ABSTRACT
We study Facebook Connect’s permissions system using crawling, experimentation, and surveys and determine that it works differently than both users and developers expect in several ways. We show that more permissions can be granted than the developer intended. In particular, permissions that allow a site to post to the user’s profile are granted on an all-or-nothing basis. We evaluate how the requested permissions are presented to the user and find that, while users generally understand what data sites can read from their profile, they generally do not understand the many different things the sites can post. In the case of write permissions, we show that user expectations are influenced by the identity of the requesting site which in reality has no impact on what is enforced. We also find that users generally do not understand the way Facebook Connect permissions interact with Facebook’s privacy settings. Our results suggest that users understand detailed, granular messages better than those that are broad and vague.

Categories and Subject Descriptors
D.4.6 [Security and Protection]: Access Controls

General Terms
Security, Human Factors

Keywords
Online social networks, permissions, privacy, Facebook

1. INTRODUCTION
Single Sign-On (SSO) systems allow users to log in to websites (called relying sites or relying parties) using their username and password from a third-party identity provider. This creates fewer passwords for users to remember, theoretically meaning that they can have more complicated and therefore more secure passwords [23]. Facebook Connect is perhaps the most popular SSO system on the web today. A key reason is that

Facebook Connect, like many SSO systems based off of the OAuth protocol, does more than just allow a user to sign in: sites can request access to read parts of the user’s Facebook profile or write data back their profile. This has been sufficient in practice to overcome the lack of adoption incentives for relying parties which has plagued many other SSO systems on the web [25].

A second important selling point is that Facebook Connect requires user approval and requires relying sites to request a specific set of permission from the user up front before reading or writing data from the user’s profile. These are presented to the user in a series of dialogs (shown in Figure 1) which the user must accept prior to logging into a relying site for the first time. In the words of Facebook “The user will have total control of the permissions granted” [20].

Effective user control relies both on Facebook granting only the permissions intended by developers and on users correctly understanding the permission requests they authorize. We will explore both questions in this paper and show that:

• Facebook Connect sometimes asks the user to authorize more permissions than the developer intended to request.
• Write permissions are granted to sites on an all-or-nothing basis. For example, if a site wants to update the user’s status, it must also gain permission to upload photos.
• Users generally understand which read permissions are being requested when they log in, although many don’t realize they are granting access to data they have marked as private using their privacy settings.
• Users generally do not understand the variety of write permissions sites will receive upon authorization. This indicates that, despite Facebook’s claims that all-or-nothing write permissions are “simpler” for users to understand, users the more granular read permissions much better.

\[1\] Facebook Connect is now technically called Facebook Login but is still frequently referred to as Facebook Connect.
User are influenced by the identity of the relying party, for example, they are much more likely to understand a photo sharing website can upload photos to their account. This suggests users are assuming a contextual integrity model of privacy [21], although this not implemented technically.

2. IMPLEMENTATION OF FACEBOOK CONNECT PERMISSIONS

The first step in determining whether the permissions system provides users with effective control is understanding which permissions are actually being granted when a given authorization message is displayed. Facebook Connect’s process of a site requesting permissions from a user can be broken down into three steps:

1. During login flow, relying parties request a set of permissions from the Facebook Connect API. We’ll call this set the requested permissions.

2. Facebook receives the requested permissions and translates them into a set of permissions for approval which we’ll call the granted permissions.

3. Facebook translates the the granted permissions into a dialog presented to the user for approval. We’ll call the text the displayed permissions.

Ideally, these three sets of permissions would be identical and the text shown to the user would clearly represent them. In this section we’ll explore the difference between the requested and granted permissions; we’ll discuss the relation of the displayed to granted permissions in Section 3.

2.1 Methodology

Unfortunately, Facebook’s own documentation [10] is incomplete and sometimes outdated. As such, there is very little explanation of how requested permissions are eventually translated into permissions displayed to the user. To gain a better understanding, we combined information from the documentation with observations from integrating Facebook Connect login with a test site and crawled data from several hundred relying sites.

2.1.1 Obtaining a list of relying sites

To obtain a list of relying sites implementing Facebook Connect, we started with the most recent (October 2013) AppInspect [19] database of 25,000 Facebook apps. We filtered this list down to about 400 apps with an external site listed on the Facebook App Center. Finally, we manually examined these to find 91 which had a Facebook Connect login.

Unfortunately, the AppInspect database does not include apps that are used solely for Facebook Connect, only those that have native Facebook apps. To make up for these deficiencies, we took the Alexa Top 500 [2] websites from February 27th, 2014 and manually identified those with Facebook Connect logins (112 sites).

Combining these two lists yielded a diverse list of 203 sites, about half which receive heavy traffic (those from the Alexa Top 500) and about half of which do not (those from the AppInspect database).

For crawling we used OpenWPM, a Selenium-based web crawler being developed by the Princeton Center for Information Technology Policy (CITP). We performed automated logins to all 203 sites and recorded the requested, granted, and displayed permissions. Twenty-six of the 203 sites used an older implementation of Facebook Connect; this paper will focus on the 177 with the current format.

2.2 Requested permissions

Developers request permissions in a parameter called “scope” or “data-scope” when the login process is initiated using Facebook’s JavaScript SDK, Facebook’s login button, or a manually built login system [14]. The developer can request any of the permissions listed in the documentation [13], although some are deprecated and will have no impact on the granted permissions.

The scope parameter is visible in the URL of the page where the user is asked to approve permissions (see Figure 2). We confirmed using our test site that this value
is indeed exactly what the developer requested.

![Image of a Facebook login URL](https://www.facebook.com/dialog/oauth?app_id=138615416238413&domain=timecrunch.me&response_type=token%2Csigned_request&scope=email%2Ccreate_event%2Coffline_access%2Cuser_groups%2Cfriends%2Cgroups%2Cpublish_stream...)

Figure 2: Example requested permissions (colored in red) shown in the scope parameter of the approval page URL for timecrunch.me.

### 2.3 Granted permissions

Facebook receives the requested permissions and translates them into a set of granted permissions which may exclude requested permissions which are deprecated or in some cases add additional permissions. Two permissions are always added regardless of what is requested which Facebook calls “Basic Info/Default permissions”[14]. These are public_profile, which gives access to the user’s public profile, and user_friends, which gives access to the user’s friends list. The documentation does not mention any other permissions that may be granted outside of what the developer requested.

