

Advanced CloudKit

Storing your application data in the cloud

Session 231

Jacob Farkas

Software Engineer

What is CloudKit?

Why am I here?



-
- Introducing CloudKit

Mission

Tuesday 3:15PM

What is CloudKit?

Why am I here?



Access to iCloud database servers

-
- Introducing CloudKit

Mission

Tuesday 3:15PM

What is CloudKit?

Why am I here?

NEW

Access to iCloud database servers

Apple uses CloudKit!



● Introducing CloudKit

Mission

Tuesday 3:15PM

What You Will Learn



What You Will Learn

CloudKit private database



What You Will Learn

CloudKit private database

Modeling your data



What You Will Learn

CloudKit private database

Modeling your data

Advanced record manipulation



What You Will Learn

CloudKit private database

Modeling your data

Advanced record manipulation

Handling notifications



What You Will Learn

CloudKit private database

Modeling your data

Advanced record manipulation

Handling notifications

iCloud Dashboard



CloudKit API

Meet NSOperation

CloudKit API

CloudKit API

Highly asynchronous

CloudKit API

Highly asynchronous

NSOperation almost everywhere

Convenience API

```
@interface CKDatabase : NSObject

- (void)fetchRecordWithID:(CKRecordID *)recordID
    completionHandler:(void (^)(CKRecord *record,
                                NSError *error))completionHandler;

@end
```

NSOperation CloudKit API

```
@interface CKFetchRecordsOperation : NSOperation
- (instancetype)initWithRecordIDs:(NSArray /* CKRecordID */ *)recordIDs;

@property (nonatomic, copy) NSArray /* CKRecordID */ *recordIDs;

@property (nonatomic, copy) NSArray /* NSString */ *desiredKeys;

@property (nonatomic, copy) void (^perRecordProgressBlock)
    (CKRecordID *recordID, double progress);
@property (nonatomic, copy) void (^perRecordCompletionBlock)
    (CKRecord *record, CKRecordID *recordID, NSError *error);

@property (nonatomic, copy) void (^fetchRecordsCompletionBlock)(
    NSDictionary /* CKRecordID * -> CKRecord */ *recordsByRecordID,
    NSError *operationError);

@end
```


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    NSDictionary /* CKRecordID * -> CKRecord */ *recordsByRecordID,
    NSError *operationError);

@end
```

CloudKit Operations

Basic NSOperations

```
@interface NSOperation : NSObject
```

- (void (^)(void))completionBlock
- (void)cancel;

- (BOOL)isCancelled;
- (BOOL)isExecuting;
- (BOOL)isFinished;

- (void)addDependency:(NSOperation *)op;
- (void)removeDependency:(NSOperation *)op;

```
@end
```

CloudKit Operations

Basic NSOperations

```
@interface NSOperation : NSObject
```

```
– (void (^)(void))completionBlock  
– (void)cancel;
```

Lifecycle

```
– (BOOL)isCancelled;  
– (BOOL)isExecuting;  
– (BOOL)isFinished;
```

```
– (void)addDependency:(NSOperation *)op;  
– (void)removeDependency:(NSOperation *)op;
```

```
@end
```

CloudKit Operations

Basic NSOperations

```
@interface NSOperation : NSObject
```

```
– (void (^)(void))completionBlock  
– (void)cancel;
```

← Lifecycle

```
– (BOOL)isCancelled;  
– (BOOL)isExecuting;  
– (BOOL)isFinished;
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```
– (void)addDependency:(NSOperation *)op;  
– (void)removeDependency:(NSOperation *)op;
```

```
@end
```

CloudKit Operations

Basic NSOperations

```
@interface NSOperation : NSObject
```

```
– (void (^)(void))completionBlock  
– (void)cancel;
```

```
– (BOOL)isCancelled;  
– (BOOL)isExecuting;  
– (BOOL)isFinished;
```

State

```
– (void)addDependency:(NSOperation *)op;  
– (void)removeDependency:(NSOperation *)op;
```

```
@end
```

CloudKit Operations

Basic NSOperations

```
@interface NSOperation : NSObject
```

- (void (^)(void))completionBlock
- (void)cancel;

- (BOOL)isCancelled;
- (BOOL)isExecuting;
- (BOOL)isFinished;

← State

- (void)addDependency:(NSOperation *)op;
- (void)removeDependency:(NSOperation *)op;

```
@end
```


CloudKit Operations

Basic NSOperations

```
@interface NSOperation : NSObject
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```
– (void (^)(void))completionBlock  
– (void)cancel;
```

```
– (BOOL)isCancelled;  
– (BOOL)isExecuting;  
– (BOOL)isFinished;
```

```
– (void)addDependency:(NSOperation *)op;  
– (void)removeDependency:(NSOperation *)op;
```

Dependencies

```
@end
```

CloudKit Operations

Basic NSOperations

```
@interface NSOperation : NSObject
```

- (void (^)(void))completionBlock
- (void)cancel;
- (BOOL)isCancelled;
- (BOOL)isExecuting;
- (BOOL)isFinished;

- (void)addDependency:(NSOperation *)op;
- (void)removeDependency:(NSOperation *)op;

← Dependencies

```
@end
```

CloudKit Operations

Basic NSOperationQueue

```
@interface NSOperationQueue : NSObject

- (void)addOperation:(NSOperation *)op;

- (NSArray *)operations;

- (void)setSuspended:(BOOL)b;
- (BOOL)isSuspended;

- (void)cancelAllOperations;

@end
```

Starting Operations

CloudKit Operations

Basic NSOperationQueue

```
@interface NSOperationQueue : NSObject
```

```
– (void)addOperation:(NSOperation *)op;
```

```
– (NSArray *)operations;
```

```
– (void)setSuspended:(BOOL)b;
```

```
– (BOOL)isSuspended;
```

```
– (void)cancelAllOperations;
```

```
@end
```

← Starting Operations

CloudKit Operations

Basic NSOperationQueue

```
@interface NSOperationQueue : NSObject

- (void)addOperation:(NSOperation *)op;

- (NSArray *)operations;

- (void)setSuspended:(BOOL)b;
- (BOOL)isSuspended;

- (void)cancelAllOperations;

@end
```

Stopping Operations

CloudKit Operations

Basic NSOperationQueue

```
@interface NSOperationQueue : NSObject  
  
- (void)addOperation:(NSOperation *)op;  
  
- (NSArray *)operations;  
  
- (void)setSuspended:(BOOL)b;  
- (BOOL)isSuspended;  
  
- (void)cancelAllOperations;
```

```
@end
```

← Stopping Operations

CloudKit Operations

Finding your way around

CKDiscoverAllContactsOperation

CKDiscoverUserInfosOperation

CKFetchNotificationChangesOperation

CKFetchRecordChangesOperation

CKFetchRecordZonesOperation

CKFetchRecordsOperation

CKFetchSubscriptionsOperation

CKMarkNotificationsReadOperation

CKModifyBadgeOperation

CKModifyRecordZonesOperation

CKModifyRecordsOperation

CKModifySubscriptionsOperation

CKQueryOperation

CloudKit Operations

Finding your way around

CKFetchRecordChangesOperation

CKFetchRecordsOperation

CKFetchSubscriptionsOperation

CKModifyBadgeOperation

CKModifyRecordsOperation

CKModifySubscriptionsOperation

CKQueryOperation

CKDiscoverAllContactsOperation

CKDiscoverUserInfosOperation

CKFetchNotificationChangesOperation

CKFetchRecordZonesOperation

CKMarkNotificationsReadOperation

CKModifyRecordZonesOperation

CloudKit Operations

Finding your way around

CKFetchRecordsOperation

CKModifyRecordsOperation

CKFetchRecordChangesOperation

CKQueryOperation

CKFetchSubscriptionsOperation

CKModifySubscriptionsOperation

CKModifyBadgeOperation

CKFetchRecordZonesOperation

CKModifyRecordZonesOperation

CKDiscoverAllContactsOperation

CKDiscoverUserInfosOperation

CKFetchNotificationChangesOperation

CKMarkNotificationsReadOperation

CloudKit Operations

Finding your way around

Records

CKFetchRecordsOperation
CKModifyRecordsOperation
CKFetchRecordChangesOperation
CKQueryOperation

Subscriptions

CKFetchSubscriptionsOperation
CKModifySubscriptionsOperation
CKModifyBadgeOperation

Zones

CKFetchRecordZonesOperation
CKModifyRecordZonesOperation

Users

CKDiscoverAllContactsOperation
CKDiscoverUserInfosOperation

Notifications

CKFetchNotificationChangesOperation
CKMarkNotificationsReadOperation

NSOperation Tips

Dependencies

NSOperation Tips

Dependencies

Use dependencies between operations

NSOperation Tips

Dependencies

Use dependencies between operations

Dependencies work between queues

NSOperation Tips

Completion blocks

NSOperation Tips

Completion blocks

`NSOperation.completionBlock` fires asynchronously with dependencies

NSOperation Tips

Completion blocks

`NSOperation.completionBlock` fires asynchronously with dependencies

Use the CloudKit specific completion blocks to process results

NSOperation Tips

Completion blocks

`NSOperation.completionBlock` fires asynchronously with dependencies

Use the CloudKit specific completion blocks to process results

```
@property (nonatomic, copy) void (^fetchRecordsCompletionBlock)  
    (NSDictionary *recordsByRecordID, NSError *operationError);
```

NSOperation Tips

Priorities

NSOperations can have priorities

