Engineering Privacy for Your Users

Session 709

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“People have entrusted us with their most personal information. We owe them nothing less than the best protections that we can possibly provide.”

Tim Cook
White House Cybersecurity Summit, February 2015
Great Apps Respect User Privacy

Transparency
Control
Consent
Security
Minimization
Use Limitation
Your Users + You + Privacy = 😊
Overview

Identifiers
Data Collection
Transparency and Control
Meaningful Choices
Building Privacy into Your App
Identifiers
😄 Know your users
😊 Know your users

😢 Track everywhere
Know your users

Track everywhere

Customize services
Know your users

Customize services

Track everywhere

Creepy services
Know your users

Customize services

Prevent fraud

Track everywhere

Creepy services
Know your users

Customize services

Prevent fraud

Track everywhere

Creepy services

Collect everything
Identifiers Best Practices
Identifiers Best Practices

Short-lived
Identifiers Best Practices

Short-lived
Random
Identifiers Best Practices

- Short-lived
- Random
- Anonymous
Examples
Examples

Favor short-lived identifiers

Spotlight, Maps
Examples

Favor short-lived identifiers
Spotlight, Maps

Make it easy to reset identifiers
Siri, News
Examples

Favor short-lived identifiers
Spotlight, Maps

Make it easy to reset identifiers
Siri, News

Identify sessions, not users
Universally Unique Identifiers (UUID)

New unique identifier for each function call

```
let uuid = UUID()
```
Universally Unique Identifiers (UUID)

Example
Universally Unique Identifiers (UUID)

Example

Call 1

a275e7cc-1d37-4ee8-8861-15ab231e44d4
Universally Unique Identifiers (UUID)

Example

Call 1  a275e7cc-1d37-4ee8-8861-15ab231e44d4

Call 2  99968a76-c1af-4257-8351-a25e82887d4e
Universally Unique Identifiers (UUID)

Example

Call 1  a27e7cc-1d37-4ee8-8861-15ab231e44d4

Call 2  99968a76-c1af-4257-8351-a25e82887d4e

Call 3  2ce3a2cd-e430-47d0-a983-b445964c46ec
Vendor ID

Persisted by system to identify device to an app vendor

```swift
let identifierForVendor = current().identifierForVendor.uuidString
```
Vendor ID
Example
<table>
<thead>
<tr>
<th>Vendor ID</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>com.myCompany.app1</td>
<td>bd81cef8-c5b3-4413-846d-3df993c8f256</td>
</tr>
</tbody>
</table>
## Vendor ID

### Example

<table>
<thead>
<tr>
<th>com.myCompany.app1</th>
<th>bd81cef8-c5b3-4413-846d-3df993c8f256</th>
</tr>
</thead>
<tbody>
<tr>
<td>com.myCompany.app2</td>
<td>bd81cef8-c5b3-4413-846d-3df993c8f256</td>
</tr>
</tbody>
</table>

## Vendor ID

**Example**

<table>
<thead>
<tr>
<th>Vendor ID</th>
<th>ID Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>com.myCompany.app1</td>
<td>bd81cef8-c5b3-4413-846d-3df993c8f256</td>
</tr>
<tr>
<td>com.myCompany.app2</td>
<td>bd81cef8-c5b3-4413-846d-3df993c8f256</td>
</tr>
<tr>
<td>com.myOtherCompany.app1</td>
<td>94004a56-8849-46f7-9427-e6e91e6e060c</td>
</tr>
</tbody>
</table>
Advertising ID

Persisted by system for advertising purposes

```swift
let identifierForAdvertising = shared().advertisingIdentifier.uuidString
```
Advertising ID
Example
### Advertising ID

**Example**

<table>
<thead>
<tr>
<th>Device</th>
<th>595d16cc-c0fa-455f-8e30-d17c250139f6</th>
</tr>
</thead>
</table>

### Advertising ID

**Example**

<table>
<thead>
<tr>
<th>Device</th>
<th>595d16cc-c0fa-455f-8e30-d17c250139f6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>595d16cc-c0fa-455f-8e30-d17c250139f6</td>
</tr>
</tbody>
</table>
## Advertising ID