The approval page presented to the user has three hidden input HTML elements named read, write, and extended whose values are the granted permissions (see Figure 3). We confirmed with our test site that these permissions are actually granted and may be used by the relying site, regardless of the requested permissions.

We used these hidden elements to determine which permissions were granted in contrast to what was requested for all 177 sites we crawled. Our results are shown in Figure 4. First, we confirmed that with every site crawled the aforementioned default permissions (public_profile and user_friends) always appear in granted read permissions although they were never requested.

In addition, we identified several requested permissions which always cause extra permissions to be granted along with them (these will be discussed in more detail in Section 2.3). For example, Facebook’s documentation states that publishing a story (such as liking an article) requires the publish_actions permission. However, if the create_note permission is requested, publish_actions will also appear as a granted permission and this will allow stories to be published. Through experimentation with our test site, we determined exactly which permissions are always grouped together, listed in Table 1. If any one permission in a group is requested, all permissions in the group are granted. We noted that permissions which are always granted together are displayed to the user with a single message, which we will discuss further in Section 2.4.

All of the grouped read and extended permissions are in pairs, so if the developer requests one they receive the other. The write permissions, however, are in a group of eight, which in fact contains all write permissions offered by Facebook Connect. Thus write permissions are in practice all-or-nothing.

![Image of a Facebook form with permissions](image)

Figure 3: Example granted permissions (colored in red) shown by the read, write, and extended input elements on the permissions approval page for timecrunch.me.

<table>
<thead>
<tr>
<th>Read Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>user_activities, user_about_me</td>
</tr>
<tr>
<td>friends_activities, friends_about_me</td>
</tr>
<tr>
<td>email, contact_email</td>
</tr>
<tr>
<td>read_stream, export_stream</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Write Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>create_note, upload_photos, upload_videos, publish_actions, publish_checkins, publish_stream, share_item, status_update</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Extended Permissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>rsvp_event, create_event</td>
</tr>
</tbody>
</table>

Table 1: Groups of permissions which area always granted together if any are requested.

### 2.4 How permissions are presented to the user

As mentioned previously, when the user logs in to a site with Facebook Connect for the first time they are presented with up to three messages from Facebook asking them to approve the read, write, and/or extended permissions. We reverse-engineered the algorithm for generating the phrase or word in the displayed permissions message that corresponds to each granted permission using our test site and verified that it matched the data observed in our crawl. Most messages appear reasonably clear. However, the grouped permissions (see Table 1) are displayed with just one corresponding word or phrase indicating that all the permissions in that group are being requested. Table 2 presents these potentially unclear messages and their meaning according to the Facebook Connect documentation [13]. Similar tables for all permissions can be found in Appendix A.

### 2.5 Facebook’s response

We sent a security bug report to Facebook stating that we could use the publish_actions permission after
### Read Permissions: **Site_Name will receive the following info**

<table>
<thead>
<tr>
<th>Message</th>
<th>Permission</th>
<th>Meaning [13]</th>
</tr>
</thead>
<tbody>
<tr>
<td>email address</td>
<td>email</td>
<td>email</td>
</tr>
<tr>
<td>contact_email</td>
<td>not listed</td>
<td></td>
</tr>
<tr>
<td>News Feed</td>
<td>read_stream</td>
<td>access my News Feed and Wall</td>
</tr>
<tr>
<td></td>
<td>export_stream</td>
<td>export my posts and make them public. All posts will be exported, including status updates.</td>
</tr>
<tr>
<td>personal description</td>
<td>user_about_me</td>
<td>about me</td>
</tr>
<tr>
<td></td>
<td>user_activities</td>
<td>activities</td>
</tr>
<tr>
<td>...and your friends’</td>
<td>friends_about_me</td>
<td>‘about me’ details</td>
</tr>
<tr>
<td></td>
<td>friends_activities</td>
<td>activities</td>
</tr>
</tbody>
</table>

### Write Permissions: **Site_Name would like to**

<table>
<thead>
<tr>
<th>Message</th>
<th>Permission</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>post to Facebook for you.</td>
<td>create_note</td>
<td>create and modify events</td>
</tr>
<tr>
<td>– or* –</td>
<td>photo_upload</td>
<td>add or modify photos</td>
</tr>
<tr>
<td>post publicly to Facebook for you.</td>
<td>publish_actions</td>
<td>publish my app activity to Facebook</td>
</tr>
<tr>
<td>– or* –</td>
<td>publish_checks</td>
<td>publish checks on my behalf</td>
</tr>
<tr>
<td>post privately to Facebook for you.</td>
<td>publish_stream</td>
<td>publish content to my Wall</td>
</tr>
<tr>
<td>status_update</td>
<td>share_item</td>
<td>share items on my behalf</td>
</tr>
<tr>
<td>video_upload</td>
<td>status_update</td>
<td>update my status</td>
</tr>
<tr>
<td></td>
<td>video_upload</td>
<td>add or modify videos</td>
</tr>
</tbody>
</table>

### Extended Permissions: **Site_Name would like to**

<table>
<thead>
<tr>
<th>Message</th>
<th>Permission</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>manage your events</td>
<td>create_event</td>
<td>create and modify events</td>
</tr>
<tr>
<td></td>
<td>rsvp_event</td>
<td>RSVP to events</td>
</tr>
</tbody>
</table>

Table 2: Message decoder for permissions that are granted in groups. Decoder tables for all permissions are in Appendix A. Italic text represents how the permissions are introduced when presented to the user. See Figure 1 for an example.

*Which of the three messages is presented depends on to whom the posts will be visible. This is controlled by the menu in the bottom left of the middle image in Figure 1.

requesting any other write permission. Facebook Security stated\(^2\) that “this behavior is by design” and confirmed that when one permission is requested in the scope, they “translate them to a broader set of [permissions] which are easier for users to understand” [1]. When asked why this was done for write permissions but not read permissions, they responded that they “made this change to simplify the experience for developers and for users” and that “write permissions are more similar...whereas read permissions are more distinct.” This motivated us to evaluate whether all-or-nothing write permissions are in fact easier for the user to understand, which we turn to in the next section.