```
NSOperationQueuePriority {  
    NSOperationQueuePriorityVeryLow,  
    NSOperationQueuePriorityLow,  
    NSOperationQueuePriorityNormal,  
    NSOperationQueuePriorityHigh,  
    NSOperationQueuePriorityVeryHigh  
};
```

The CloudKit Private Database

Storing private user data in CloudKit

Big Data, Little Phone

More data than could fit on a single client

Data downloaded on demand

No offline use



Big Data, Little Phone

More data than could fit on a single client

Data downloaded on demand

No offline use



Little Data, Lots of Clients

Data fits on a client

Every client wants the same data

Lots of clients



Little Data, Lots of Clients

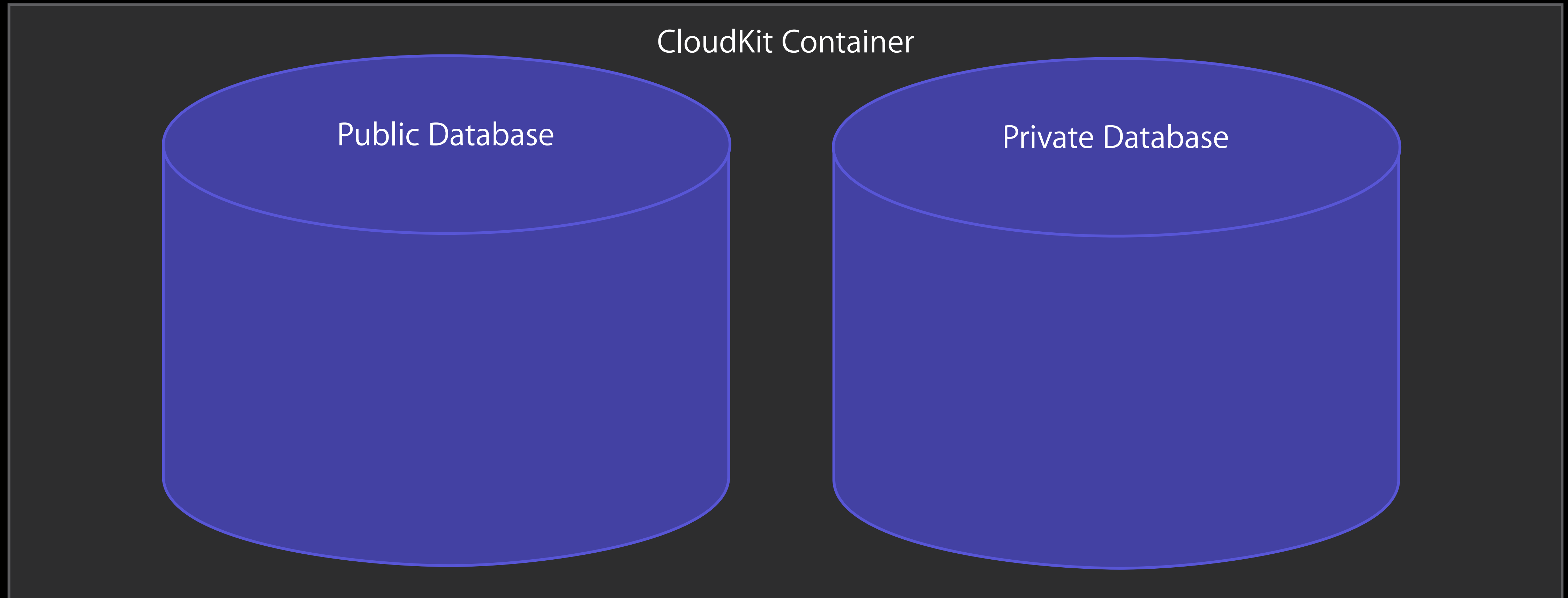
Data fits on a client

Every client wants the same data

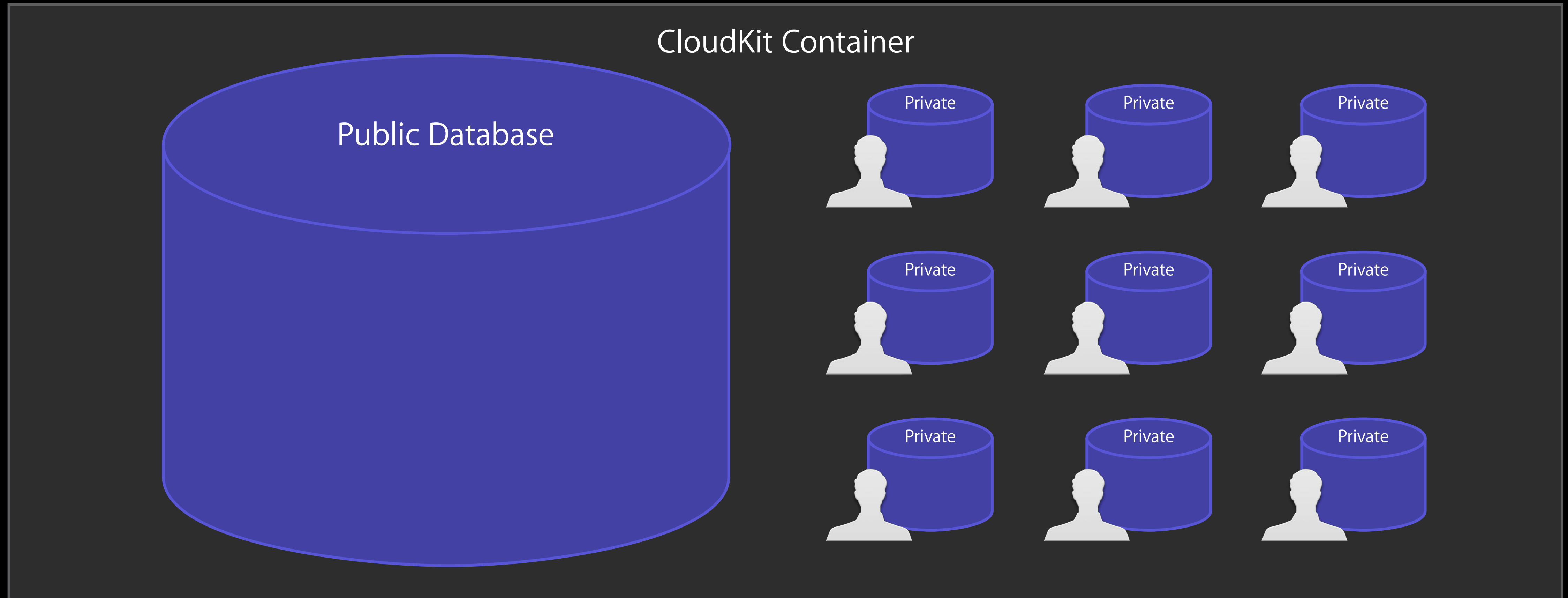
Lots of clients



Public vs. Private Database

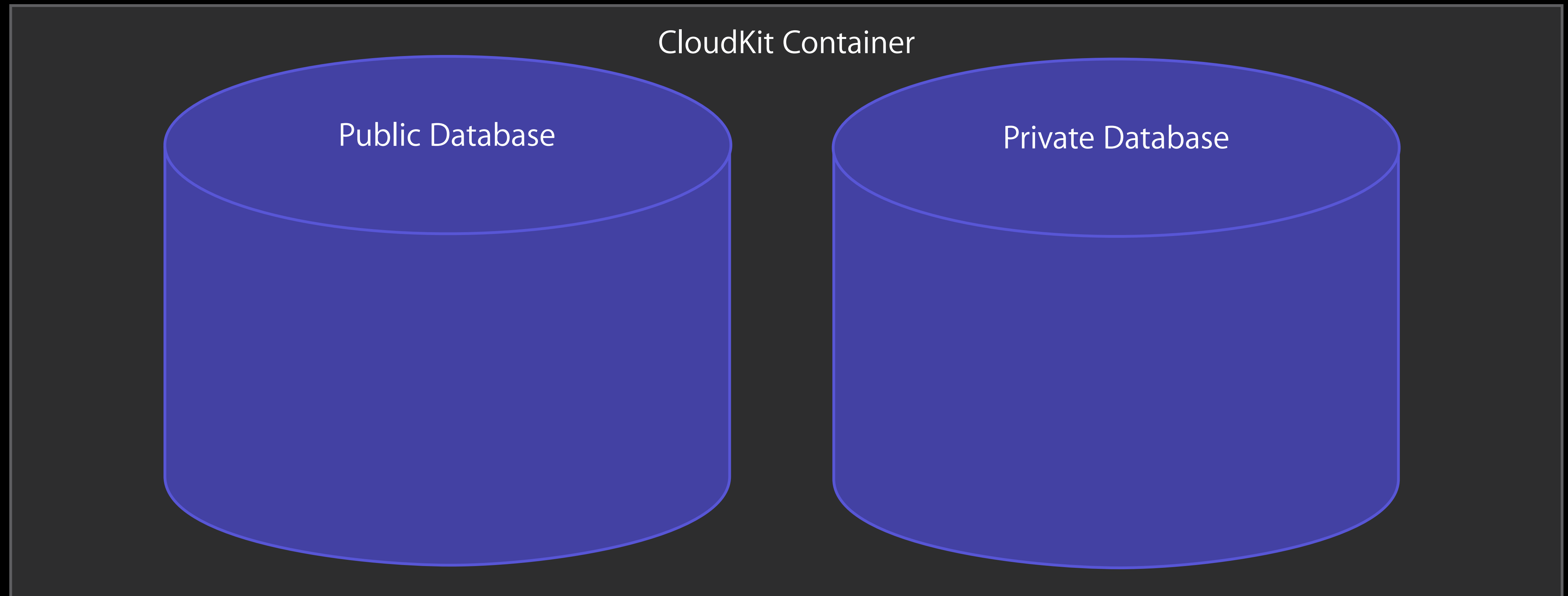


Databases



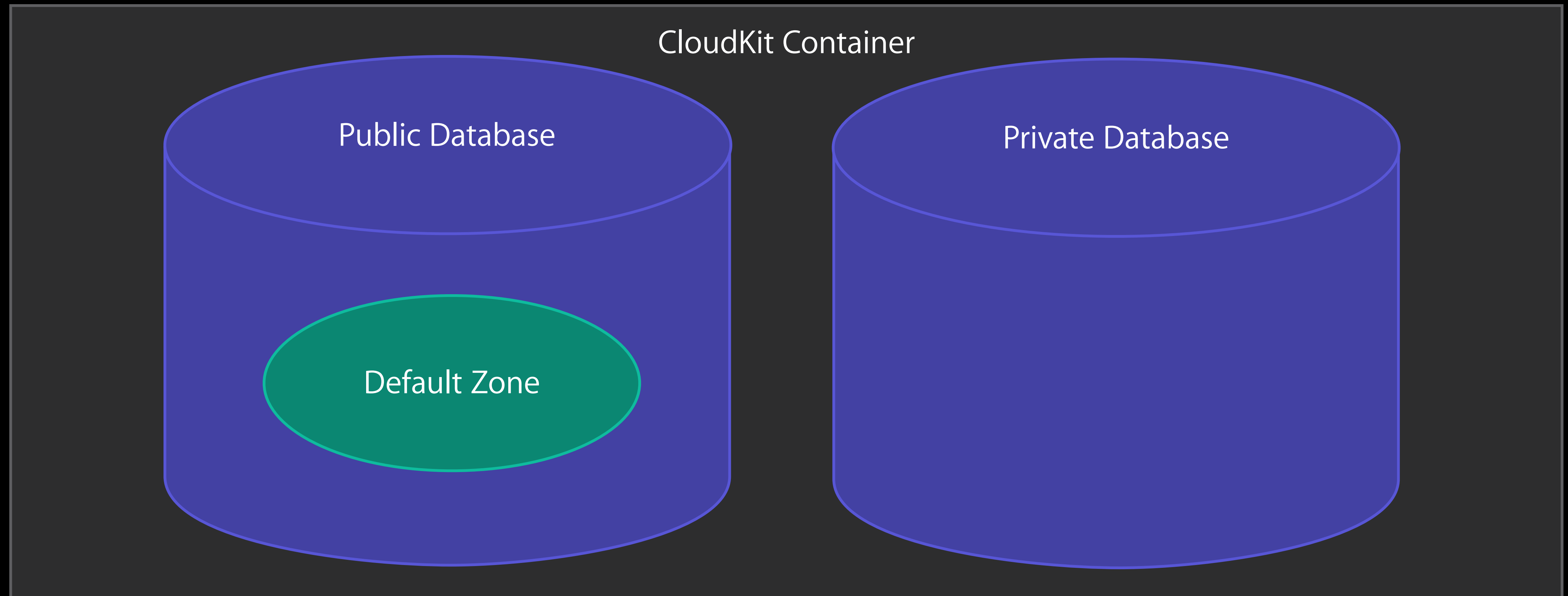
Zones

Partitioning your data



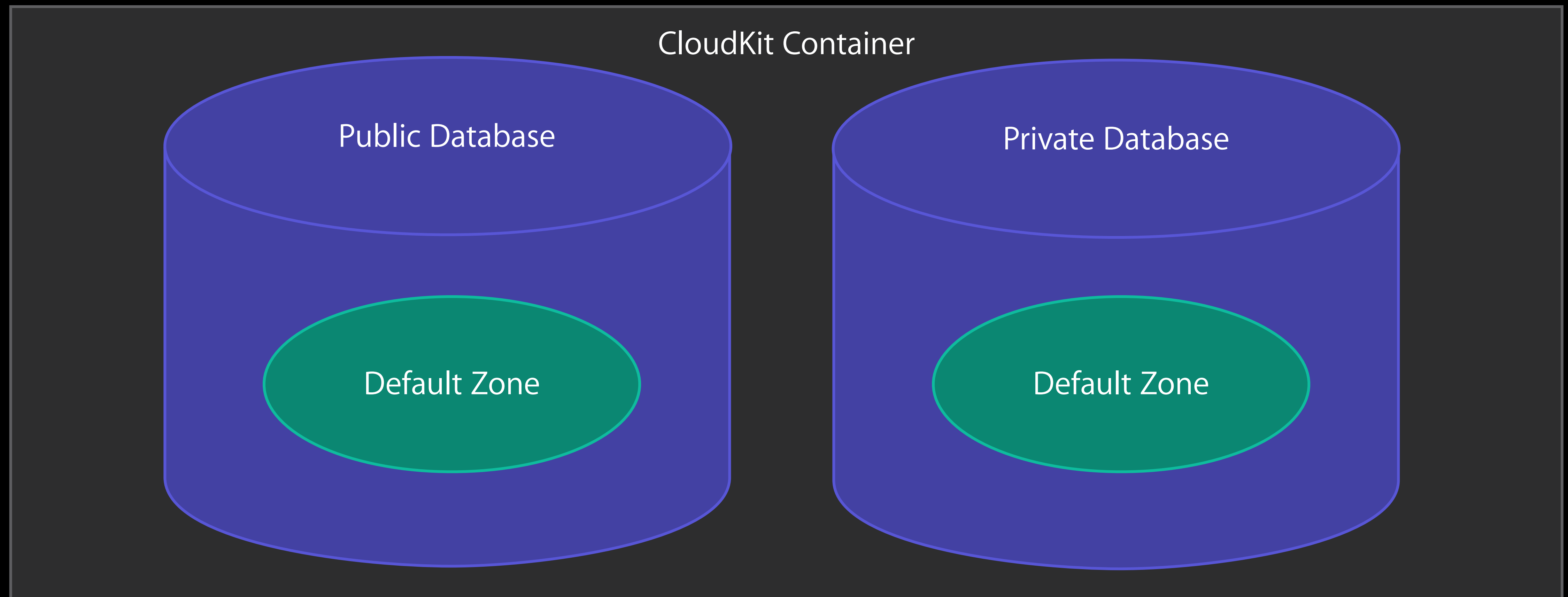
Zones

Partitioning your data



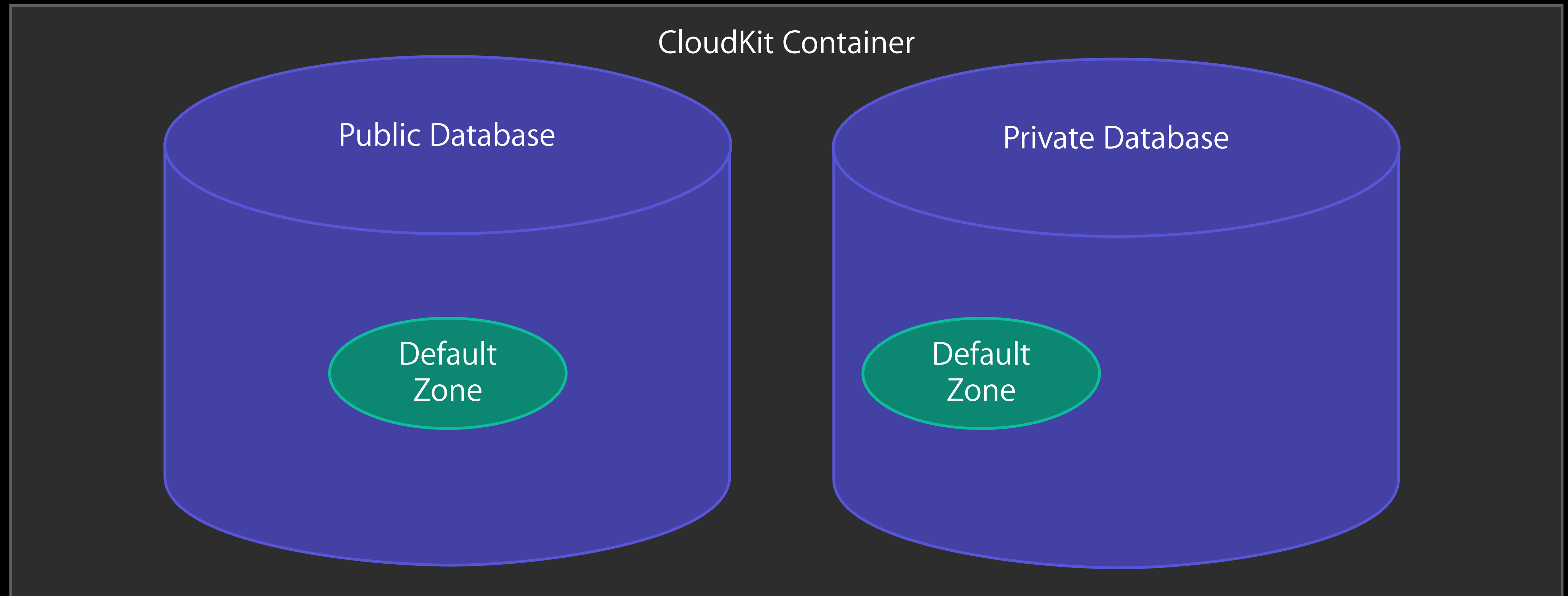
Zones

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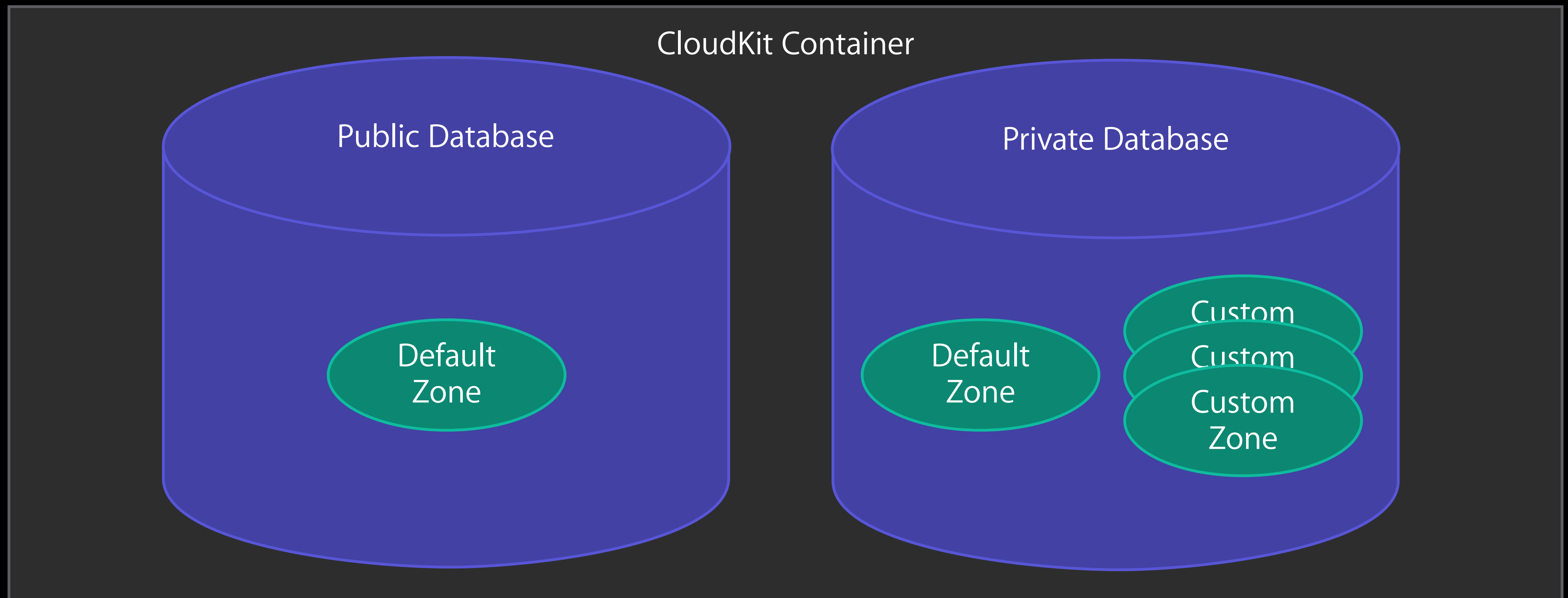
Zones

Partitioning your data



Zones

Partitioning your data



Atomic Commits

CloudKit relationship advice

Atomic Commits

CloudKit relationship advice

CloudKit has relationships

Atomic Commits

CloudKit relationship advice

CloudKit has relationships

You want consistency

Atomic Commits

CloudKit relationship advice

CloudKit has relationships

You want consistency

Public database tradeoffs

Atomic Commits

CloudKit relationship advice

CloudKit has relationships

You want consistency

Public database tradeoffs

Custom zones give you atomic commits

Atomic Commits

Custom zone features

Atomic Commits

Custom zone features

Batch operations succeed or fail as a whole

Atomic Commits

Custom zone features

Batch operations succeed or fail as a whole

Failures return `CKErrorPartialFailure`

Atomic Commits

Custom zone features

Batch operations succeed or fail as a whole

Failures return **CKErrorPartialFailure**

- UserInfo dictionary contains individual errors under CKPartialErrorsByItemID

Atomic Commits

Custom zone features

Batch operations succeed or fail as a whole

