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Unauthorized Origin Crossing on Mobile Platforms: Threats and Mitigation

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With the progress in mobile computing, web services are increasingly delivered to their users through mobile apps, instead of web browsers. However, unlike the browser, which enforces origin-based security policies to mediate the interactions between the web content from different sources, today's mobile OSes do not have a comparable security mechanism to control the cross-origin communications between apps, as well as those between an app and the web. As a result, a mobile user's sensitive web resources could be exposed to the harms from a malicious origin. In this paper, we report the first systematic study on this mobile cross-origin risk. Our study inspects the main cross-origin channels on Android and iOS, including intent, scheme and web-accessing utility classes, and further analyzes the ways popular web services (e.g., Facebook, Dropbox, etc.)

and their apps utilize those channels to serve other apps. The research shows that lack of origin-based protection opens the door to a wide spectrum of cross-origin attacks. These attacks are unique to mobile platforms, and their consequences are serious: for example, using carefully designed techniques for mobile cross-site scripting and request forgery, an unauthorized party can obtain a mobile user's Facebook/Dropbox authentication credentials and record her text input. We report our findings to related software vendors, who all acknowledged their importance. To address this threat, we designed an origin-based protection mechanism, called Morbs, for mobile OSes. Morbs labels every message with its origin information, lets developers easily specify security policies, and enforce the policies on the mobile channels based on origins. Our evaluation demonstrates the effectiveness of our new technique in defeating unauthorized origin crossing, its efficiency and the convenience for the developers to use such protection.