3. USER UNDERSTANDING

The second critical component in effective user control on Facebook Connect is users’ comprehension of the messages describing the permissions they’re asked to approve. This is especially important given our findings in Section 2 that all write permissions are grouped together and displayed with a single somewhat-vague message. Previous research by Egelman [9] found that 88% of users have a general understanding of Facebook’s read permissions dialogs; however, he studied only the read permissions dialogues. To our knowledge this is the first study evaluating comprehension of write permissions. Together with read permissions these make a fascinating natural experiment: are users better able to understand granular (but complicated) read permissions, or simpler (but vaguer) write permissions? To test this and other aspects of user comprehension, we ultimately conducted three studies:

1. One study tested general comprehension of read and write permissions and compares them to each other (see Section 3.2).\(^3\)

\(^2\)Our full correspondence with Facebook is in Appendix C.

\(^3\)We decided not to test extended permissions since they are presented similarly to read permissions and are relatively
2. One study tested how site identity affects interpretation of the write permissions message (see Section 3.3).

3. Our final study tested to see if users understand that they are giving access to data regardless of their profile privacy settings (see Section 3.4).

### 3.1 Methodology

We conducted our surveys using Amazon Mechanical Turk, a service where workers can be paid to complete simple online tasks. This allowed a large and reasonably diverse response pool for little cost (see Section 3.5 for a discussion of its limitations). All of our surveys took the basic format of present users with real dialogs that they might see when logging in to a site using Facebook Connect and asking questions about what actions that site may take if they authorize the login.

#### 3.1.1 Pilot studies

We piloted three different methods of testing user comprehension. After verifying that the respondent had seen a Facebook Connect login, all pilots began by presenting the respondent with either a read or write permissions message that they might see when using Facebook Connect. No respondents were presented with both to ensure that no one got the two questions mixed up. Respondents were then presented with one of the following three question types:

1. A yes/no question asking if the site would be able to do something if they clicked okay, such as view their photos or update their status.

2. A list of things the site might be able to do if they clicked okay. The user was asked to select all those they thought the site would be able to do.

3. A free response question asking the user to describe what information they thought the site would be able to do if they clicked okay.

The free response question has the advantage of not prompting the user with any ideas that may not have occurred to them otherwise. However, pilots showed that answers to free response questions were frequently too vague to be useful and that respondents may not have put enough thought into their answer. While this may reflect how users pay little attention to permissions messages in real life when they log in to sites, it is not useful for this survey. There was no noticeable difference in responses between the yes/no questions and the multiple-selection questions, so we chose the latter to get results about more permissions.

We also experimented with showing the respondent messages from different sites. There was some indication that the site influenced the responses. For example, people appeared more likely to think photo-oriented sites like Flickr would be able to do photo-oriented things, such as uploading photos. To keep our independent variables separate, we conducted two different surveys. The first survey (Section 3.2 used the site name “Hooli.com.” (Hooli is a fake tech company in HBO’s Silicon Valley.) The description of the site given to users was a description of a real site, Splashscore.com. This was one of the sites piloted and we determined it had an appropriately general-sounding description and could conceivably need a wide variety of permissions. The way the site was presented to users can be seen in Appendix B. Our second survey (Section 3.3) was designed to test write permission comprehension across different sites.

#### 3.2 Read vs. write permissions

Our first study tests general comprehension of read and write permissions in such a way that they can be directly compared. For all questions, we used the site name “Hooli.com” to eliminate the site name as a variable. Our tests were designed to evaluate the following null hypotheses:

1. Respondents’ ability to identify which read permissions they are authorizing is no different than if they were randomly guessing.

2. Respondents’ ability to identify which write permissions they are authorizing is no different than if they were randomly guessing.
3. Respondents’ ability to identify which read permissions they are authorizing is no different than their ability to identify which write permissions they are authorizing.

This survey was taken by 600 Mechanical Turk workers. All were first asked if they had seen a site use Facebook login before—nearly all had. Half of those who had were presented with Facebook’s standard write permissions message followed by 13 options of things they might be giving the site permission to do by clicking okay. Eight of the 13 were taken almost directly from the Facebook Connect documentation’s permission descriptions [13], so they were all things the site would be able to do (since Facebook gives all write permissions together). The other five were things the site could not do. They were present not to be tested but to eliminate biases due to an aversion to selecting all available options. The 13 options were presented in 4 different orders and can be seen in Appendix B.3.

The other half were presented with read permissions questions. Since read permissions messages vary, we used messages taken from four different real sites with varying numbers of permissions (Jabong.com, Flickr.com, Splashscore.com, and TripAdvisor.com). All were renamed “Hooli.com.” Each message was followed with eight or nine options for things the site might be able to do. Four or five options were information on a Facebook profile that the site would be able to see. The other four were either things the site could not see or were write or extended permissions. Again, the incorrect answers were only so the respondent did not have to select all options to be correct. The four different questions can be seen in Appendix B.2. There are too many different read permissions to effectively test them all without exhausting the respondents with too many questions, so the ones tested are some of the more common ones.

3.2.1 Read permissions results

Figure 5 illustrates the percentage of people who correctly identified that each permission would be given to the requesting site after they clicked okay. Table 3 lists the numerical percentages as well as the 2-tailed p-value from a binomial test comparing the number of people who correctly selected each permission to a null hypothesis of random guessing:

![Figure 5: Percentage of people who correctly identified that each read permission would be granted to the site upon authorization.](image)

<table>
<thead>
<tr>
<th>Permission</th>
<th>N</th>
<th>Percent Correct</th>
<th>2-tailed p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>see the cities your friends live in</td>
<td>78</td>
<td>80.77</td>
<td>0.000</td>
</tr>
<tr>
<td>see your friends photos</td>
<td>78</td>
<td>76.92</td>
<td>0.000</td>
</tr>
<tr>
<td>see what you’ve liked</td>
<td>78</td>
<td>88.46</td>
<td>0.000</td>
</tr>
<tr>
<td>see your status updates</td>
<td>150</td>
<td>77.33</td>
<td>0.000</td>
</tr>
<tr>
<td>see which city you live in</td>
<td>230</td>
<td>89.13</td>
<td>0.000</td>
</tr>
<tr>
<td>see your wall</td>
<td>72</td>
<td>62.50</td>
<td>0.044</td>
</tr>
<tr>
<td>see your gender</td>
<td>72</td>
<td>79.17</td>
<td>0.000</td>
</tr>
<tr>
<td>see your News Feed</td>
<td>72</td>
<td>81.94</td>
<td>0.000</td>
</tr>
<tr>
<td>see who your family members are</td>
<td>80</td>
<td>67.50</td>
<td>0.002</td>
</tr>
<tr>
<td>see your relationship status</td>
<td>80</td>
<td>85.00</td>
<td>0.000</td>
</tr>
<tr>
<td>see your exact age</td>
<td>159</td>
<td>71.70</td>
<td>0.000</td>
</tr>
<tr>
<td>see where you’ve previously worked</td>
<td>80</td>
<td>83.75</td>
<td>0.000</td>
</tr>
<tr>
<td>see who your friends are</td>
<td>79</td>
<td>84.81</td>
<td>0.000</td>
</tr>
<tr>
<td>see what language you speak</td>
<td>79</td>
<td>63.29</td>
<td>0.024</td>
</tr>
<tr>
<td>see what country you live in</td>
<td>79</td>
<td>65.82</td>
<td>0.007</td>
</tr>
</tbody>
</table>

Table 3: p-values for 2-tailed binomial test comparing the number of people who correctly selected each permission to a null hypothesis of random guessing.