Failures return **CKErrorPartialFailure**

- UserInfo dictionary contains individual errors under CKPartialErrorsByItemID
- Some records have real failures

Atomic Commits

Custom zone features

Batch operations succeed or fail as a whole

Failures return **CKErrorPartialFailure**

- UserInfo dictionary contains individual errors under CKPartialErrorsByItemID
- Some records have real failures
- All others have **CKErrorBatchRequestFailed**

Delta Downloads

Keeping an offline cache

Some apps need to work while offline

Data set is small enough to store locally

Sync is hard



Delta Downloads

Example



Local Cache

Custom Zone



Local Cache



Delta Downloads

Example



Local Cache

Custom
Zone

Record

Record

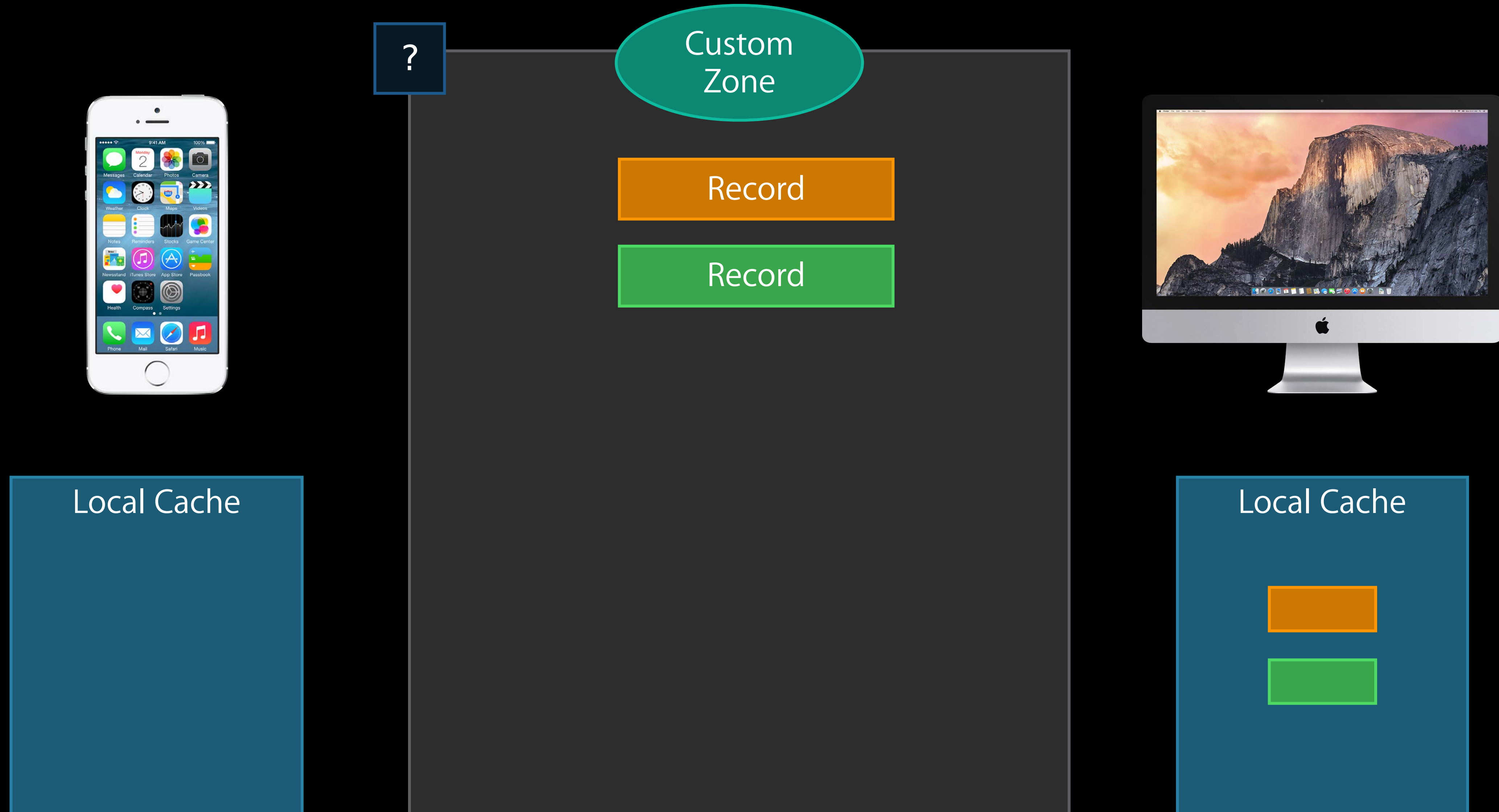


Local Cache



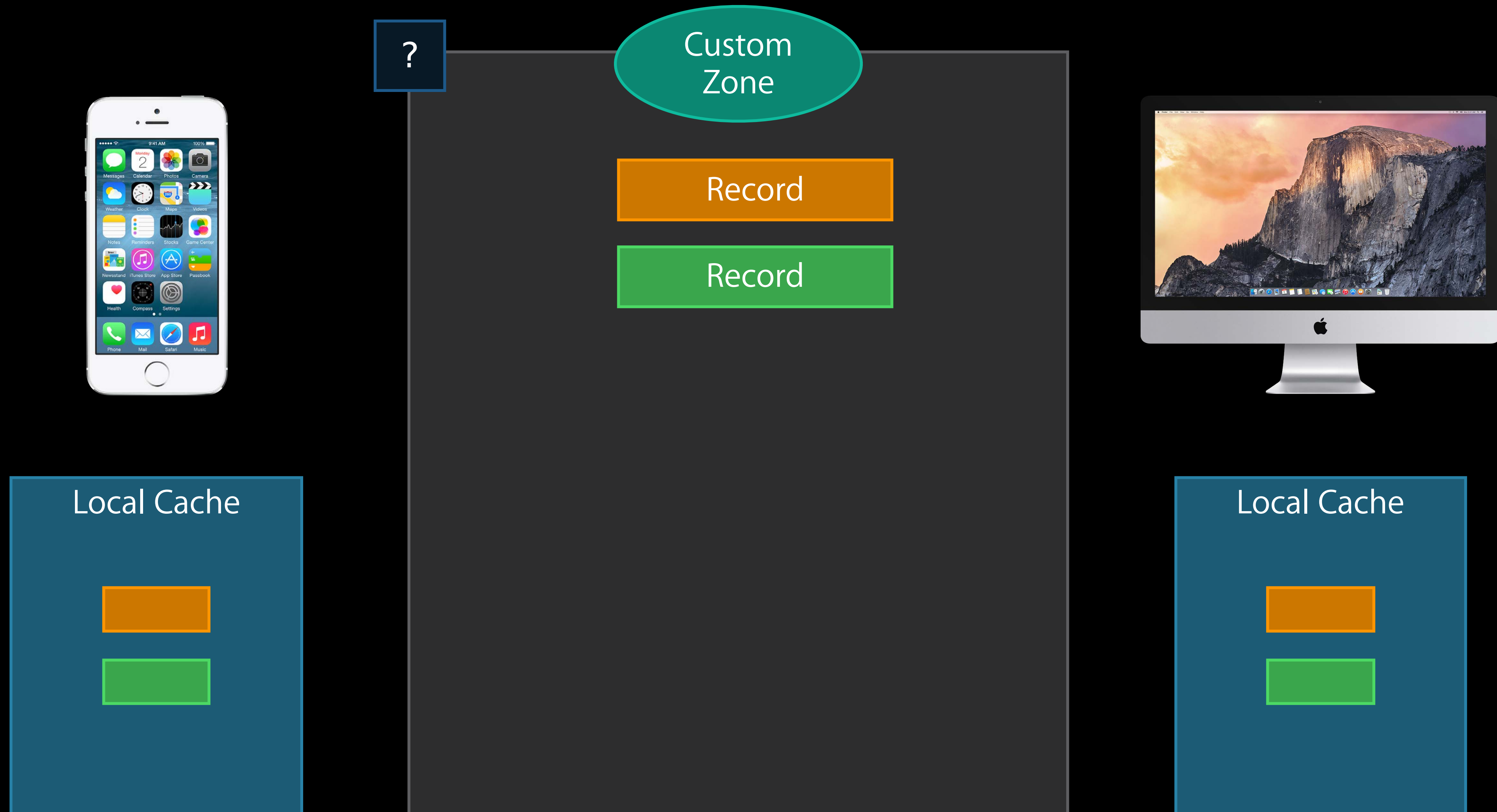
Delta Downloads

Example



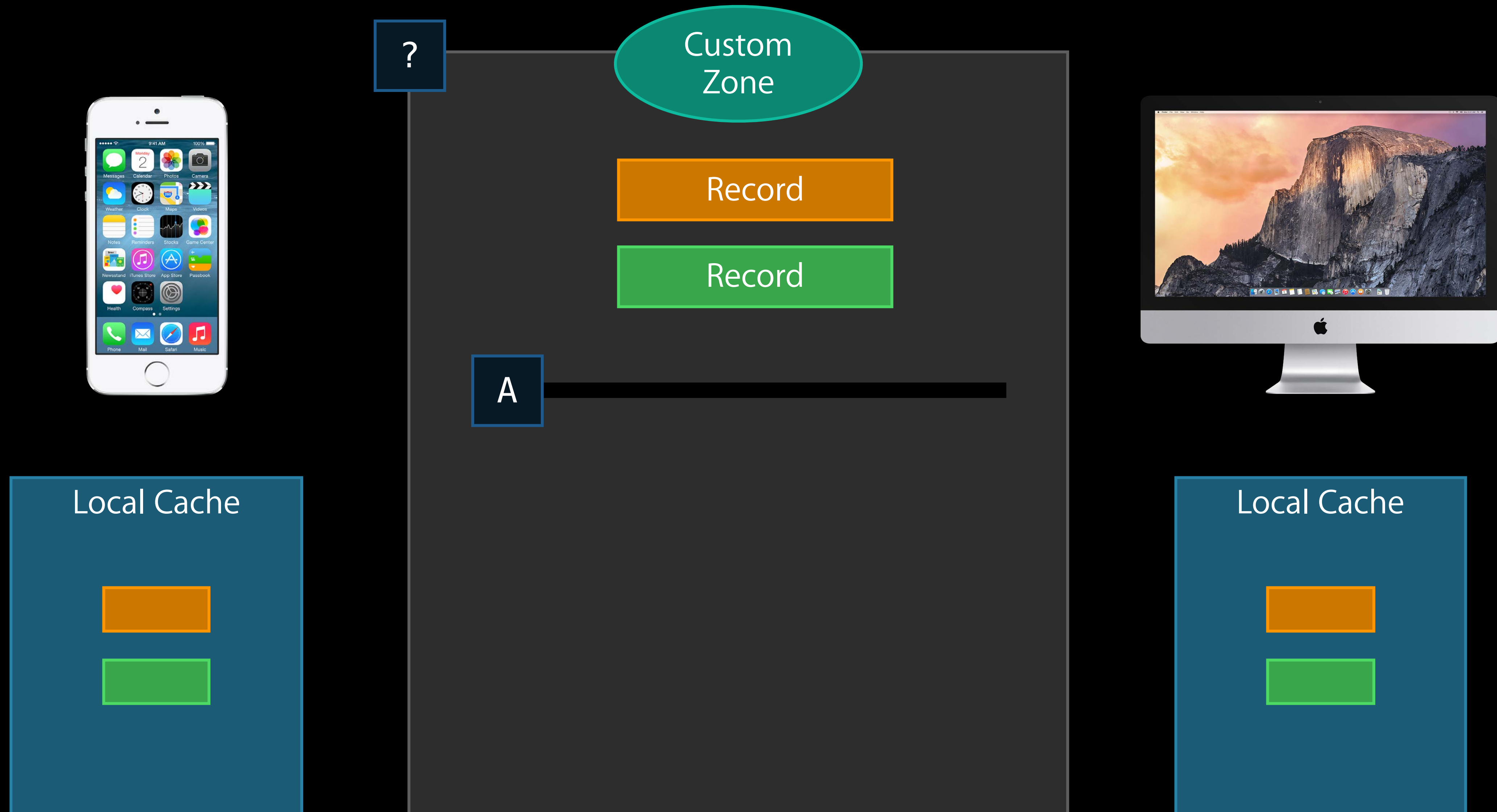
Delta Downloads

Example



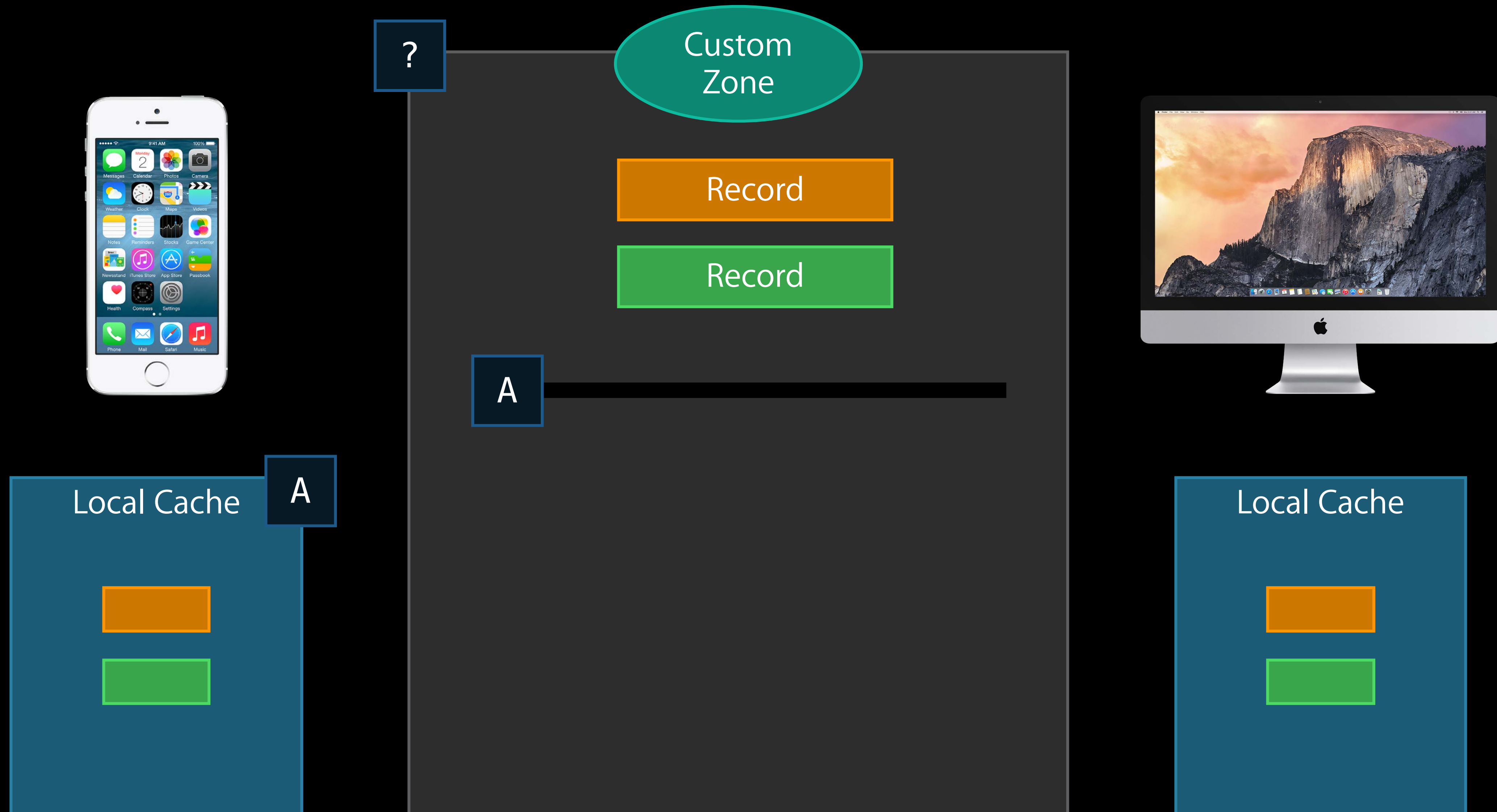
Delta Downloads

Example



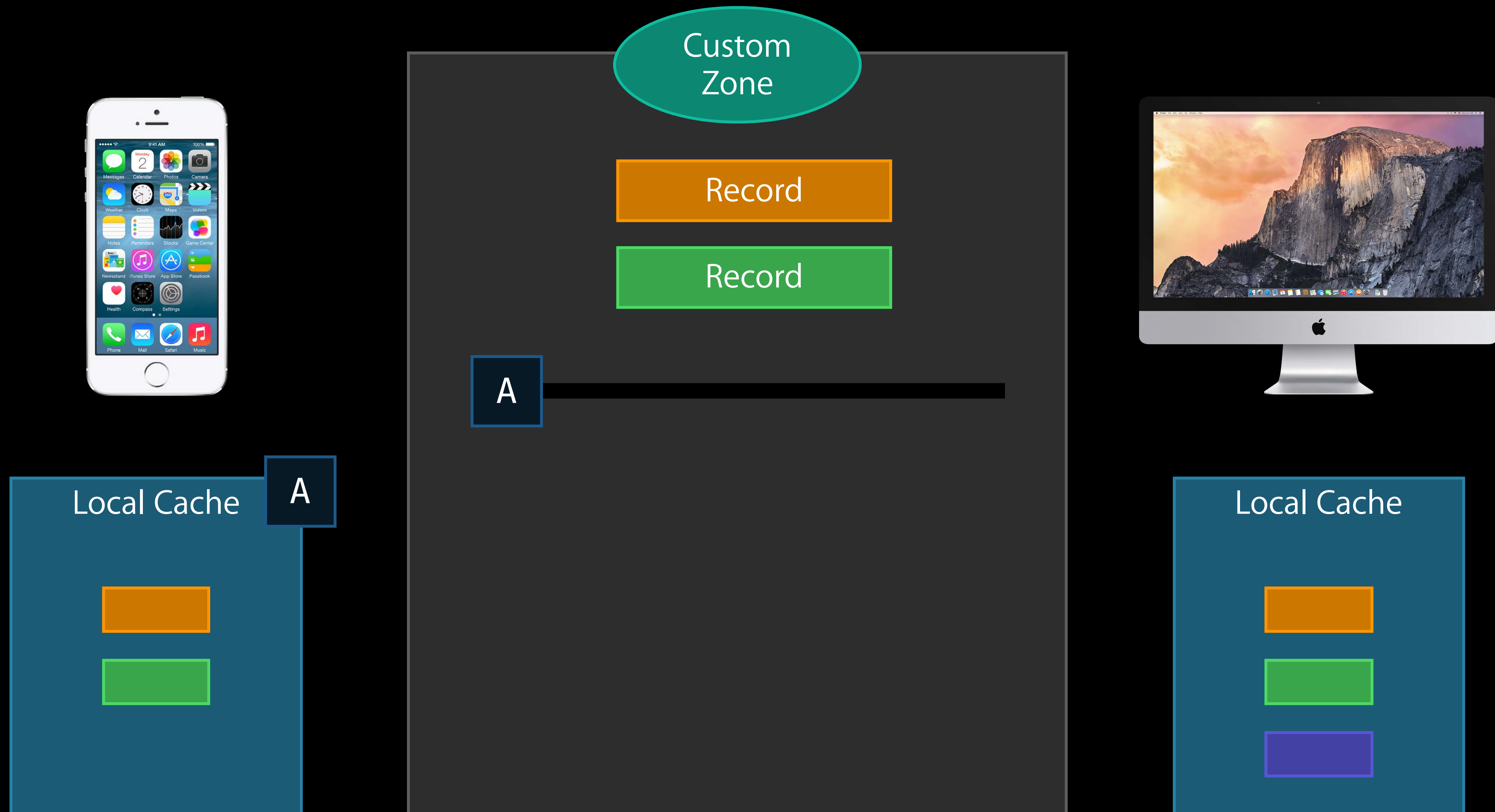
Delta Downloads

Example



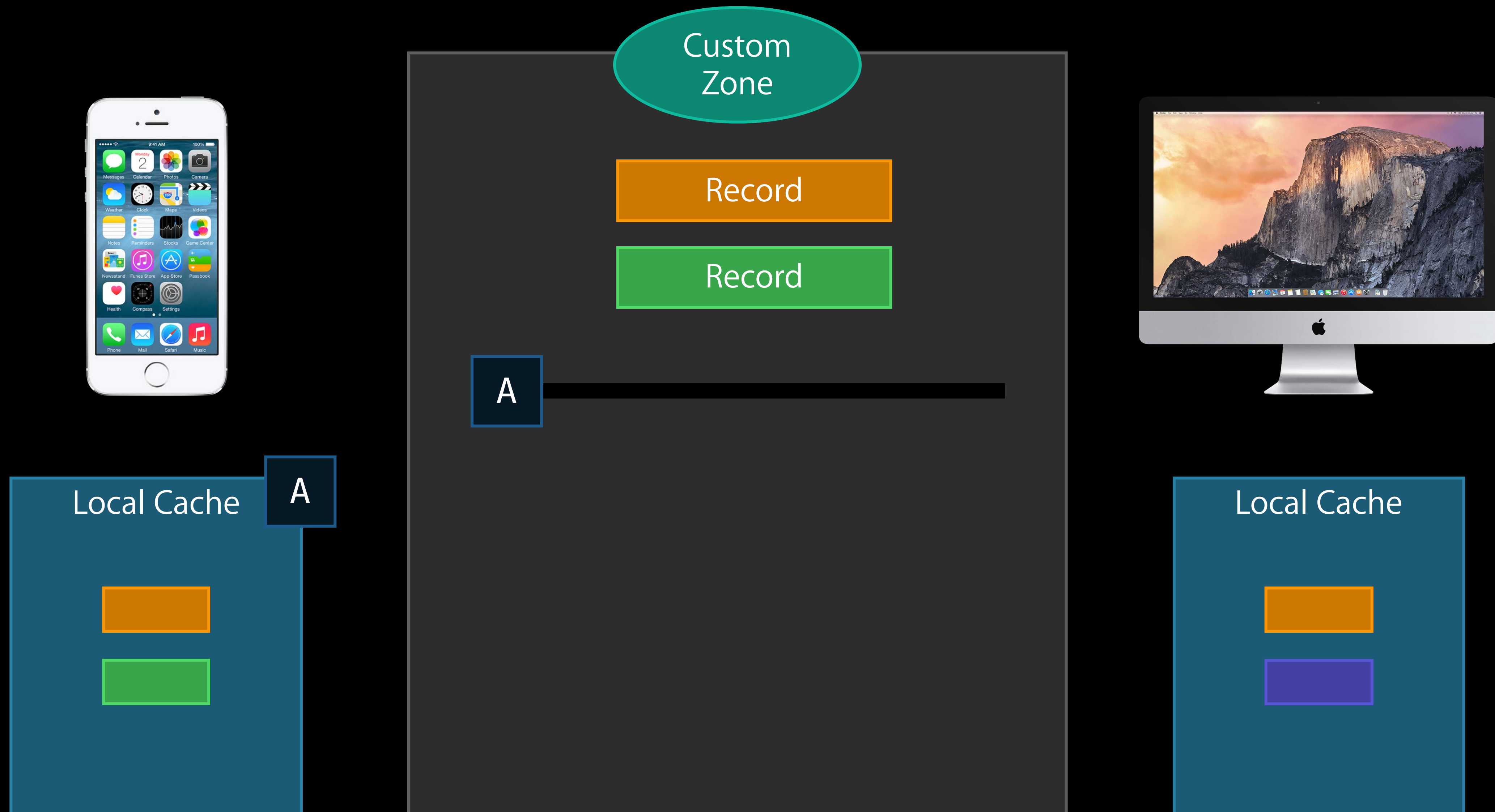
Delta Downloads

Example



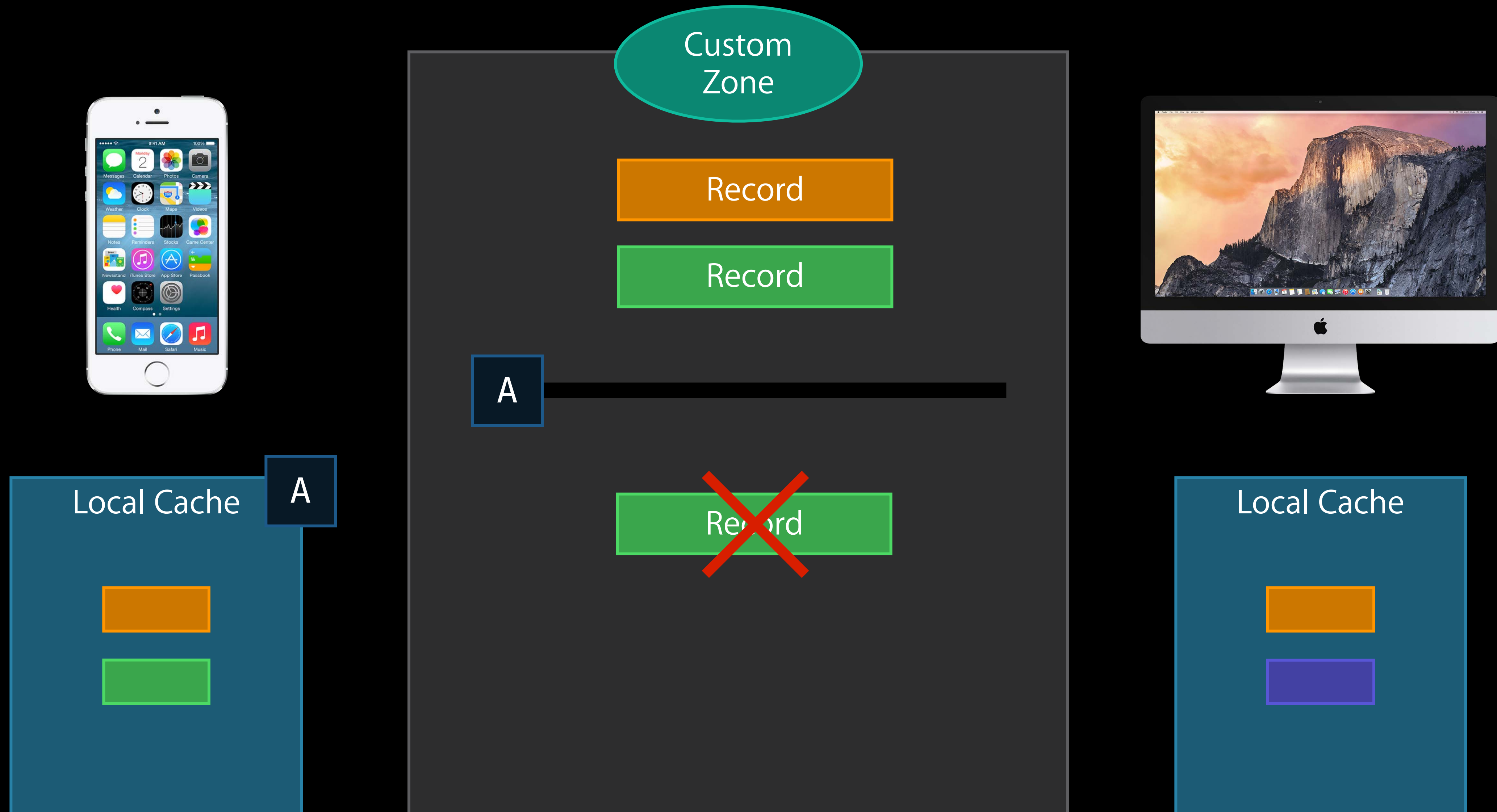
Delta Downloads

Example



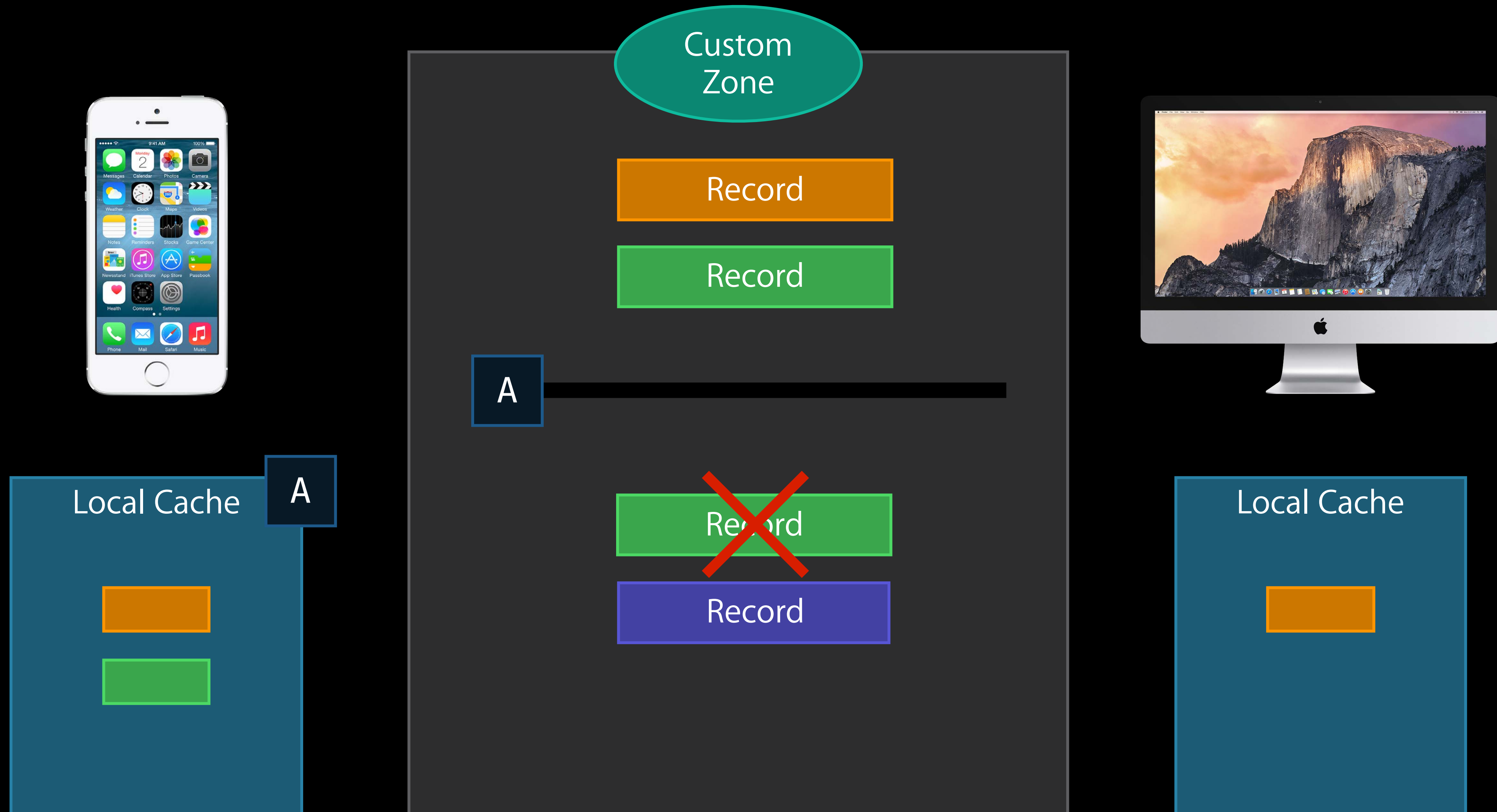
Delta Downloads

Example



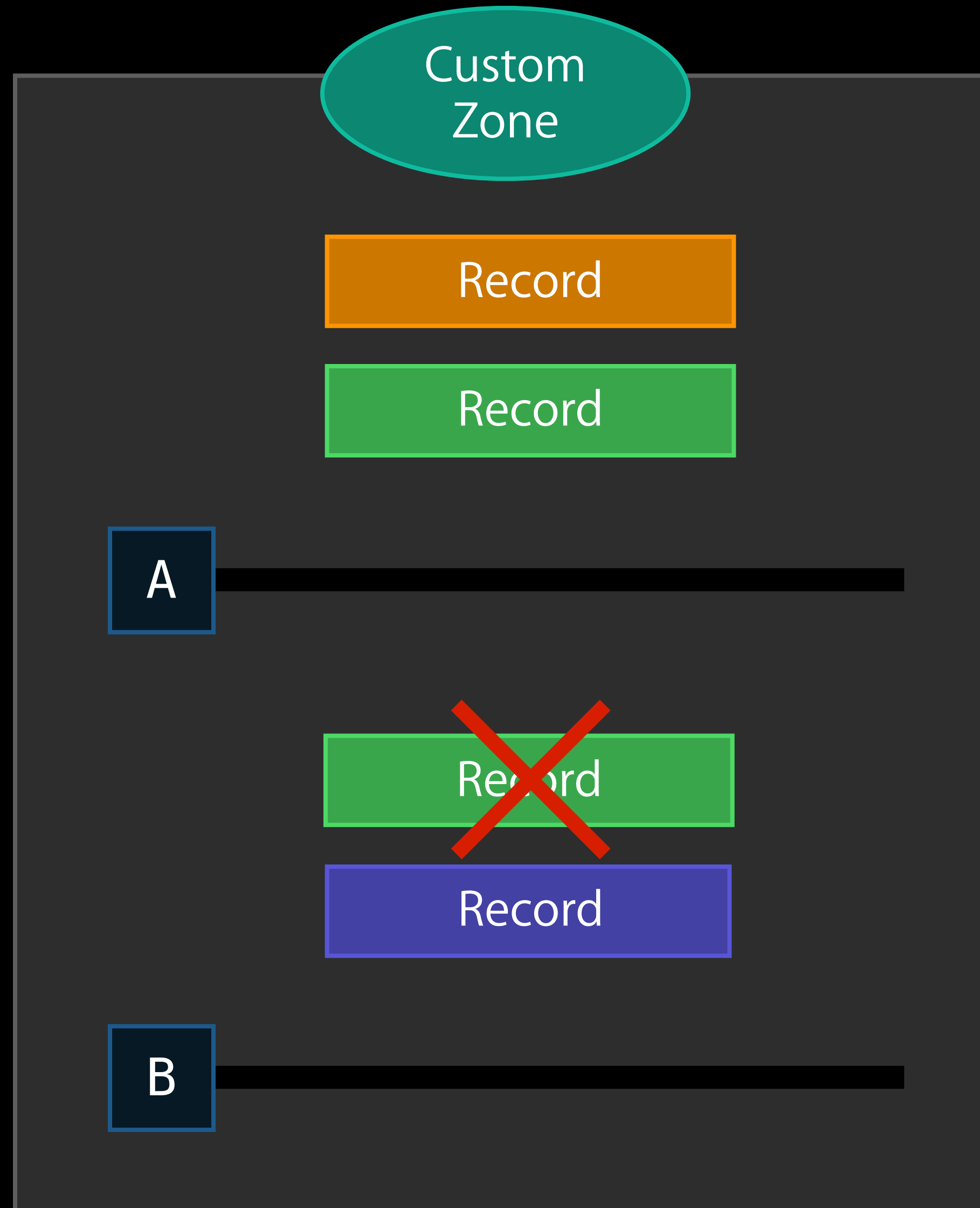
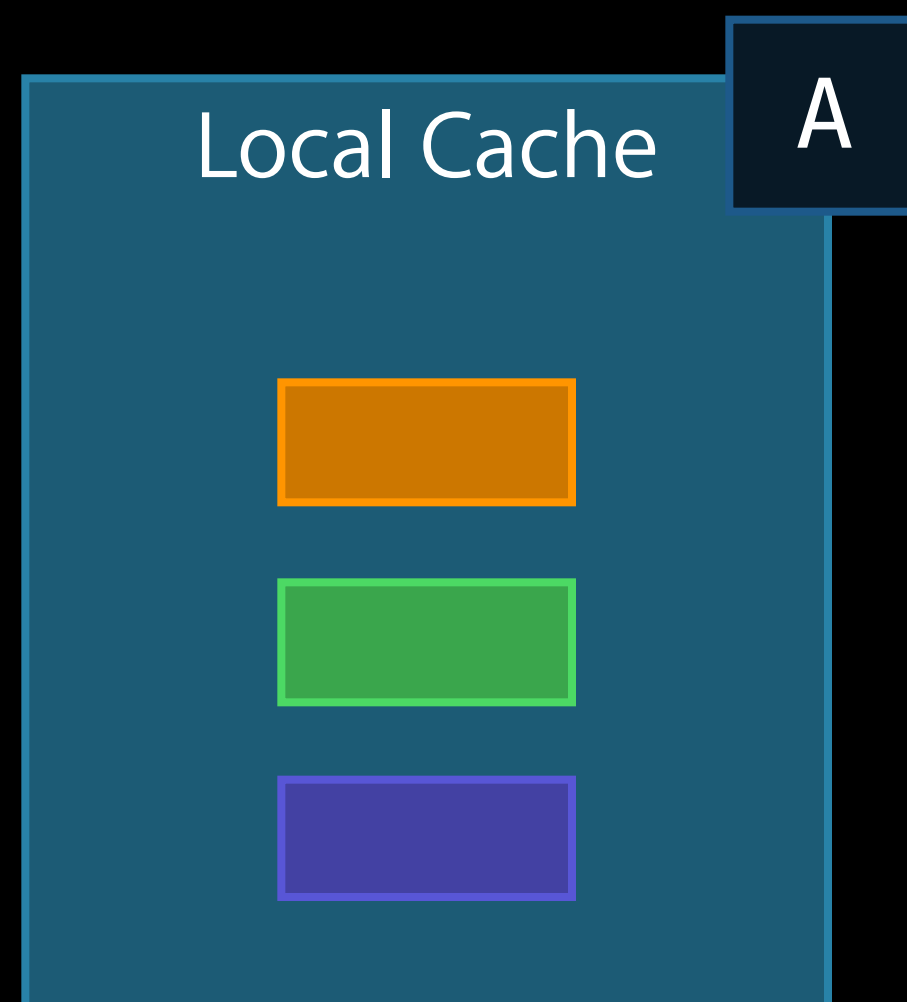
Delta Downloads

Example



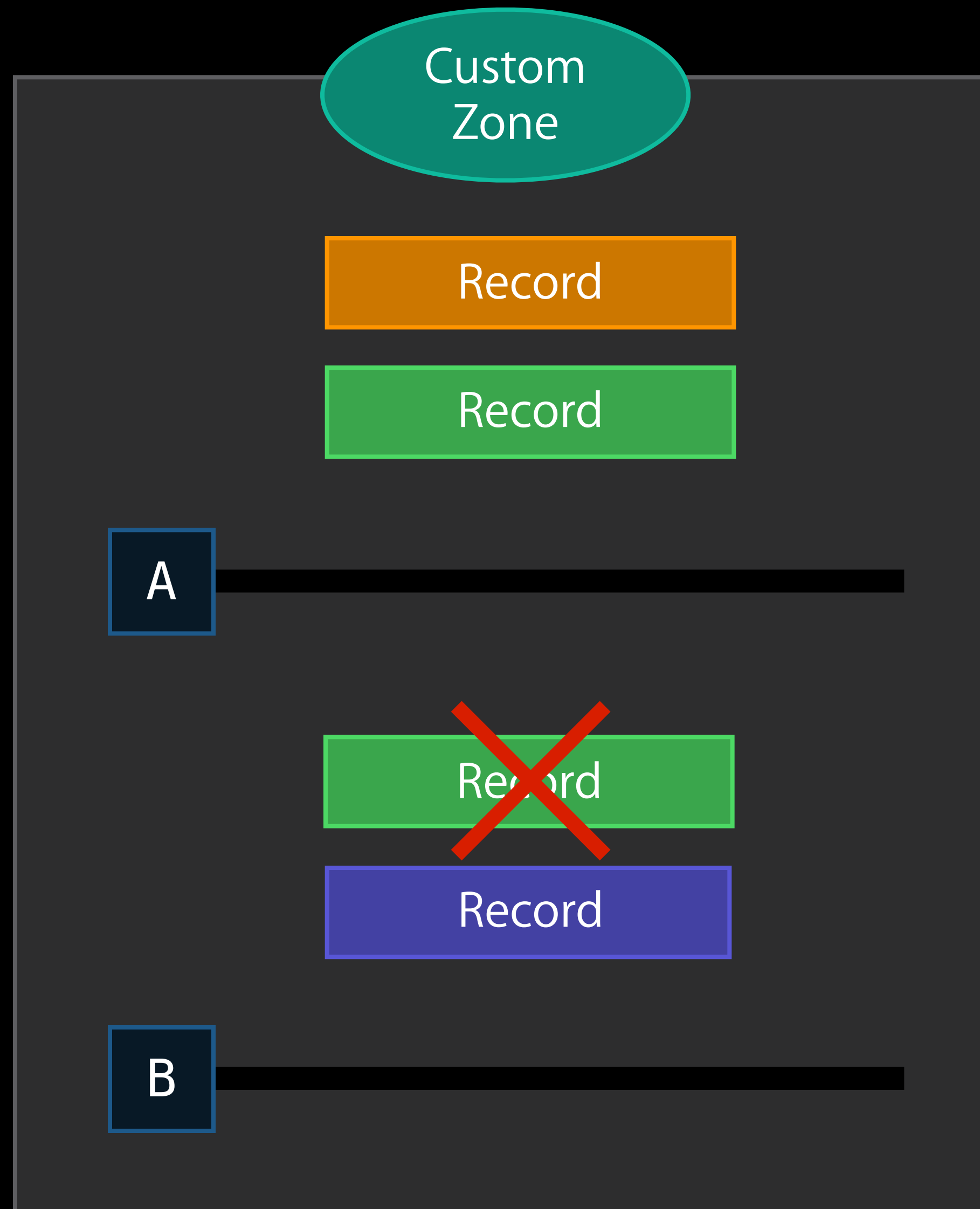
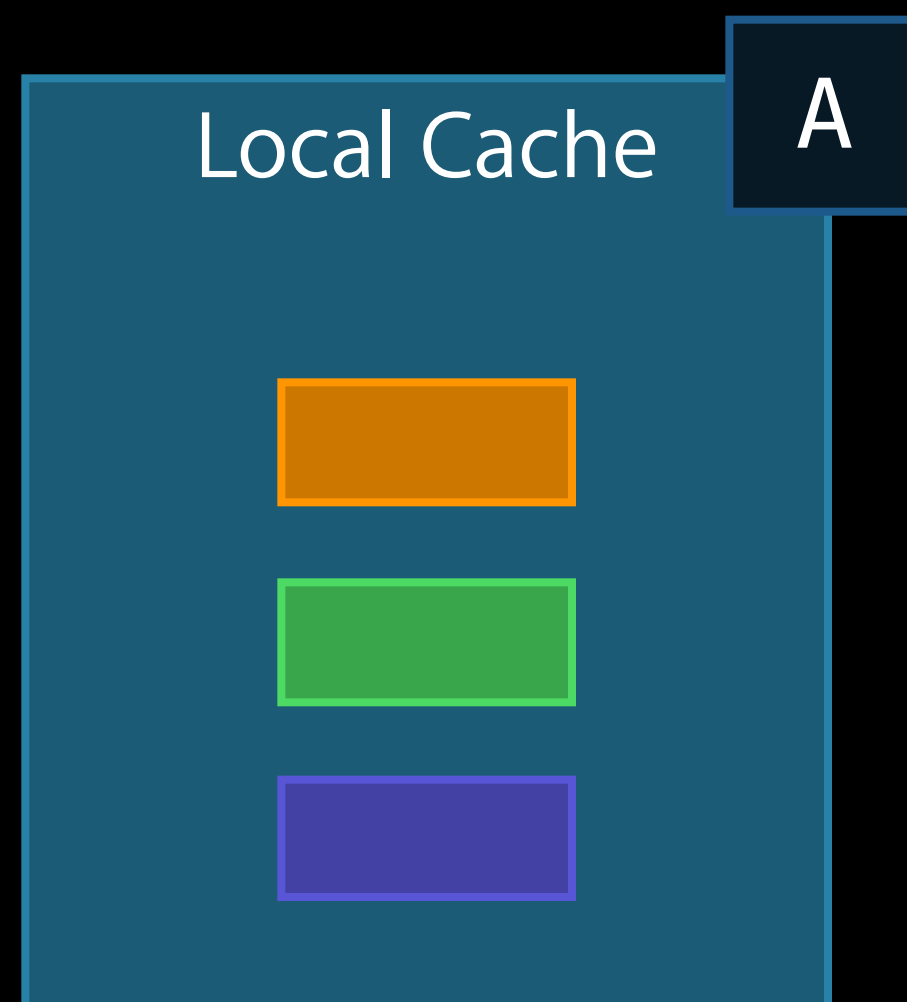
Delta Downloads

Example



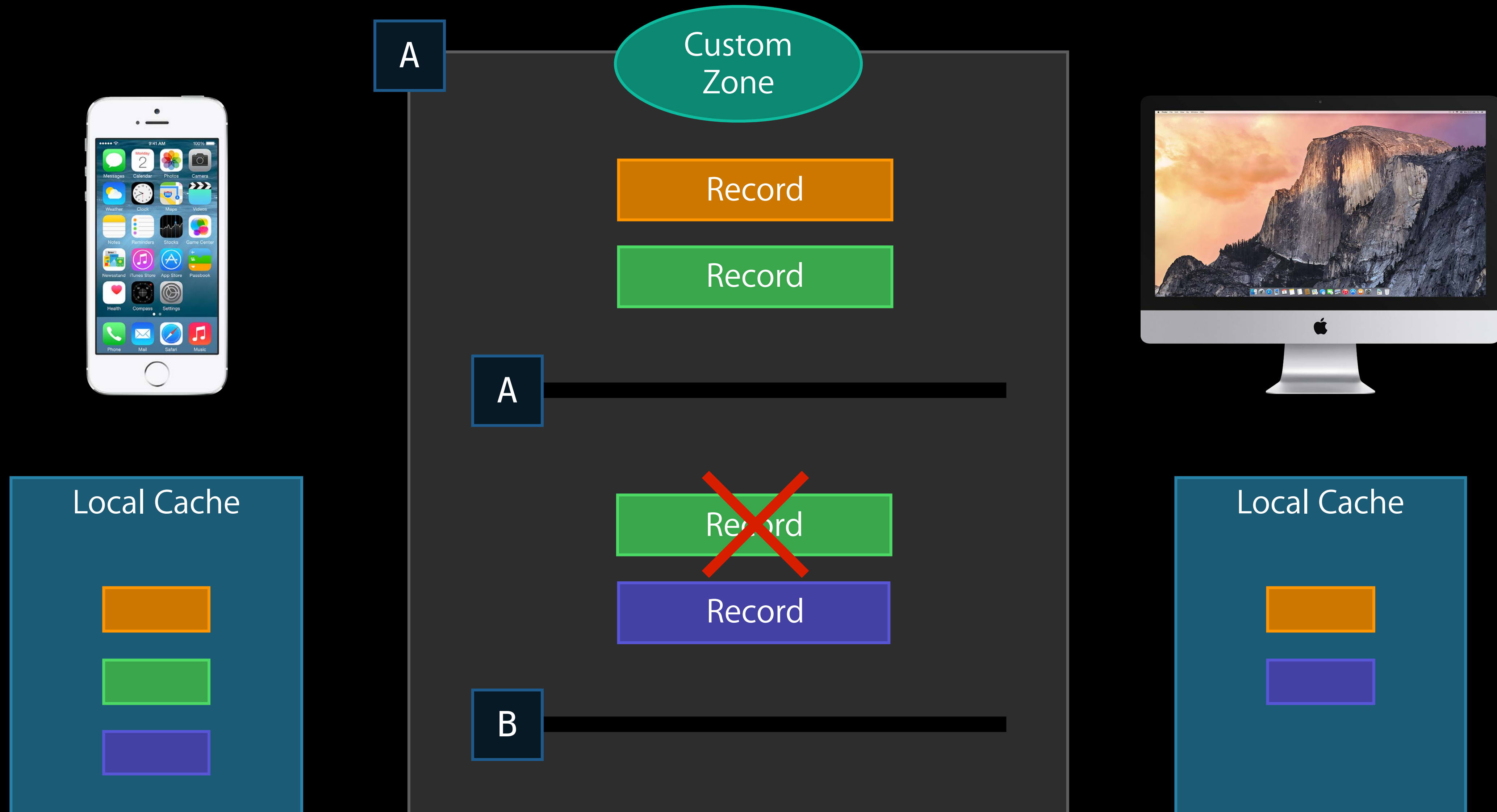
Delta Downloads

Example



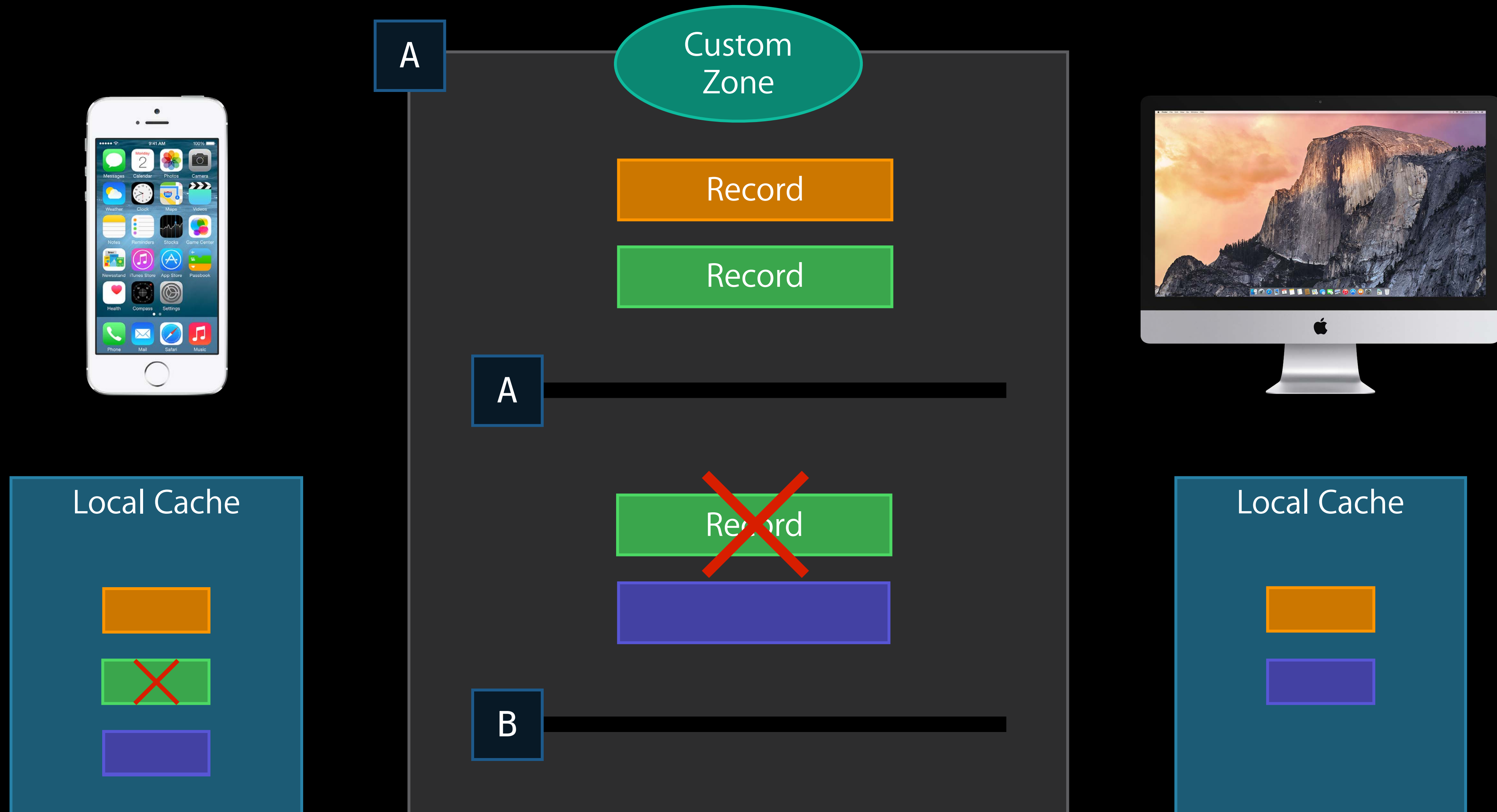
Delta Downloads

Example



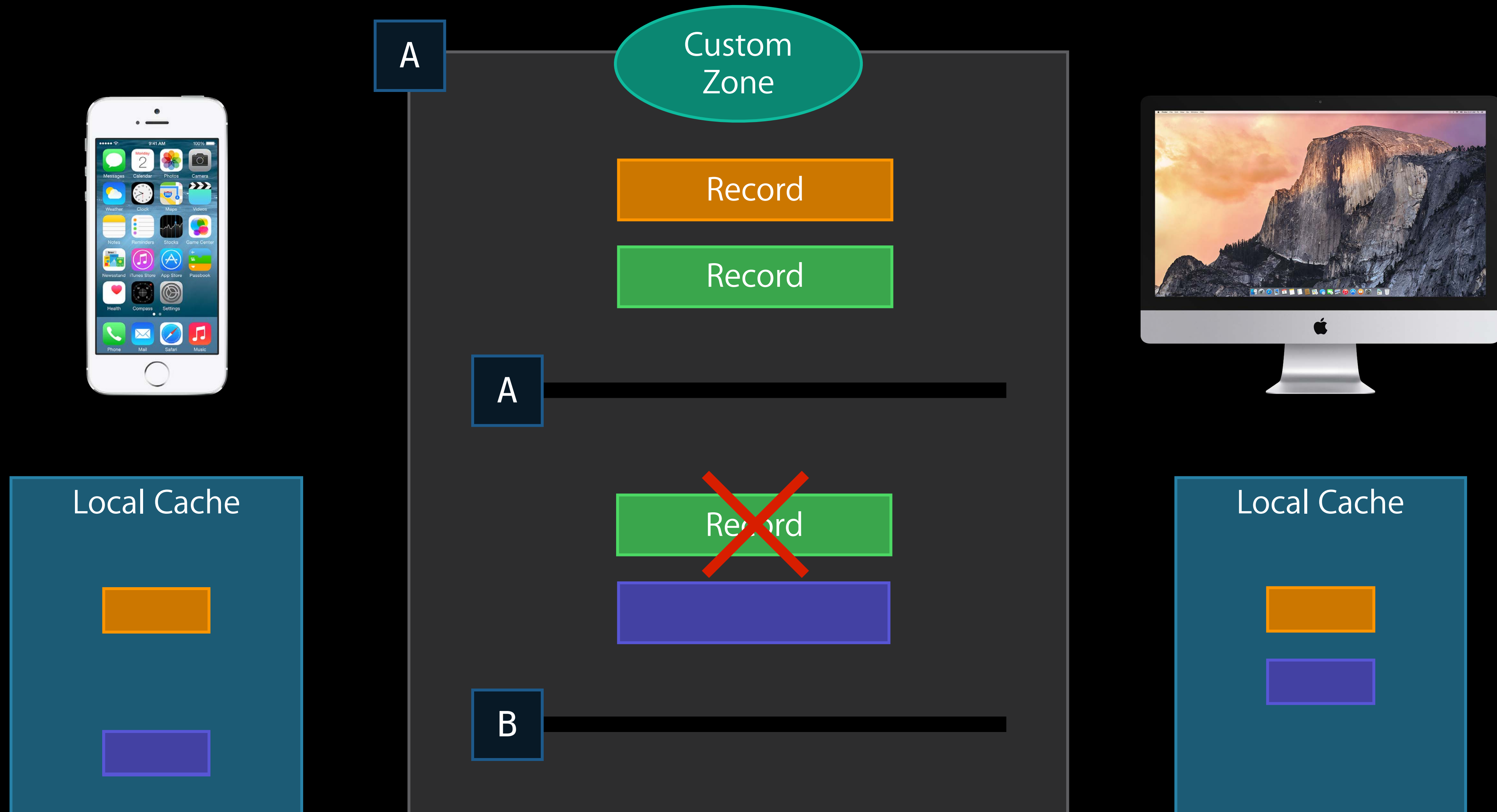
Delta Downloads

Example



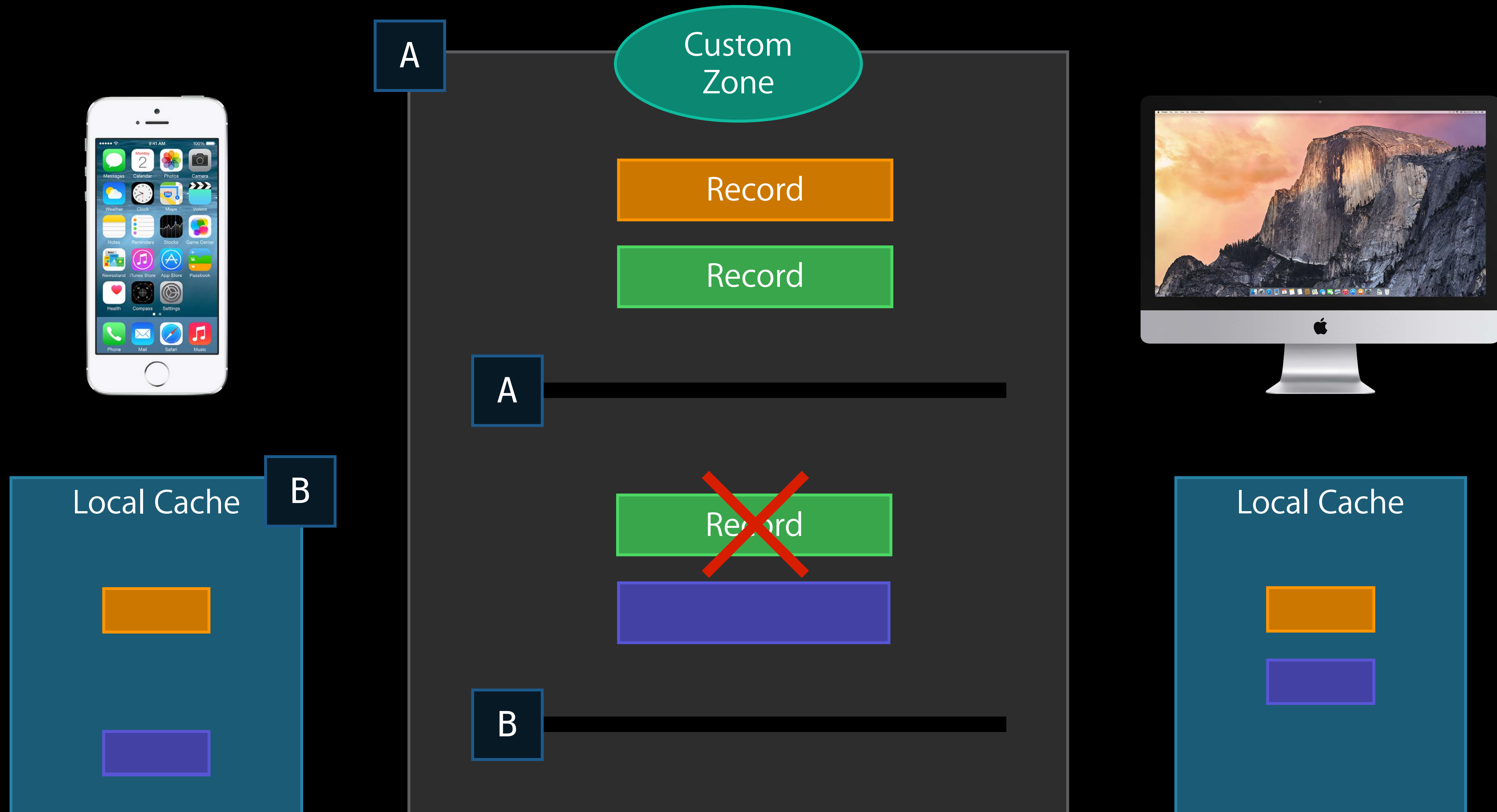
Delta Downloads

Example



Delta Downloads

Example



Sync Different

Implementing an offline cache

Sync Different

Implementing an offline cache

Your app should

Sync Different

Implementing an offline cache

Your app should

- Track local changes

Sync Different

Implementing an offline cache

Your app should

- Track local changes
- Send changes to the server

Sync Different

Implementing an offline cache

Your app should

- Track local changes
- Send changes to the server
- Resolve conflicts

Sync Different

Implementing an offline cache