**Example**

<table>
<thead>
<tr>
<th>Device</th>
<th>595d16cc-c0fa-455f-8e30-d17c250139f6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>595d16cc-c0fa-455f-8e30-d17c250139f6</td>
</tr>
<tr>
<td>Reset</td>
<td>2ce3a2cd-e430-47d0-a983-b445964c46ec</td>
</tr>
</tbody>
</table>
## Identifiers’ APIs

<table>
<thead>
<tr>
<th></th>
<th>Scope</th>
<th>Control</th>
<th>Backed Up</th>
<th>Restored Across Devices</th>
</tr>
</thead>
<tbody>
<tr>
<td>UUID</td>
<td>App</td>
<td>Uninstall App</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Vendor ID</td>
<td>Developer</td>
<td>Uninstall all Apps from same teamID</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Advertising ID</td>
<td>Device</td>
<td>Reset Advertising ID</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
MAC Address Randomization
MAC Address Randomization

D1:8D:FC:AD:63:28
MAC Address Randomization
<table>
<thead>
<tr>
<th></th>
<th>x min</th>
<th>2x min</th>
<th>3x min</th>
</tr>
</thead>
</table>
MAC Address Randomization

x min  2x min  3x min

iOS and macOS
MAC Address Randomization

iOS and macOS
Real MAC address not always included in Wi-Fi scans
Message App Extensions

Users identified by random UUID
  
  For each App extension
  
  For each chat

---

Messages

<table>
<thead>
<tr>
<th>Messages</th>
<th>Marina</th>
<th>Tuesday 2:00PM</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Implicit Identifiers
Implicit Identifiers
Implicit Identifiers
Sandboxing

Your App
Sandboxing

Your App

API
Sandboxing

Your App

API
What Does This Mean for You?

Identifiers

Favor short-term identifiers
Use OS-provided identifier APIs
Data Collection
Data Collection Best Practices

Bucket
Sample
Aggregate via Differential Privacy
Bucket
Only required detail
How often does a given user open in-app Settings on a given day?
How often does a given user open in-app Settings on a given day?
Bucket

Only required detail

How often does a given user open in-app Settings on a given day?
Sample
Only from subset of users
Sample

Only from subset of users

How often do my users open in-app Settings on a given day?
Sample

Only from subset of users

How often do my users open in-app Settings on a given day?

10m
Sample

Only from subset of users

How often do my users open in-app Settings on a given day?

\[ \mu = 50 \pm 1 \]

10k /10m
Sample

Only from subset of users

How often do my users open in-app Settings on a given day?

$\mu = 50 \pm 0.1$

1m/10m
Aggregate via Differential Privacy
Aggregate via Differential Privacy

Learn from crowd while protecting individual privacy
Aggregate via Differential Privacy

Learn from crowd while protecting individual privacy

Strong mathematical guarantees
Aggregate via Differential Privacy

Learn from crowd while protecting individual privacy
Strong mathematical guarantees
iOS and macOS
∀i ∈ [n], d ∈ S, \[\ln \frac{\text{Pr}[T_i ∈ T|d_i = d]}{\text{Pr}[T_i ∈ T|d_i = \text{NULL}]} \leq \epsilon\]

\[\left| \ln \frac{\text{Pr}[A_{\text{client}}(d) = t]}{\text{Pr}[A_{\text{client}}(\text{null}) = t]} \right| \leq \ln \left( \frac{e^\epsilon}{1 + e^\epsilon} \cdot \frac{1 + e^\epsilon}{1} \right) = \epsilon\]

\[\alpha = \frac{3k + c_\epsilon \sqrt{\ln(4mk/\beta)}}{\sqrt{n}} = O \left( \frac{\sqrt{\log(p/\beta)}}{\epsilon \sqrt{n}} \right)\]

\[v_{\text{priv}} = \left\{ \left( \frac{v[j] \cdot b[j] + 1}{2} \right), \forall j ∈ [m]\right\}\]
Idea

Data
Idea

Data → Add noise → Privatized Data
Idea

Data → Add noise → Privatized Data

128 hours
Idea

Data  Add noise  Privatized Data

128 hours  128+noise
Idea

Data → Add noise → Privatized Data

128 hours → -201
How Does Noise Work?