For all tested read permissions, over half of people correctly identified that each permission would be
granted based on the message presented. On average, individual permissions were correctly identified 79.72% of the time. This is comparable to Egelman’s [9] conclusion that 88% of users understand generally which permissions are being requested.

The null hypothesis (that respondents’ ability to identify which read permissions they are authorizing is no different than if they were randomly guessing) can be rejected for all but two permissions with \( p < .01 \), suggesting that users have a significantly better understanding of which read permissions they are granting than if they were randomly guessing. We can also reject the possibility that users simply marked every survey option as visible to the website: an average of 81.96% of users correctly identified each of the options that would not be visible to the site. The null hypothesis for each of these options can be rejected with \( p < .01 \).

The null hypothesis for “see what language you speak” can be rejected with \( p < .03 \) and for “see your wall” with \( p < .05 \). A G-test\(^7\) shows that respondents were worse at identifying “see your wall” than “see your status updates” (which had an accuracy rate roughly equal to the average) with \( p < .04 \) and a G-test statistic of 4.528. Recall that seeing one’s Wall and seeing one’s News Feed are both granted by the read_stream permission but the message presented to the user says only “News Feed” (see Section 4.1). This may have been the cause of some confusion. Respondents were also worse at identifying “see what language you speak” with \( p < .04 \) and a G-test statistic of 4.338, but the reason for this is unclear.

### 3.2.2 Write permissions results

Figure 6 illustrates the percentage of people who correctly identified that each permission would be given to the requesting site after they clicked okay. Table 4 lists the numerical percentages as well as the 2-tailed \( p \)-value from a binomial test comparing the number of people who correctly identified a permission as being requested to the expected value of \( \frac{1}{2} \) the total number of people asked.

The null hypothesis for “see what language you speak” can be rejected with \( p < .03 \) and for “see your wall” with \( p < .05 \). A G-test\(^7\) shows that respondents were worse at identifying “see your wall” than “see your status updates” (which had an accuracy rate roughly equal to the average) with \( p < .04 \) and a G-test statistic of 4.528. Recall that seeing one’s Wall and seeing one’s News Feed are both granted by the read_stream permission but the message presented to the user says only “News Feed” (see Section 4.1). This may have been the cause of some confusion. Respondents were also worse at identifying “see what language you speak” with \( p < .04 \) and a G-test statistic of 4.338, but the reason for this is unclear.

### 3.2.3 Comparison

It is evident at this point that users understand read

\(^7\)The G-test is a likelihood-ratio statistical test of independence applicable in the same cases as a \( \chi^2 \)-test, but with lower approximation error in nearly all cases than the more traditional Pearson’s \( \chi^2 \)-test.

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![Figure 6: Percentage of people who correctly identified that each permission would be given to the site upon authorization.

<table>
<thead>
<tr>
<th>Permission</th>
<th>Percent Correct</th>
<th>2-tailed ( p )-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>update your status</td>
<td>34.88</td>
<td>0.000</td>
</tr>
<tr>
<td>publish app activity to Facebook</td>
<td>45.85</td>
<td>0.166</td>
</tr>
<tr>
<td>add and modify photos</td>
<td>8.64</td>
<td>0.000</td>
</tr>
<tr>
<td>add and modify videos</td>
<td>8.97</td>
<td>0.000</td>
</tr>
<tr>
<td>publish checkins at locations</td>
<td>12.62</td>
<td>0.000</td>
</tr>
<tr>
<td>create and modify notes</td>
<td>5.65</td>
<td>0.000</td>
</tr>
<tr>
<td>share items with others</td>
<td>34.88</td>
<td>0.000</td>
</tr>
<tr>
<td>publish content to your wall</td>
<td>55.81</td>
<td>0.050</td>
</tr>
</tbody>
</table>

Table 4: \( p \)-values for 2-tailed binomial test comparing the number of people who correctly selected each permission to an expected value of \( \frac{1}{2} \) the total number of people asked. \( N = 301 \).
permissions messages significantly better than they understand write permissions messages: Respondents correctly identified whether a read permission would be granted 79.72% of the time, whereas write permissions were only correctly identified 25.91% of the time.

We assigned a ranking to each respondent based on the percentage of permissions they correctly identified and separated them into two groups, one for those asked about read permissions and one for those asked about write permissions. A Mann-Whitney U test of these two groups allows us to reject the null hypothesis that respondents ability to identify which read permissions they are authorizing is no different than their ability to identify which write permissions they are authorizing with \( p < 0.001 \) and a test statistic of 9163.0.

### 3.3 Influence of relying site

As previously mentioned, our pilot surveys indicated that the site identity may influence how people interpret the write permissions message. We performed a separate survey with 300 Mechanical Turk workers to test this. The format of the survey was identical to the write permissions questions in the first survey and we provided the same options for the user to select. However, instead of using “Hooli.com” as the website in question, one third of respondents were presented with Flickr.com (a photo and video sharing site), one third with TripAdvisor.com (a travel site), and one third with iLikeU.com (an anonymous messaging site). (Since there is only one write permissions message, the message presented to the user in all cases was identical aside from the site name and description.)

The results of this survey can be statistically analyzed with a \( G \)-test to see if the number of respondents who thought each permission would be granted varied across the four sites (the three mentioned here plus the data from “Hooli.com” from the first survey). The null hypothesis is that the site identity does not affect how many people think a given permission is being requested.

#### 3.3.1 Results

Figure 7 illustrates the percentage of people who correctly identified that each permission would be given to each site after they clicked okay. Table 5 lists the numerical percentages as well as the \( p \)-values from a \( G \)-test comparing the variation in number of correct selections for each permission across all four sites.