Your app should

- Track local changes
- Send changes to the server
- Resolve conflicts
- Fetch server changes with `CKFetchRecordChangesOperation`

Sync Different

Implementing an offline cache

Your app should

- Track local changes
- Send changes to the server
- Resolve conflicts
- Fetch server changes with `CKFetchRecordChangesOperation`
- Apply server changes

Sync Different

Implementing an offline cache

Your app should

- Track local changes
- Send changes to the server
- Resolve conflicts
- Fetch server changes with `CKFetchRecordChangesOperation`
- Apply server changes
- Save server change token

Zone Subscription

Custom zone features

Zone Subscription

Custom zone features

Different from query subscriptions

Zone Subscription

Custom zone features

Different from query subscriptions

Push notifications when zone contents update

Custom Zones

Notes on design

Custom Zones

Notes on design

Compartmentalize data

Custom Zones

Notes on design

Compartmentalize data

- Records can't be moved between zones

Custom Zones

Notes on design

Compartmentalize data

- Records can't be moved between zones
- No cross-zone relationships

Custom Zones

Notes on design

Compartmentalize data

- Records can't be moved between zones
- No cross-zone relationships

Determines level of updates

Advanced Record Operations

Modifying records efficiently

Advanced Record Operations

Record changes

Advanced Record Operations

Record changes

Changes to CKRecords are tracked locally

Advanced Record Operations

Record changes

Changes to CKRecords are tracked locally

Only changes are transmitted

Advanced Record Operations

Save policies

Advanced Record Operations

Save policies

Save If Unchanged: `CKRecordSaveIfServerUnchanged`

Advanced Record Operations

Save policies

Save If Unchanged: `CKRecordSaveIfServerUnchanged`

Force Save Changed Keys: `CKRecordSaveChangedKeys`

Advanced Record Operations

Save policies

Save If Unchanged: `CKRecordSaveIfServerUnchanged`

Force Save Changed Keys: `CKRecordSaveChangedKeys`

Force Save All Keys: `CKRecordSaveAllKeys`

Advanced Record Operations

Save policies

Advanced Record Operations

Save policies

`SaveIfServerUnchanged`

`SaveChangedKeys`

`SaveAllKeys`

Advanced Record Operations

Save policies