Original value: 128

Compute projection
### How Does Noise Work?

<table>
<thead>
<tr>
<th>Original value</th>
<th>128</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compute projection</td>
<td>0000000000000001000000000</td>
</tr>
</tbody>
</table>

Original value 128 after noise is added, effectively causing random bit flips.
# How Does Noise Work?

<table>
<thead>
<tr>
<th>Original value</th>
<th>128</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compute projection</td>
<td>0000000000100000000</td>
</tr>
<tr>
<td></td>
<td>00010101000000011000</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Local

128+noise = 010010101000
Julien

48+noise = 100101001000
Jessie

130+noise = 0101000010110
Timmy
Local

128 + noise = 010010101000
Julien

48 + noise = 100101001000
Jessie

130 + noise = 0101000010110
Timmy
Average = 41 hours

...00000000000000010000...
So What?

Learn popular items privately

Average

Presence of certain attributes

Frequencies
Differential Privacy Over Time

Privacy budget

Restrict the number of submissions made during a period

No identifiers

Periodically delete donations from server
Learning Popular Emojis with Privacy
Learning Popular Emojis with Privacy

SMILEYS & PEOPLE

😊  😆  😃  😄  😅  😆  😇  😈  😋  😌  😍  😝  😘  😗  😙  😚  😜  😳  😄  😭  😠  😛
Learning Popular Emojis with Privacy

Julien
Jessie
Timmy

Frequency

![Apple logo](attachment://apple_logo.png)
Learning Popular Emojis with Privacy

- Julien
- Jessie
- Timmy

Frequency

Example emojis: 😊, 😆, 😐, 😌, 😍, 😘, 😗, 😙, 😜, 😝, 😯, 😈, 😩, 😞, 😟, 😊, 😆, 😐, 😌, 😍, 😘, 😗, 😙, 😜, 😝, 😯, 😈, 😩, 😞, 😟
Learning Popular Emojis with Privacy

Julien

Jessie

Timmy

Frequency

😀😊😌😍😘😗😙😜😝😛🤑😎🤗😏😶😐😑

 нескольkie symbole

 нескольkie symbole

 нескольkie symbole

 several emojis
Crowd-Driven Insight with Privacy
Crowd-Driven Insight with Privacy
Use Cases
Use Cases

Emojis
Popular emojis

New words
Popular words unknown to QuickType dictionary

Deeplinks (iOS)
Popular deeplinks within apps marked as "eligible for public indexing"

Lookup Hints in Notes
Popularly highlighted hints
What Does this Mean for You?
Data collection via Differential Privacy

Crowd-driven insight at scale
Protects individuals
No identifiers
No raw measurements
Transparency and Control
LightRight gives photographers the capability to bookmark natural lighting conditions.

Rookie Cam - Photo Editor & Filter Camera
JellyBus Inc.  
⭐⭐⭐⭐⭐ (6,420)

Features:
- Photo Editor & Filter Camera
- Live Filter Camera
LightRight gives photographers the capability to bookmark natural lighting conditions.
Ads in the App Store are presented based on their relevance to your search. This ad was displayed because you also meet some of the criteria listed below. No personally identifiable information is provided to third parties.

Account Information
Inferred from the data you provided for your Apple ID.

- Age Range: 18-34
- Gender: Male
- Location: 95129

Device Information
Information about your device’s connectivity, time setting, type, language, and location (if the Location-Based iAds system service is on) may be used to deliver ads.

To limit Ad Tracking, reset your Advertising Identifier
Ads in the App Store are presented based on their relevance to your search. This ad was displayed because you also meet some of the criteria listed below. No personally identifiable information is provided to third parties.