For “publish app activity to Facebook,” “add and modify photos,” “add and modify videos,” and “publish checkins at locations,” the null hypothesis (that the site identity does not affect how many people think a given permission is being requested) can be rejected with \( p < .01 \). More respondents thought Flickr would be able to add and modify photos and videos compared to other sites, which is reasonable since it is a photo and video sharing site. Likewise, many more people thought that TripAdvisor would be able to publish checkins at locations—a logical thing for a travel site to do.

The null hypothesis can be rejected for “update your status” with \( p < .04 \) and “publish content to your wall” with \( p < .05 \). It cannot be rejected for “share items with others” nor “create and modify notes” with a reasonable level of confidence.

### 3.4 Influence of privacy settings

In one pilot survey of the free response format, a respondent stated that the site would gain access to only a limited number of permissions because their Facebook settings prevented them from accessing the rest. This suggests a lack of understanding of how the read permissions work: A site can access nearly everything that is public with only the public_profile permission [16]. By granting the site additional permissions, a user is giving the site permission to access that information regardless of the user’s privacy settings. (Using the test site, we confirmed that we could see all user photo albums regardless of their privacy settings with the user_photos permission.)

We surveyed 100 additional Mechanical Turk respondents to see if this confusion was widespread. The survey presented the user with the permission message for Imgur.com, which requests the user_photos permission. Users were asked to identify which photo albums Imgur would be able to see if they clicked okay. The options were those marked as visible to the public, those marked as visible to friends, and those marked as visible to only them. (The correct answer is all three.) The survey can

---

This counts only the real permissions and not the incorrect options since those were artificially created.
Table 5: \(p\)-values for \(G\)-test comparing the number of people who correctly selected each permission across four sites.

<table>
<thead>
<tr>
<th>Permission</th>
<th>Percent Correct</th>
<th>(G)-test statistic</th>
<th>(p)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>update your status</td>
<td>34 20.43</td>
<td>8.662</td>
<td>0.034</td>
</tr>
<tr>
<td>publish app activity to Facebook</td>
<td>64 51.61</td>
<td>16.733</td>
<td>0.001</td>
</tr>
<tr>
<td>add and modify photos</td>
<td>22 7.53</td>
<td>15.185</td>
<td>0.002</td>
</tr>
<tr>
<td>add and modify videos</td>
<td>15 2.15</td>
<td>11.783</td>
<td>0.008</td>
</tr>
<tr>
<td>publish checkins at locations</td>
<td>11 24.73</td>
<td>10.937</td>
<td>0.006</td>
</tr>
<tr>
<td>create and modify notes</td>
<td>6 3.23</td>
<td>4.783</td>
<td>0.188</td>
</tr>
<tr>
<td>share items with others</td>
<td>31 32.26</td>
<td>0.706</td>
<td>0.872</td>
</tr>
<tr>
<td>publish content to your wall</td>
<td>65 53.76</td>
<td>8.208</td>
<td>0.042</td>
</tr>
</tbody>
</table>

be seen in Appendix B.4.

Our null hypothesis in this experiment is that users are equally likely to identify that data could be read regardless of its privacy setting.

3.4.1 Results

Figure 8 illustrates the percentage of people who correctly identified that Imgur.com would be able to see their photo albums with various privacy settings if they clicked okay. Table 6 lists the numerical percentages as well as the 2-tailed \(p\)-value from a binomial test comparing the number of people who correctly identified that a privacy level was visible to the expected value with random guessing: half of the total number of people who were given the survey.

![Percentage of people who correctly identified that Imgur.com would be able to see their photo albums of each privacy level upon authorization.](image)

Table 6: \(p\)-values for 2-tailed binomial test comparing the number of people who correctly selected each privacy level to an expected value of half the total number of people asked. \(N = 99\).

<table>
<thead>
<tr>
<th>Privacy Setting</th>
<th>Percent Correct</th>
<th>2-tailed (p)-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>those marked as visible to the public</td>
<td>83.84</td>
<td>0.000</td>
</tr>
<tr>
<td>those marked as visible to friends</td>
<td>33.33</td>
<td>0.001</td>
</tr>
<tr>
<td>those marked as visible to only me</td>
<td>22.22</td>
<td>0.000</td>
</tr>
</tbody>
</table>

3.5 Limitations

There are several possible limitations to our surveys:

- As discussed previously, by giving respondents several options to select we suggested possible things the site could do that may not have occurred to them otherwise. In addition, in order to respond to our questions they may have paid more attention to the permissions dialogues than they normally would have. As a result, our survey may indicate that users are more aware of what permissions are being requested than they are in practice.

- If read and write permissions are fundamentally different in some non-obvious way, it may be invalid to compare understanding of read permissions to understanding of write permissions. It is
possible that users would understand write permissions even more poorly if they were presented granularly rather than all-or-nothing.

- There may be some demographic bias in using Mechanical Turk to collect responses. We did not collect demographic information from respondents although we did restrict respondents to the United States. Our use of Mechanical Turk is justified by previous research finding that “[Mechanical Turk] participants produced reliable results that are consistent with previous decision-making research” [18]. The most relevant concern they raise is of respondents not paying enough attention and becoming fatigued in longer surveys; the short length of our surveys hopefully ameliorated that to some degree. In addition, users are known to pay little attention to permissions messages in practice [9].

- We had to make up permissions that are not actually granted upon authorization so users did not have to select every option to be correct. If we did a poor job, this could have influenced results by distracting or unsettling users. We did not count these made up permissions in our statistical analysis for this reason.

4. DISCUSSION

Our studies indicate that users have a decent understanding of read permissions messages but a poor—and significantly worse—understanding of write permissions messages. As discussed in Sections 4.1 and 2.5, Facebook claims that all-or-nothing write permissions are easier for the user to understand. However, comparison with the very granular read permissions suggests that users understand specific, distinct permissions better.

We also observe that grouped permissions cause confusion for developers who may receive more permissions than intended due to grouping of permissions. This appears contrary to Facebook’s stated advice to developers that they should “only ask for the permissions that are essential to an app [or site]” [14]. Facebook’s own research has demonstrated that “the more permissions an app requests, the less likely it is that people will use Facebook to log into [that] app”[14]. But because Facebook Connect often grants more permissions than the developer requested (even just by always granting public_profile and user_friends), the developer has no choice but to receive unnecessary permissions.

We consider several possible explanations for why the system may be architected this way.