SaveIfServerUnchanged

SaveChangedKeys

SaveAllKeys

Locked



Advanced Record Operations

Save policies

	SaveIfServerUnchanged	SaveChangedKeys	SaveAllKeys
Locked	Yes		

Advanced Record Operations

Save policies

	SaveIfServerUnchanged	SaveChangedKeys	SaveAllKeys
Locked	Yes	No	

Advanced Record Operations

Save policies

	SaveIfServerUnchanged	SaveChangedKeys	SaveAllKeys
Locked	Yes	No	No

Advanced Record Operations

Save policies

	SaveIfServerUnchanged	SaveChangedKeys	SaveAllKeys
Locked	Yes	No	No
Data Sent			

Advanced Record Operations

Save policies

	SaveIfServerUnchanged	SaveChangedKeys	SaveAllKeys
Locked	Yes	No	No
Data Sent	Changed Keys		

Advanced Record Operations

Save policies

	SaveIfServerUnchanged	SaveChangedKeys	SaveAllKeys
Locked	Yes	No	No
Data Sent	Changed Keys	Changed Keys	

Advanced Record Operations

Save policies

	SaveIfServerUnchanged	SaveChangedKeys	SaveAllKeys
Locked	Yes	No	No
Data Sent	Changed Keys	Changed Keys	All Keys

Unlocked Updates



Johnny
Appleseed



Johnny
Appleseed



Johnny
Appleseed



Unlocked Updates



Johnny
Appleseed



Paul
Smith



Johnny
Appleseed



Unlocked Updates



Johnny
Appleseed



Paul
Smith



Johnny
Appleseed



Unlocked Updates

A blue rectangular card featuring a portrait of Paul Smith on the left and the text "Paul Smith" in orange on the right.A blue rectangular card with a yellow border, featuring a portrait of Paul Smith on the left and the text "Paul Smith" in white on the right. A white iPhone is positioned to the right of the card.A blue rectangular card featuring a portrait of Johnny Appleseed on the left and the text "Johnny Appleseed" in white on the right.

Unlocked Updates

A blue rounded rectangular card. On the left is a portrait of Paul Smith, a man with a mustache wearing a dark hooded jacket. To the right of the portrait, the text "Paul Smith" is written in white.A blue rounded rectangular card. On the left is a portrait of Paul Smith, a man with a mustache wearing a dark hooded jacket. To the right of the portrait, the text "Paul Smith" is written in white.A blue rounded rectangular card with a yellow border. On the left is a portrait of John Appleseed, a man with short brown hair wearing a red shirt. To the right of the portrait, the text "John Appleseed" is written in white, with "John" in yellow.