**Account Information**
Inferred from the data you provided for your Apple ID.

- **Age Range**: 18-34
- **Gender**: Male
- **Location**: 95129

**Device Information**
Information about your device's connectivity, time setting, type, language, and location (if the Location-Based iAds system service is on) may be used to deliver ads.

To limit Ad Tracking, reset your Advertising Identifier.
About This Ad

Relevance to your search: This ad was displayed because you also meet some of the criteria listed below. No personally identifiable information is provided to third parties.

Account Information
Inferred from the data you provided for your Apple ID.

- Age Range: 18-34
- Gender: Male
- Location: 95129

Device Information
Information about your device’s connectivity, time setting, type, language, and location (if the Location-Based iAd system service is on) may be used to deliver ads.

To limit Ad Tracking, reset your Advertising Identifier and view the information used by Apple to deliver more relevant ads in Apple News and the App Store, go to Settings > Privacy > Advertising.
As applications request access to your data, they will be added in the categories above.

Twitter
Facebook

As applications request access to your social accounts data, they will be added in the categories above.

Diagnostics & Usage
Advertising
As applications request access to your data, they will be added in the categories above.

Twitter
Facebook

As applications request access to your social accounts data, they will be added in the categories above.

Diagnostics & Usage
Advertising
You have downloaded content from these iTunes Store and App Store categories.

- Apps: 7
- Books: 0
- Audiobooks: 3
- Movies: 3
- Music: 3
- TV: 3

You are included in segments of users based on your interactions with advertisers and Apple services, including content downloads, and In-App Purchases.

Customer Relationships: 3

Account Information: Inferred from the data you provided for your Apple ID.

To control the information that is used to deliver ads to you, visit About Advertising & Privacy.

About Advertising & Privacy:

- Birth Year Unknown
- Gender Male
- Location 95129

Information about the connectivity of your device, its time setting, type of device, the language setting, and location (if Location Services is enabled) may be used to deliver ads.
The following information is associated with an anonymous identifier and is used by Apple to deliver more relevant ads in Apple News, the App Store, and Wallet. Your personal data is not provided to third parties.

Content Categories
You have downloaded content from these iTunes Store and App Store categories.

- Apps 7
- Audiobooks 3
- Books 0
- Movies 3
- Music 3
- TV 3

Advertising Segments
You are included in segments of users based on your interactions with advertisers and Apple services, including content downloads, and In-App Purchases.
Ad Information

Advertising Segments
You are included in segments of users based on your interactions with advertisers and Apple services, including content downloads, and In-App Purchases.

- Customer Relationships 3
- News 6

Account Information
Inferred from the data you provided for your Apple ID.

- Birth Year: Unknown
- Gender: Male
- Location: 95129

Device Information
Information about the connectivity of your device, its time setting, type of device, the language setting, and location (if Location Services is enabled) may be used to deliver ads.

To control the information that is used to deliver ads to you, visit About Advertising & Privacy.
Limit Ad Tracking Disabled
Random Advertising ID
7d97c5e0-2424-11e6-abc5-0002a5d5c51b
Limit Ad Tracking Disabled
Random Advertising ID
7d97c5e0-2424-11e6-abc5-0002a5d5c51b
Limit Ad Tracking Disabled
Random Advertising ID
7d97c5e0-2424-11e6-abc5-0002a5d5c51b
Limit Ad Tracking Disabled
Random Advertising ID
00000000-0000-0000-0000-000000000000
Limit Ad Tracking Disabled
Random Advertising ID
00000000-0000-0000-0000-000000000000
Limit Ad Tracking Disabled
Random Advertising ID
00000000-0000-0000-0000-000000000000
Limit Ad Tracking Disabled
Random Advertising ID
9cc11160-2424-11e6-823e-0002a5d5c51b
What Does That Mean For You?
What Does That Mean For You?

Increase in transparency for ads surfaced to users
What Does That Mean For You?

Increase in transparency for ads surfaced to users
Limit Ad Tracking now supported in code
Meaningful Choices
Empowering users to make good privacy decisions
Consent Alerts
Consent Alerts

Allow “Camera” to access your location while you use the app?
Photos and videos will be tagged with the location where they are taken.