4.1 Evolution over time

Some of our findings around the permissions API appear likely to be artifacts of the API’s evolution, many of which appear harmless. For example, two permissions for reading an email address exist (email and contact_email) and grouping them seems sensible.

It appears that the reason that all write permissions are presented together is that Facebook has decided to eliminate the distinction between different types of publishing. The description in the documentation for publish_actions is “publish my app activity to Facebook” and the description for publish_stream is “publish content to my Wall” [13]. These are quite vague, and seem as though they could encompass nearly anything. A blog post from a Facebook employee [7] helps explain these permissions: They are essentially the same thing (and are being merged into one) and allow a site to do any type of publishing to Facebook. The post mentions that they can be used to upload a photo, which one may have suspected required the photo_upload permission. Another post from a Facebook employee mentions that developers should only request publish_actions because it encompasses all other write permissions in an effort to “simplify the model” [27]. Furthermore, Facebook’s Graph API lists publish_actions as the permission needed for all API calls that involve publishing [12].

This transition towards only one type of publishing is visible to anyone who has used Facebook for several years: updating one’s status and uploading a photo used to be distinct actions, but now they are both performed by creating a post on one’s Timeline. Perhaps at one point the six granular write permissions (create_note, upload_photos, upload_videos, publish_checkins, share_item, status_update) were the only write permissions. The read and extended permissions that are presented in groups may stem from similar changes in Facebook’s structure and it may no longer be possible to separate them.

It is understandable that changes in the structure of Facebook necessitate changes in the Facebook Connect API to keep it simple and consistent. However, our results suggest user control may be being significantly harmed for the sake of simplicity: as previously discussed, Facebook acknowledges that is giving developers more write permissions than they need and just tells them to not abuse the permissions. This threat doesn’t appear purely academic, as there are many malicious Facebook apps that abuse the permissions they are given [8, 22].

4.2 Privacy salience

It is also possible that Facebook has evolved towards having a vague write permissions message as a strategy to decrease privacy salience [5]. If users thought too many permissions were being granted, they may not use the app or the Facebook Connect platform in general. A vague message allows developers to receive more
permissions without losing users.

Evidence that this may be Facebook’s intention can be seen by comparing the current write permissions messages to those from the previous implementation of Facebook Connect. As mentioned previously, 26 of the 203 websites we crawled used an older implementation. Table 7 presents a sampling of the messages we saw. These messages may be misleading since they provide examples of what the site can post based on the specific site even though all sites in the table request only publish_actions. However, these messages do distinctly identify several things the sites can post, unlike the vague messages in the current implementation. Facebook’s choice to eliminate these descriptions may indicate an attempt to be less clear about what permissions are actually being granted.

This explanation is somewhat inconsistent with the relatively detailed read permissions being displayed to users. However, it’s possible users are less sensitive to granting read permissions whereas detailed write permissions are more concerning, meaning there is more obscure to downplay the latter.

<table>
<thead>
<tr>
<th>Site</th>
<th>Write Permissions Message</th>
</tr>
</thead>
<tbody>
<tr>
<td>Starpires.com</td>
<td>This app may post on your behalf, including status updates, photos and more.</td>
</tr>
<tr>
<td>PioneerLegends.com</td>
<td>This app may post on your behalf, including collections you completed, miles you collected and more.</td>
</tr>
<tr>
<td>Stratego.com</td>
<td>This app may post on your behalf, including achievements you earned and more.</td>
</tr>
<tr>
<td>OpenShuffle.com</td>
<td>This app may post on your behalf, including your high scores and more.</td>
</tr>
<tr>
<td>Fupa.com</td>
<td>This app may post on your behalf, including games you played and more.</td>
</tr>
</tbody>
</table>

Table 7: Write permissions messages from sites using an older version of Facebook Connect. All sites are gaming sites. The only write permission they request is publish_actions.

4.3 Ineffectiveness of user choice

It is possible that write messages in particular are vague because users are unable to effectively understand them at all (or simply don’t pay attention to them [9]), so Facebook has decided it is better off protecting user privacy by policing developers instead of providing users with effective choice and control.

Facebook has publicly attempted to address how general write permissions are by placing responsibility on the developer. The aforementioned Facebook blog post explaining the publish_stream and publish_actions permissions [7] states that since anything can be shared, “it will continue to be the developer’s responsibility to make it clear to the user what content will be shared back to Facebook.” It says Facebook’s policy was updated to read: “If a user grants [the developer] a publishing permission, actions [the developer takes] on the users behalf must be expected by the user and consistent with the users actions within [the] app.” This is especially important since our survey showed that users’ interpretation of the write permissions message is influenced by the identity of the site even though there is no difference in the permissions being granted. As of the time of this writing, however, this is no longer mentioned in the Facebook policy [15].

5. FUTURE AREAS FOR RESEARCH

This research could be continued in a variety of directions.

- The results of our survey testing whether users understand that sites are getting access to their information even if it is marked as private (see Figure 8) indicate that there is room for more research in the area. This should be tested with a variety of different permissions. One could also experiment with ways to make it clear to the user that all of their information is being shared, regardless of the privacy settings.

- We previously mentioned that our survey included options of things the sites could not actually do so the respondent would not have to select all options to be correct. However, many people selected these fake options. One could research what permissions users think are being requested beyond what is actually being requested. This is an important area of research because people may be unwilling to use the SSO service if they think too many permissions are being given.

- It is clear that users do not understand the full range of write permissions being requested. However, Egelman [9] determined that users make their decision to use Facebook Connect or not before they see the permissions requested. Egelman only tested read permissions, though. A similar study could see how the presence of write permissions affects users’ decisions to use Facebook Connect. It could also test whether explicitly stating what write permissions are being requested and varying the number of write permissions requested affects whether users are willing to use the system.
6. RELATED WORK

Many researchers have studied the security and permissions systems of various apps and SSO systems. Sun and Beznosov [24] uncovered vulnerabilities in many major OAuth SSO implementations. Chaabane et al. [6] and Huber et al. [19] identified information leaks in Facebook and RenRen apps. There have also been several studies of what permissions sites request, such as Frank et al.’s study in which Facebook apps were grouped into categories based on the permissions they request [17].

Some studies have tested user comprehension of SSO systems as well. A 2011 audit of Facebook Ireland looked at, among other things, how clearly the Facebook app system is presented to users. It also states that it “is not possible for an application to access personal data over and above that to which an individual gives their consent or enabled by the relevant settings”—that is, Facebook’s permissions do appropriately limit what data an app can access [3].