Unlocked Updates



John
Smith

A blue rounded square icon with a white cloud outline is positioned above a blue rectangular profile card. The card features a photo of a man with a mustache wearing a dark hooded jacket on the left, and the name 'John Smith' in yellow and white text on the right. The entire card is enclosed in a yellow border.



Paul
Smith

A blue rounded rectangular profile card on the left contains a photo of a man with a mustache in a dark hooded jacket and the name 'Paul Smith' in white text. To the right of the card is a white iPhone displaying its home screen with various app icons.



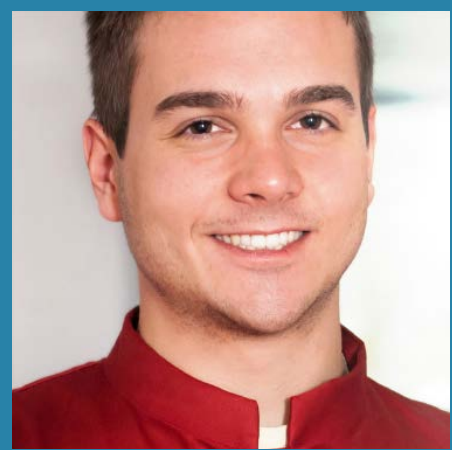
John
Appleseed

A blue rounded rectangular profile card on the left contains a photo of a man with short brown hair wearing a red shirt and the name 'John Appleseed' in yellow and white text. To the right of the card is a silver iMac computer with a screen displaying a landscape image of a mountain peak.

Locked Updates

Yeah everything is going to be ok!

Local



Johnny
Appleseed



Hobby:

iCloud



Johnny
Appleseed




Hobby:

Locked Updates


Yeah everything is going to be ok!

Local

A




Johnny
Appleseed




Hobby:

iCloud

A



Johnny
Appleseed



Hobby:

Locked Updates

Yeah everything is going to be ok!

Local

A




Johnny
Appleseed




Hobby: Horticulture

iCloud

A



Johnny
Appleseed



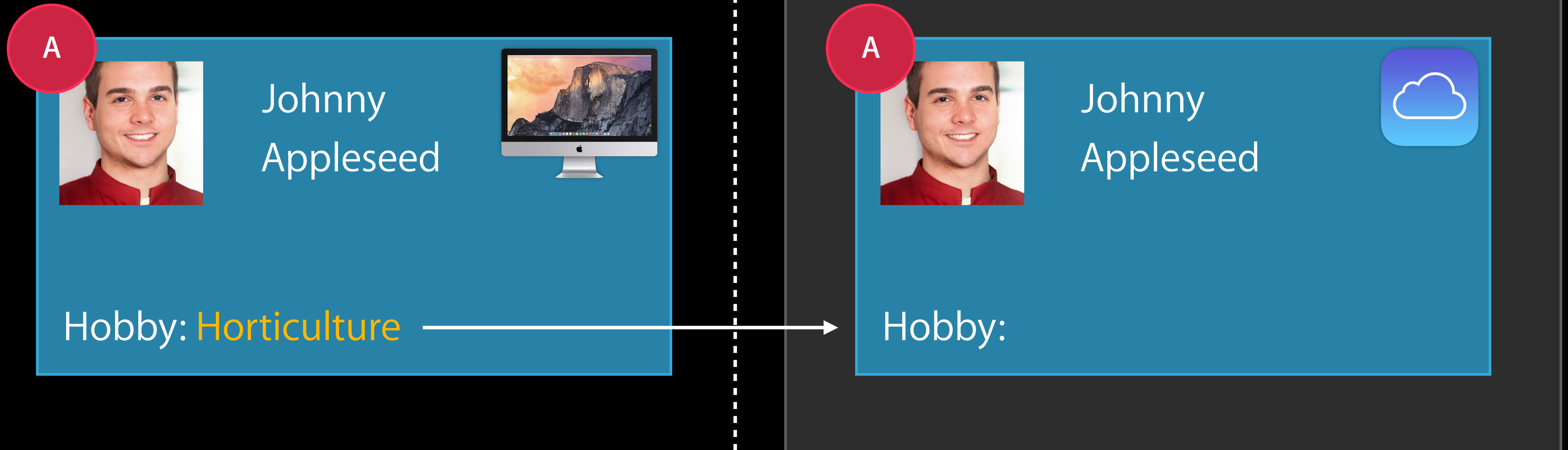
Hobby:

Locked Updates

Yeah everything is going to be ok!

Local

iCloud



Locked Updates

Yeah everything is going to be ok!

Local



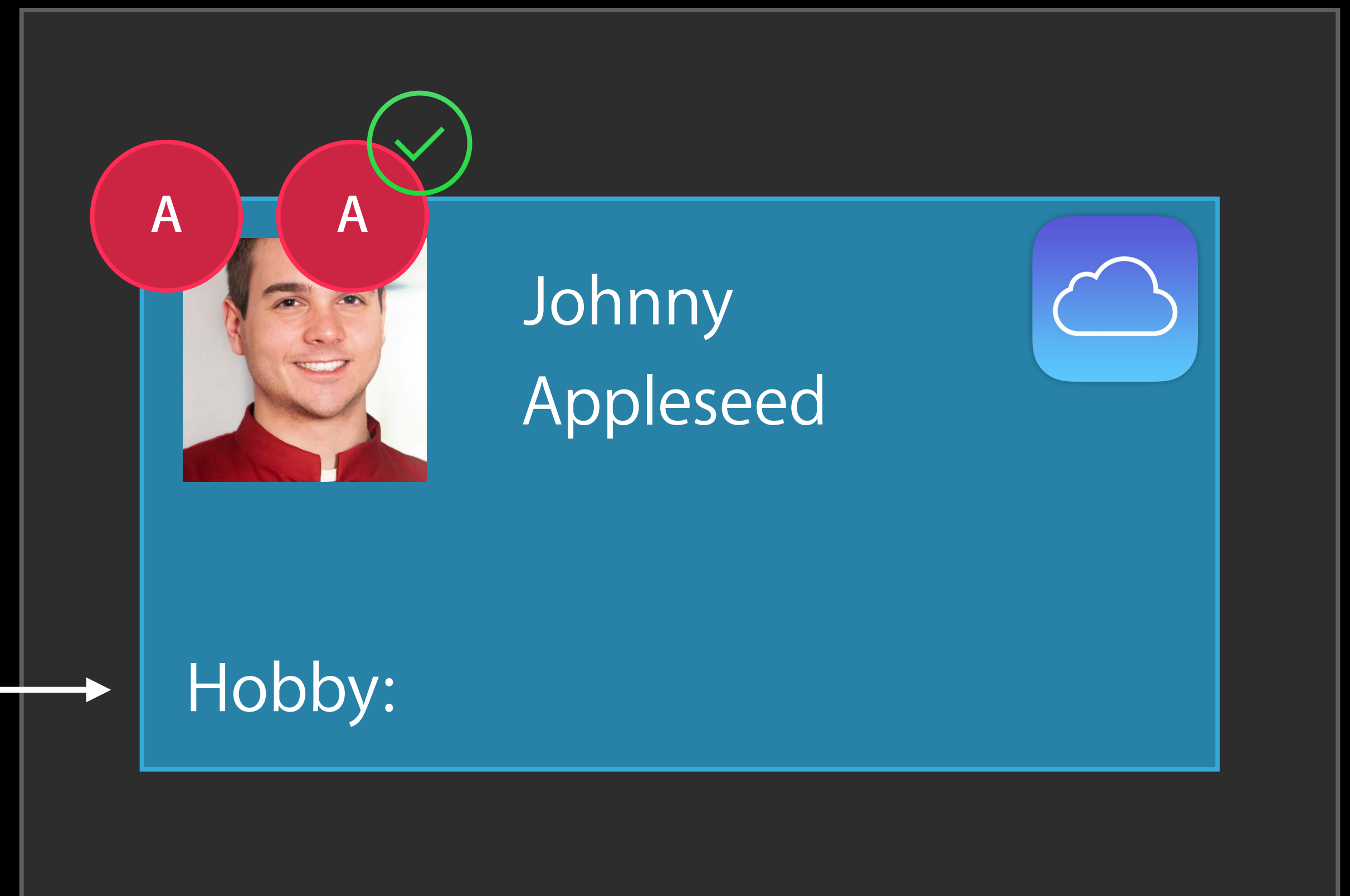
Johnny
Appleseed




Hobby: Horticulture

The local profile for Johnny Appleseed is shown in a blue box. It includes a profile picture, the name 'Johnny Appleseed', an iMac icon, and the hobby 'Horticulture'.

iCloud



Johnny
Appleseed



Hobby:

The iCloud profile for Johnny Appleseed is shown in a blue box within a grey container. It includes a profile picture, the name 'Johnny Appleseed', an iCloud icon, and the hobby field is empty. Two red circles with the letter 'A' are positioned above the profile picture, and a green checkmark is in a circle above the second 'A'.

Locked Updates

Yeah everything is going to be ok!

Local



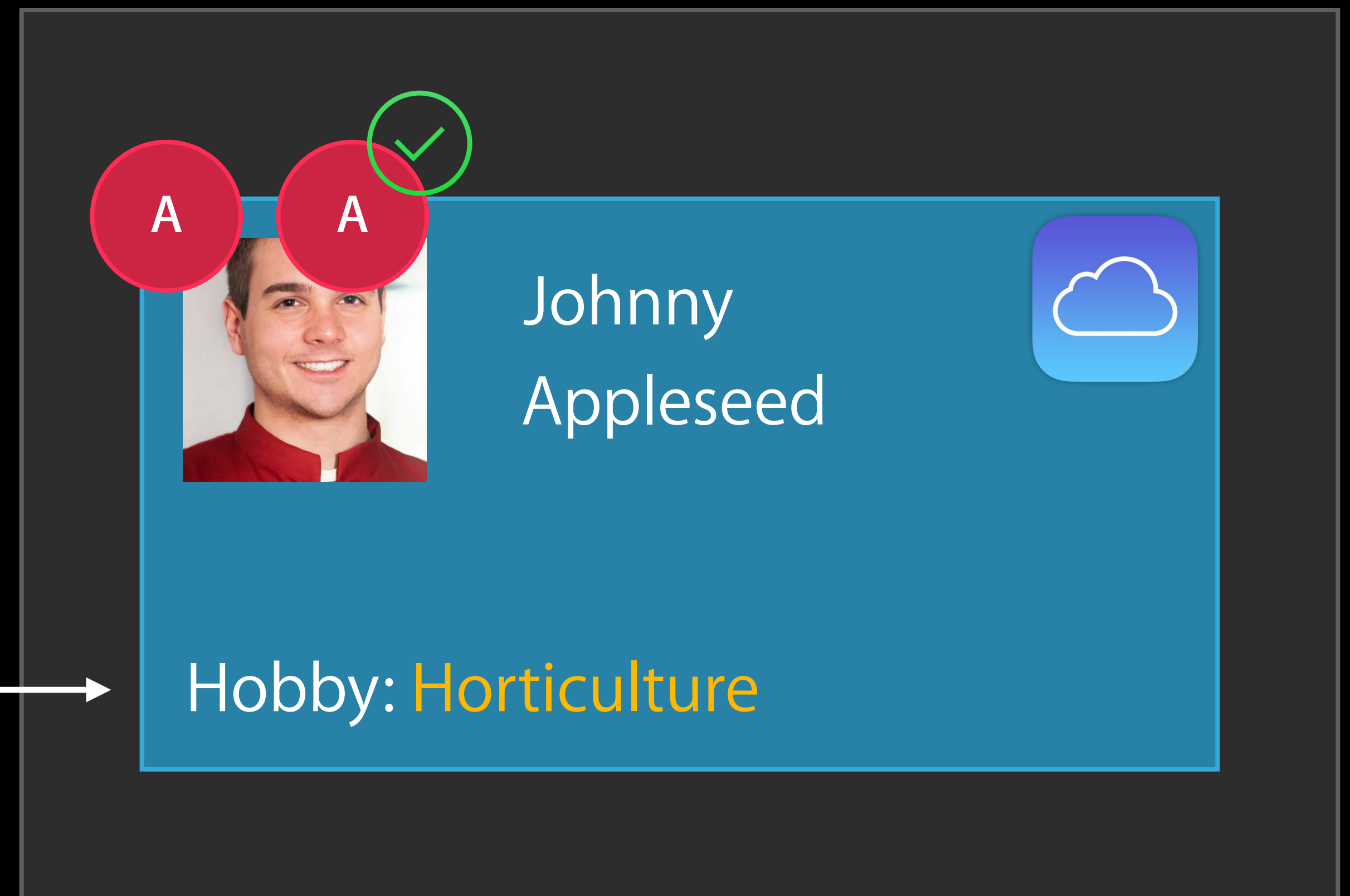