Don’t Allow  Allow
New Consent Alerts
Media Library Privacy Setting

iOS 10

Apple Music Subscriber status
Media Library Privacy Setting

iOS 10

Apple Music Subscriber status

SKCloudServiceController.requestCapabilities(completionHandler: (SKCloudServiceCapability, NSError?) -> Void)
Media Library Privacy Setting
iOS 10

Apple Music Subscriber status
Apple Music Subscriber storefront
Media Library Privacy Setting
iOS 10

Apple Music Subscriber status
Apple Music Subscriber storefront

```swift
SKCloudServiceController.requestStorefrontIdentifier(completionHandler: (String?, NSError?) -> Void)
```
Media Library Privacy Setting

iOS 10

Apple Music Subscriber status
Apple Music Subscriber storefront
Add content to a playlist
Media Library Privacy Setting
iOS 10

Apple Music Subscriber status
Apple Music Subscriber storefront
Add content to a playlist

```
MPMediaLibrary.defaultMediaLibrary().addItemWithProductID(productID: String, completionHandler: (([MPMediaEntity], NSError?) -> Void)?)
```
Media Library Privacy Setting
iOS 10

Apple Music Subscriber status
Apple Music Subscriber storefront
Add content to a playlist
Read from media library
Media Library Privacy Setting
iOS 10

Apple Music Subscriber status
Apple Music Subscriber storefront
Add content to a playlist
Read from media library

MPMediaQuery.songs()
MPMediaQuery.playlists()
MPMediaQuery.audiobooks()
MPMediaQuery.podcasts()}
Do I Already Have Access?
Do I Already Have Access?

```swift
SKCloudServiceController.authorizationStatus()

enum SKCloudServiceAuthorizationStatus : Int {
    case notDetermined
    case denied
    case restricted
    case authorized
}
```
Do I Already Have Access?

```swift
SKCloudServiceController.authorizationStatus()

enum SKCloudServiceAuthorizationStatus : Int {
    case notDetermined
    case denied
    case restricted
    case authorized
}
```
Do I Already Have Access?

```swift
SKCloudServiceController.authorizationStatus()

enum SKCloudServiceAuthorizationStatus : Int {
    case notDetermined
    case denied
    case restricted
    case authorized
}
```
Do I Already Have Access?

```swift
SKCloudServiceController.authorizationStatus()

enum SKCloudServiceAuthorizationStatus : Int {
    case notDetermined
    case denied
    case restricted
    case authorized
}
```
Do I Already Have Access?

```
SKCloudServiceController.authorizationStatus()

enum SKCloudServiceAuthorizationStatus : Int {
    case notDetermined
    case denied
    case restricted
    case authorized
}
```
Speech Recognition
iOS 10
Speech Recognition

iOS 10

Speech transcription engine for use by apps
Speech Recognition
iOS 10

Speech transcription engine for use by apps
Speech transcription done on the user’s behalf
Speech Recognition
iOS 10

Speech transcription engine for use by apps
Speech transcription done on the user’s behalf

SFSpeechRecognizer.requestAuthorization(SFSpeechRecognizerAuthorizationStatus)
SiriKit

iOS 10

Users can make Siri requests that are completed with a third party app
SiriKit
iOS 10

Users can make Siri requests that are completed with a third party app.
Apps must request access to receive requests via Siri.
SiriKit

iOS 10

Users can make Siri requests that are completed with a third party app.
Apps must request access to receive requests via Siri.

INPreferences.requestSiriAuthorization()
TV Provider
iOS 10, tvOS 10
Enabled television apps can request access to user subscription information
TV Provider
iOS 10, tvOS 10

Enabled television apps can request access to user subscription information
Reach out to your WWDR partner manager for more details
Photos on tvOS
HomeKit on tvOS
Updates
Consent Alert Purpose String

Allow “Camera” to access your location while you use the app?
Photos and videos will be tagged with the location where they are taken.

Don’t Allow  Allow
Consent Alert Purpose String

Allow “Camera” to access your location while you use the app?