Sun et al. studied user understanding of the authentication process in general—for example, whether users understood that the site they are logging in to cannot see the password for the identity provider (Facebook, Google, etc.) [26]. The study most directly related to ours is Egelman [9], which studied whether users were willing to use Facebook Connect and how well they understand (and how much they pay attention to) the permissions messages. Egelman concluded that 88% of users have a general understanding that their profile information will be shared with the site they are logging in to, but that they typically do not pay attention to the specifics of the dialogues and do not make their decision whether to use Facebook Connect based on which permissions are being requested.

Our study differs from previous studies by determining what specific permissions correspond to the messages presented to the user and by evaluating user comprehension of these permissions. This lets us answer most precisely whether users understand exactly what information they are sharing by using Facebook Connect. In addition, Egelman only looked at read permissions. We found that write permissions are much more confusing to users.

7. CONCLUSIONS

To maximize security and to ensure users feel comfortable using Facebook Connect, developers should be allowed to minimize the number of permissions they request from the user and the permissions should be presented to the user as clearly as possible. On both fronts, Facebook Connect could be improved.

When a developer designs their site to request certain permissions through Facebook Connect, the Facebook Connect system may translate certain permissions into broader groups of permissions that will all be granted if the user authorizes the site to access their profile. This may force users to give unnecessary permissions to a site in order to log in.

The messages presented to the user for read permissions are reasonably clear—our survey showed that a majority of users understand what data they are providing access to. (However, they may be unaware that they are providing access to this information even if their privacy settings are set to private.)

Write permissions, however, are much less clear. Facebook has “simplified” the write permissions process so that every site either gets all write permissions or none. Our survey shows that users do not understand the many things a site will be able to do to their profile if they authorize the vague message stating that the site “would like to post to Facebook for you.” In addition, users’ interpretations of this message vary depending on the identity of the site they are logging in to although this actually has no impact on the permissions granted. Given the relative success with which users were able to identify the more distinct and well-defined read permissions, it appears users might actually understand write permissions better if they were split up.

On April 30, 2014 Facebook announced an update to their Facebook Login system to be rolled out over the following months that allows users to reject individual permissions or log in anonymously [4]. While this is a big step forward, it appears there is still only one publishing permission and it is presented with the same vague message that our survey respondents had trouble understanding. However, it does provide even more specific details about read permissions.

8. ACKNOWLEDGMENTS

Thanks to Arvind Narayanan for introducing us and starting us on this research path. Thanks to Steven Englehardt, Dillon Reisman, Pete Zimmerman, and Christian Eubank for setting us up with the CITP’s web crawling infrastructure. (We would also like to acknowledge Steven for discovering the permissions in the hidden HTML input elements.) Thanks to Markus Huber for providing us with the AppInspect dataset [19].

9The Facebook Connect SSO system uses the same system as native Facebook apps—creating a Facebook login on a website requires creating a Facebook app [11].
9. REFERENCES

APPENDIX
A. FULL MESSAGE DECODING TABLES
<table>
<thead>
<tr>
<th>Message</th>
<th>Permission</th>
<th>Meaning [13]</th>
</tr>
</thead>
<tbody>
<tr>
<td>birthday</td>
<td>user_birthday</td>
<td>birthday</td>
</tr>
<tr>
<td>chat status</td>
<td>user_online_presence</td>
<td>online presence</td>
</tr>
<tr>
<td>checkins</td>
<td>user_checkins</td>
<td>checkins</td>
</tr>
<tr>
<td>current city</td>
<td>user_location</td>
<td>current city</td>
</tr>
<tr>
<td>custom friends lists</td>
<td>read_friendlists</td>
<td>access my friend lists</td>
</tr>
<tr>
<td>education history</td>
<td>user_education_history</td>
<td>education history</td>
</tr>
<tr>
<td>email address</td>
<td>email</td>
<td>email</td>
</tr>
<tr>
<td>events</td>
<td>user_events</td>
<td>events</td>
</tr>
<tr>
<td>follows and followers</td>
<td>user_subscriptions</td>
<td>subscribers and subscribees</td>
</tr>
<tr>
<td>friend list</td>
<td>user_friends</td>
<td>list of friends</td>
</tr>
<tr>
<td>friend requests</td>
<td>read_requests</td>
<td>access my friend requests</td>
</tr>
<tr>
<td>groups</td>
<td>user_groups</td>
<td>groups</td>
</tr>
<tr>
<td>hometown</td>
<td>user_hometown</td>
<td>hometown</td>
</tr>
<tr>
<td>interests</td>
<td>user_interests</td>
<td>interests</td>
</tr>
<tr>
<td>likes</td>
<td>user_likes</td>
<td>likes, music, TV, movies, books, quotes</td>
</tr>
<tr>
<td>messages</td>
<td>read_mailbox</td>
<td>read messages from my mailbox</td>
</tr>
<tr>
<td>News Feed</td>
<td>read_stream</td>
<td>access my News Feed and Wall</td>
</tr>
<tr>
<td></td>
<td>export_stream</td>
<td>export my posts and make them public. All posts will be exported, including status updates.</td>
</tr>
<tr>
<td>notes</td>
<td>user_notes</td>
<td>notes</td>
</tr>
<tr>
<td>personal description</td>
<td>user_about_me</td>
<td>about me</td>
</tr>
<tr>
<td></td>
<td>user_activities</td>
<td>activities</td>
</tr>
<tr>
<td>photos</td>
<td>user_photos</td>
<td>photos uploaded by me</td>
</tr>
<tr>
<td>public profile</td>
<td>public_profile</td>
<td>not listed</td>
</tr>
<tr>
<td>questions</td>
<td>user_questions</td>
<td>questions</td>
</tr>
<tr>
<td>relationship interests</td>
<td>user_relationship_details</td>
<td>significant other and relationship details</td>
</tr>
<tr>
<td>relationships</td>
<td>user_relationships</td>
<td>family members and relationship status</td>
</tr>
<tr>
<td>religious and political views</td>
<td>user_religion_politics</td>
<td>religious and political views</td>
</tr>
<tr>
<td>status updates</td>
<td>user_status</td>
<td>Facebook status</td>
</tr>
<tr>
<td>Video activity</td>
<td>user_actions_video</td>
<td>not listed</td>
</tr>
<tr>
<td>videos</td>
<td>user_videos</td>
<td>videos uploaded by me</td>
</tr>
<tr>
<td>website</td>
<td>user_website</td>
<td>website</td>
</tr>
<tr>
<td>work history</td>
<td>user_work_history</td>
<td>work history</td>
</tr>
</tbody>
</table>