Johnny
Appleseed




Hobby: Horticulture

The local user profile for Johnny Appleseed is shown in a blue box. It includes a profile picture, the name 'Johnny Appleseed', an iMac icon, and the hobby 'Horticulture'. A white arrow points from the 'Horticulture' text to the iCloud version.

iCloud



Johnny
Appleseed



Hobby: Horticulture

The iCloud user profile for Johnny Appleseed is shown in a blue box within a grey container. It includes a profile picture, the name 'Johnny Appleseed', an iCloud icon, and the hobby 'Horticulture'. Two red circles with the letter 'A' are positioned above the profile picture, and a green checkmark is in a circle above the second 'A'. A white arrow points from the local version to this one.

Locked Updates

Yeah everything is going to be ok!

Local



Johnny
Appleseed



Hobby: Horticulture

iCloud



Johnny
Appleseed



Hobby: Horticulture

Locked Updates

Yeah everything is going to be ok!

Local

B




Johnny
Appleseed




Hobby: Horticulture

iCloud

B



Johnny
Appleseed



Hobby: Horticulture

Locked Updates

Yeah everything is going to be ok!

Local

iCloud



Johnny
Appleseed



Hobby: Horticulture

Locked Updates

Yeah everything is going to be ok!

Local



Johnny
Appleseed



Hobby:

iCloud



Johnny
Appleseed



Hobby: Horticulture

Locked Updates

Yeah everything is going to be ok!

Local

iCloud

A



Johnny
Appleseed



Hobby:

B



Johnny
Appleseed



Hobby: Horticulture

Locked Updates

Yeah everything is going to be ok!

Local

iCloud

A



Johnny
Appleseed



Hobby: **Geocaching**

B



Johnny
Appleseed



Hobby: Horticulture

Locked Updates

Yeah everything is going to be ok!

Local



Johnny
Appleseed



Hobby: **Geocaching**

iCloud



Johnny
Appleseed



Hobby: Horticulture



Locked Updates

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Local

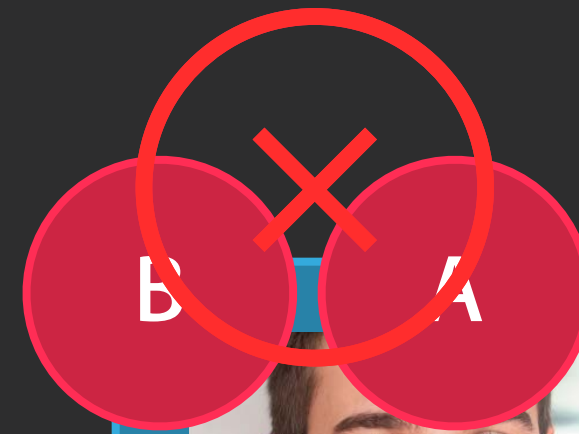


Johnny
Appleseed



Hobby: **Geocaching**

iCloud



Johnny
Appleseed



Hobby: Horticulture

Save Record If Unchanged

Dealing with conflicts

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If record has changed, save fails with `CKErrorServerRecordChanged`

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Error's `userInfo` dictionary helps with three-way merge