Photos and videos will be tagged with the location where they are taken.

Don’t Allow  Allow
Purpose String Required

iOS 10
Purpose String Required

iOS 10

Contacts
Calendar
Reminders
Photos
Bluetooth Sharing
Microphone
Camera
Location
Health—Sharing

Health—Updating
HomeKit
Media Library
Motion and Fitness
CallKit
Speech Recognition
SiriKit
TV Provider

tvOS 10
Purpose String Required

tvOS 10

Photos
Location
HomeKit
TV Provider
Purpose String Key Names
<table>
<thead>
<tr>
<th>Purpose</th>
<th>String Key Names</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contacts</td>
<td>NSContactsUsageDescription</td>
</tr>
<tr>
<td>Calendars</td>
<td>NSCalendarsUsageDescription</td>
</tr>
<tr>
<td>Reminders</td>
<td>NSRemindersUsageDescription</td>
</tr>
<tr>
<td>Photos</td>
<td>NSPhotoLibraryUsageDescription</td>
</tr>
<tr>
<td>Bluetooth Sharing</td>
<td>NSBluetoothPeripheralUsageDescription</td>
</tr>
<tr>
<td>Microphone</td>
<td>NSMicrophoneUsageDescription</td>
</tr>
<tr>
<td>Camera</td>
<td>NSCameraUsageDescription</td>
</tr>
<tr>
<td>Health—Sharing</td>
<td>NSHealthShareUsageDescription</td>
</tr>
<tr>
<td>Health—Updating</td>
<td>HSHHealthUpdateUsageDescription</td>
</tr>
<tr>
<td>Purpose String Key Names</td>
<td>Key Name</td>
</tr>
<tr>
<td>---------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>HomeKit</td>
<td>paramref HomeKitUsageDescription</td>
</tr>
<tr>
<td>Media Library</td>
<td>paramref AppleMusicUsageDescription</td>
</tr>
<tr>
<td>Motion and Fitness</td>
<td>paramref MotionUsageDescription</td>
</tr>
<tr>
<td>CallKit</td>
<td>paramref CallKitUsageDescription</td>
</tr>
<tr>
<td>Speech Recognition</td>
<td>paramref SpeechRecognitionUsageDescription</td>
</tr>
<tr>
<td>Siri Third Party</td>
<td>paramref SiriUsageDescription</td>
</tr>
<tr>
<td>TV Provider</td>
<td>paramref VideoSubscriberAccountUsageDescription</td>
</tr>
</tbody>
</table>
Add Purpose String in Xcode
Add Purpose String in Xcode
Add Purpose String in Xcode

<table>
<thead>
<tr>
<th>Key</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required device capabilities</td>
<td>Array</td>
<td>(1 item)</td>
</tr>
<tr>
<td>Bundle identifier</td>
<td>String</td>
<td>BPRODUCT_BUNDLE_IDENTIFIER</td>
</tr>
<tr>
<td>infoDictionary version</td>
<td>String</td>
<td>6.0</td>
</tr>
<tr>
<td>Main storyboard file base name</td>
<td>String</td>
<td>Main</td>
</tr>
<tr>
<td>Bundle version</td>
<td>String</td>
<td>1</td>
</tr>
<tr>
<td>Launch screen interface file base name</td>
<td>String</td>
<td>LaunchScreen</td>
</tr>
<tr>
<td>Executable file</td>
<td>String</td>
<td>EXECUTABLE_NAME</td>
</tr>
<tr>
<td>Application requires (iPhone environment)</td>
<td>Boolean</td>
<td>YES</td>
</tr>
<tr>
<td>Bundle versions string, short</td>
<td>String</td>
<td>1.0</td>
</tr>
<tr>
<td>Supported interface orientations</td>
<td>Array</td>
<td>(3 items)</td>
</tr>
<tr>
<td>Bundle display name</td>
<td>String</td>
<td>DiscoTime</td>
</tr>
<tr>
<td>Bundle OS Type code</td>
<td>String</td>
<td>XPLR</td>
</tr>
<tr>
<td>Bundle creator OS Type code</td>
<td>String</td>
<td>??</td>
</tr>
<tr>
<td>Localization native development region</td>
<td>String</td>
<td>en</td>
</tr>
<tr>
<td>Supported interface orientations (iPad)</td>
<td>Array</td>
<td>(4 items)</td>
</tr>
<tr>
<td>Bundle name</td>
<td>String</td>
<td>BPRODUCT_NAME</td>
</tr>
</tbody>
</table>
Add Purpose String in Xcode
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Add Purpose String in Xcode

