i | Device ID & call information | ~ | | |
| Goog | gle Play ACCEP | т | | |
| | Grouped | | Request | |

Opportunity Cost

| Models | Lower | Point Esti- | Upper |
|--------------|--------|-------------|---------|
| | Bound | mate | Bound |
| Explicit | \$0.52 | \$1.86 | \$4.34 |
| Explicit(II) | \$2.32 | \$8.40 | \$20.14 |
| Grouped | \$0.05 | \$0.25 | \$0.76 |
| Grouped(II) | \$0.32 | \$1.77 | \$5.16 |
| Grouped(III) | \$0.63 | \$2.83 | \$7.43 |
| Request | 0 | \$0.16 | \$0.75 |

Annual opportunity cost for person if read at leisure

| Models | Lower | Point Esti- | Upper |
|--------------|---------|-------------|----------|
| | Bound | mate | Bound |
| Explicit | \$4.23 | \$14.96 | \$34.83 |
| Explicit(II) | \$18.58 | \$67.24 | \$161.21 |
| Grouped | \$0.41 | \$2.06 | \$6.03 |
| Grouped(II) | \$2.53 | \$14.19 | \$41.35 |
| Grouped(III) | \$5.05 | \$22.71 | \$59.46 |
| Request | 0 | \$1.29 | \$6.03 |

Annual opportunity cost for person if read at work

| Models | Lower | Point Esti- | Upper |
|--------------|-----------|-------------|-----------|
| | Bound | mate | Bound |
| Explicit | \$2.407B | 3.405B | \$4.404B |
| Explicit(II) | \$10.569B | \$15.032B | \$20.375B |
| Grouped | \$234.9MM | \$469.8MM | \$763.4MM |
| Grouped(II) | \$1.468B | 3.229B | \$5.226B |
| Grouped(III) | 2.877B | \$5.167B | \$7.516B |
| Request | 0 | \$293.6MM | \$763.4MM |

Annual opportunity cost in millions and billions to the USA if permissions are read at work.

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