Table 8a: Read permission message decoder, part (a). Message begins with “Site_Name will receive the following info” See Figure 1 (left image) for an example.
birthdays
chat statuses
checkins
current cities
education histories
events
follows and followers
groups
hometowns
interests
likes
notes
personal descriptions
photos
questions
relationship interests
relationships
religious and political views
status updates
videos
websites
work histories
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<table>
<thead>
<tr>
<th><strong>Message</strong></th>
<th><strong>Permission</strong></th>
<th><strong>Meaning</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>access your Facebook ads and related stats</td>
<td>ads_read</td>
<td>access my Facebook ads and related stats</td>
</tr>
<tr>
<td>access your Facebook Pages’ messages</td>
<td>read_page_mailboxes</td>
<td>read messages for my pages</td>
</tr>
<tr>
<td>access your Page and App insights</td>
<td>read_insights</td>
<td>access Insights data for my pages and applications</td>
</tr>
<tr>
<td>manage your ads</td>
<td>ads_management</td>
<td>manage advertisements on behalf of me</td>
</tr>
<tr>
<td>manage your custom friend lists</td>
<td>manage_friendlists</td>
<td>create, delete, and modify my friend lists</td>
</tr>
<tr>
<td>manage your events</td>
<td>create_event</td>
<td>create and modify events</td>
</tr>
<tr>
<td></td>
<td>rsvp_event</td>
<td>RSVP to events</td>
</tr>
<tr>
<td>manage your notifications</td>
<td>manage_notifications</td>
<td>may access my notifications and may mark them as read</td>
</tr>
<tr>
<td>manage your Pages</td>
<td>manage_pages</td>
<td>manage my pages</td>
</tr>
<tr>
<td>send and receive messages on your behalf</td>
<td>xmpp_login</td>
<td>login to Facebook Chat</td>
</tr>
<tr>
<td>send you text messages</td>
<td>sms</td>
<td>send SMS messages to my phone</td>
</tr>
</tbody>
</table>

Table 10: Extended permission message decoder. Message begins with “Site_Name would like to” See Figure 1 (right image) for an example.
B. SURVEYS

This appendix provides details of the surveys used to test user understanding of permissions messages. Descriptions of the survey process can be found in Section 3.

B.1 Initial question

The first question on every survey reads “Some websites allow you to log in to their site using your Facebook account. Have you seen this?” If the user answered yes, they were taken to the rest of the survey. If they answered no, the survey ended. This was to prevent confusion caused by seeing permissions messages out of context. Nearly all users answered yes.

B.2 Read permissions surveys

Figures 9, 10, 11, and 12 show the four different versions of the survey to test understanding of read permissions. Each uses the fake site name “Hooli” but the permissions are taken from a different real site for each. The correct answers are selected.

Figure 9: A read permissions survey. The correct answers are selected. This version of the survey uses the permissions from TripAdvisor.com.

Figure 10: A read permissions survey. The correct answers are selected. This version of the survey uses the permissions from Splashscore.com.

Figure 13 shows the survey to test understanding of write permissions. It also uses the fake site “Hooli.” The correct answers are selected. There were a total of four versions of this survey with the options in different orders.

B.4 Additional read permissions survey

Figure 14 shows the survey to test whether users understand that they are giving access to their information that is not marked as visible to the public. The correct answers are selected.

B.3 Write permissions surveys
Figure 11: A read permissions survey. The correct answers are selected. This version of the survey uses the permissions from Jabong.com.

Figure 12: A read permissions survey. The correct answers are selected. This version of the survey uses the permissions from Flickr.com.
Figure 13: A write permissions survey. The correct answers are selected.

Figure 14: The additional read permissions survey. The correct answers are selected.
C. CORRESPONDENCE WITH FACEBOOK SECURITY

As mentioned in Section 2.5, we sent a security bug report to Facebook reporting that we could use the publish_actions permission after requesting any other write permission (see Section 2.3). Below is the full correspondence with Facebook Security [1].

Initial bug report
Description and Impact:
I can design a site with Facebook Connect that publishes a story with the ‘publish_actions’ permission. However, if I request any other write/publishing permission, such as ‘create_note’, I can still use the ‘publish_actions’ permission and publish the story. I believe this is a vulnerability because applications may be receiving more capability than they believe they are requesting.

Reproduction Instructions / Proof of Concept:
1. I followed the Facebook documentation instructions to create a story with the publish_actions permission: https://developers.facebook.com/docs/opengraph/getting-started/
2. If I replace publish_actions in data-scope with any other write permission, including create_note, I can still publish the story. (If I replace it with a read permission such as email I cannot.)

Facebook Security’s response
Thanks for writing in. Can you send in some screenshots of the dialog you see when requesting the different permissions? I’m curious to see if the wording changes between the two.

Our response
Below are screenshots of the two messages presented whether I request create_note or publish_actions. [screenshots not shown here, roughly equivalent to Figure 1, center image]

The HTML for these messages has three hidden input elements named read, write, and extended. The permissions requested appear in their value fields. However, if I request any of the 8 write permissions (publish_actions, publish_stream, status_update, video_upload, photo_upload, share_item, create_note, or publish_checkins), all 8 appear in the value of the input element named write. I’ve been researching this for a class project at Princeton University and I’ve confirmed that this is true on 73 of 73 different websites that request write permissions. The only two write permissions messages between the 73 sites are “AppName would like to post to Facebook for you” and “AppName would like to post publicly to Facebook for you.” The presence of “publicly” is just determined by the selection on the menu on the bottom left of the message page (second screenshot), not by the permissions being requested.

Facebook Security’s response
I’ll confirm with the Platform team, but I believe this is intentional behavior: as you noted, while in the URL you’re requesting one scope we actually translate them to a broader set of scopes which are easier for users to understand.

Facebook Security’s followup
I just confirmed with our Platform team that this behavior is by design.

Our response
Ok, thanks for looking into that. Is there a reason you do that for the write permissions but not for read or extended permissions?

Facebook Security’s response
The Platform team made this change to simplify the experience for developers and for users. My guess would be that generally, write permissions are more similar (ie: creating a note versus creating a video versus posting all are ways to create content on the site that aren’t very different) whereas read permissions are more distinct (ie: an app which can view your friends does not necessarily need to view your relationships unless major functionality changes).

[End of correspondence]