![Custom iOS Target Properties in Xcode](image)

<table>
<thead>
<tr>
<th>Key</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required device capabilities</td>
<td>Array</td>
<td>(1 item)</td>
</tr>
<tr>
<td>Bundle identifier</td>
<td>String</td>
<td>BPRODUCT_BUNDLE_IDENTIFIER</td>
</tr>
<tr>
<td>infoDictionary version</td>
<td>String</td>
<td>6.0</td>
</tr>
<tr>
<td>Main storyboard file base name</td>
<td>String</td>
<td>Main</td>
</tr>
<tr>
<td>Bundle version</td>
<td>String</td>
<td>1</td>
</tr>
<tr>
<td>Launch screen interface file base name</td>
<td>String</td>
<td>LaunchScreen</td>
</tr>
<tr>
<td>Executable file</td>
<td>String</td>
<td>EXECUTABLE_NAME</td>
</tr>
<tr>
<td>Application requires (iPhone environment)</td>
<td>Boolean</td>
<td>YES</td>
</tr>
<tr>
<td>Bundle version string, short</td>
<td>String</td>
<td>1.0</td>
</tr>
<tr>
<td>Supported interface orientations</td>
<td>Array</td>
<td>(3 items)</td>
</tr>
<tr>
<td>Bundle display name</td>
<td>String</td>
<td>DiscoTime</td>
</tr>
<tr>
<td>Bundle OS Type code</td>
<td>String</td>
<td>XPL</td>
</tr>
<tr>
<td>Bundle creator OS Type code</td>
<td>String</td>
<td>XXX</td>
</tr>
<tr>
<td>Localization native development region</td>
<td>String</td>
<td>en</td>
</tr>
<tr>
<td>Supported interface orientations (iPad)</td>
<td>Array</td>
<td>(4 items)</td>
</tr>
<tr>
<td>Bundle name</td>
<td>String</td>
<td>BPRODUCT_NAME</td>
</tr>
<tr>
<td>Privacy - HomeKit Usage Descriptor</td>
<td>String</td>
<td>This will allow you to create a disco light show using HomeKit.</td>
</tr>
<tr>
<td>Document Types (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exported UTIs (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Imported UTIs (0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>URL Types (0)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
If Not, You’ll Crash and 🔥
If Not, You’ll Crash and 🔥

2016-05-12 13:40:54.161036 DiscoTime[12103:588848] This app has crashed because it attempted to access privacy-sensitive data without a usage description. The app's Info.plist must contain an NSHomeKitUsageDescription key with a string value explaining to the user how the app uses this data.
What Does That Mean for You?
What Does That Mean for You?

New Features with Privacy Settings
What Does That Mean for You?

New Features with Privacy Settings
Declare Purpose String in info.plist
Building Privacy into Your App
Pasteboard Changes

iOS 10
Pasteboard Changes

iOS 10

Set expiration and local options of pasteboards
Pasteboard Changes

iOS 10

Set expiration and local options of pasteboards
Pasteboard Changes
iOS 10

Set expiration and local options of pasteboards

```swift
@available(iOS 10.0, *)
enum UIPasteboardOption: String {
    case expirationDate
    case localOnly
}
```
Pasteboard Changes

Example
Pasteboard Changes

Example

Set expiration and local options of pasteboards
Pasteboard Changes

Example

Set expiration and local options of pasteboards

```
var image: UIImage
```
Pasteboard Changes

Example

Set expiration and local options of pasteboards

```swift
var image: UIImage
let pasteboard = UIPasteboard.general()
```
Pasteboard Changes

Example

Set expiration and local options of pasteboards

```swift
var image: UIImage
let pasteboard = UIPasteboard.general()
pasteboard.setItems([UIPasteboardTypeAutomatic: "Hello, world"],
```
Pasteboard Changes

Example

Set expiration and local options of pasteboards

```swift
var image: UIImage
let pasteboard = UIPasteboard.general()
pasteboard.setItems(
    [{UIPasteboardTypeAutomatic: "Hello, world"},
     {UIPasteboardTypeAutomatic: image}]
)```
Pasteboard Changes

Example

Set expiration and local options of pasteboards

```swift
var image: UIImage
let pasteboard = UIPasteboard.general()
pasteboard.setItems(
    [{UIPasteboardTypeAutomatic: "Hello, world"},
     {UIPasteboardTypeAutomatic: image}],
        options: 
            [.expirationDate: Date(timeIntervalSinceNow: 120.0)],
```
Pasteboard Changes

Example

Set expiration and local options of pasteboards

```swift
var image: UIImage
let pasteboard = UIPasteboard.general()
pasteboard.setItems([UIPasteboardTypeAutomatic: "Hello, world"],
                     {UIPasteboardTypeAutomatic: image},
                     options: [.expirationDate: Date(timeIntervalSinceNow: 120.0),
                               .localOnly: true])
```
Pasteboard Changes

iOS 10
Pasteboard Changes

iOS 10

All named pasteboards will be defaulted to non-persistent
Pasteboard Changes

iOS 10

All named pasteboards will be defaulted to non-persistent
The Find Pasteboard will yield an empty object
Pasteboard Changes

iOS 10

All named pasteboards will be defaulted to non-persistent
The Find Pasteboard will yield an empty object
Use shared containers instead of named pasteboards
Core Spotlight Framework
Core Spotlight Framework

Every user tap should not result in NSUserActivity being published
Core Spotlight Framework

Every user tap should not result in NSUserActivity being published

Do not set eligibleForPublicIndexing to true if data is sensitive user data
Widgets
Widgets on Home screen
Widgets on Lock screen
Widgets on Lock Screen
Widgets on Lock Screen

Evaluate sensitivity of data in widgets
Widgets on Lock Screen

Evaluate sensitivity of data in widgets
Consistent and predictable data
Widgets on Lock Screen

Evaluate sensitivity of data in widgets
Consistent and predictable data
Data that is FileProtectionType.complete will not be available
Find my Friends widget
Find my Friends widget
Find my Friends widget
Summary
Summary

Favor short-lived identifiers
Summary

Favor short-lived identifiers
Collect data in privacy friendly ways
Summary

Favor short-lived identifiers
Collect data in privacy friendly ways
Increase transparency and control
to gain user trust
Summary

Favor short-lived identifiers
Collect data in privacy friendly ways
Increase transparency and control to gain user trust
Empower users to make good privacy decisions
Summary

Favor short-lived identifiers
Collect data in privacy friendly ways
Increase transparency and control to gain user trust
Empower users to make good privacy decisions
Use new tools to build privacy into your app
More Information

https://developer.apple.com/wwdc16/709
## Related Sessions

<table>
<thead>
<tr>
<th>Session</th>
<th>Location</th>
<th>Date</th>
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<tbody>
<tr>
<td>How iOS Security Really Works</td>
<td>Nob Hill</td>
<td>Tuesday 4:00PM</td>
</tr>
<tr>
<td>What's New in Security</td>
<td>Nob Hill</td>
<td>Tuesday 5:00PM</td>
</tr>
<tr>
<td>Core Location Best Practices</td>
<td>Pacific Heights</td>
<td>Thursday 4:00PM</td>
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<tr>
<td>Labs</td>
<td>Frameworks Lab C</td>
<td>Wednesday 9:00AM</td>
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<tr>
<td>Security &amp; Privacy Lab 1</td>
<td>Frameworks Lab B</td>
<td>Thursday 9:00AM</td>
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<tr>
<td>Security &amp; Privacy Lab 2</td>
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