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- Attempted record: `CKRecordChangedErrorClientRecordKey`

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- Server record: `CKRecordChangedErrorServerRecordKey`

Save Record If Unchanged

Dealing with conflicts

If record has changed, save fails with `CKErrorServerRecordChanged`

Error's `userInfo` dictionary helps with three-way merge

- Attempted record: `CKRecordChangedErrorClientRecordKey`
- Original local record: `CKRecordChangedErrorAncestorRecordKey`
- Server record: `CKRecordChangedErrorServerRecordKey`

Apply diffs to server version

Save Record If Unchanged

Dealing with conflicts

If record has changed, save fails with `CKErrorServerRecordChanged`

Error's `userInfo` dictionary helps with three-way merge

- Attempted record: `CKRecordChangedErrorClientRecordKey`
- Original local record: `CKRecordChangedErrorAncestorRecordKey`
- Server record: `CKRecordChangedErrorServerRecordKey`

Apply diffs to server version

Retry the save with the server record

Advanced Record Operations

What update type should I use?

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You should **almost always** use `CKRecordSaveIfServerUnchanged`

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- Highly contentious updates

Advanced Record Operations

What update type should I use?

You should **almost always** use `CKRecordSaveIfServerUnchanged`

- It's the default for a reason

Use unlocked saves for

- Highly contentious updates
- Forcing local data to the server (user's choice)

Saving All Keys

CKRecordSaveAllKeys

Saving All Keys

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Server properties that don't exist locally aren't deleted

Saving All Keys

CKRecordSaveAllKeys

Server properties that don't exist locally aren't deleted

Unless that property was explicitly removed from the local record

Save All Keys

Example

Local



Johnny
Appleseed



Hobby: Horticulture

Save All Keys

Example

Local



John
Appleseed



Last tree planted: August 13, 1845

Hobby: Horticulture

Save All Keys

Example

Local



John
Appleseed



Last tree planted: August 13, 1845

Hobby: Horticulture

Save All Keys

Example

Local



John
Appleseed



Last tree planted: August 13, 1845
Hobby: Horticulture

iCloud



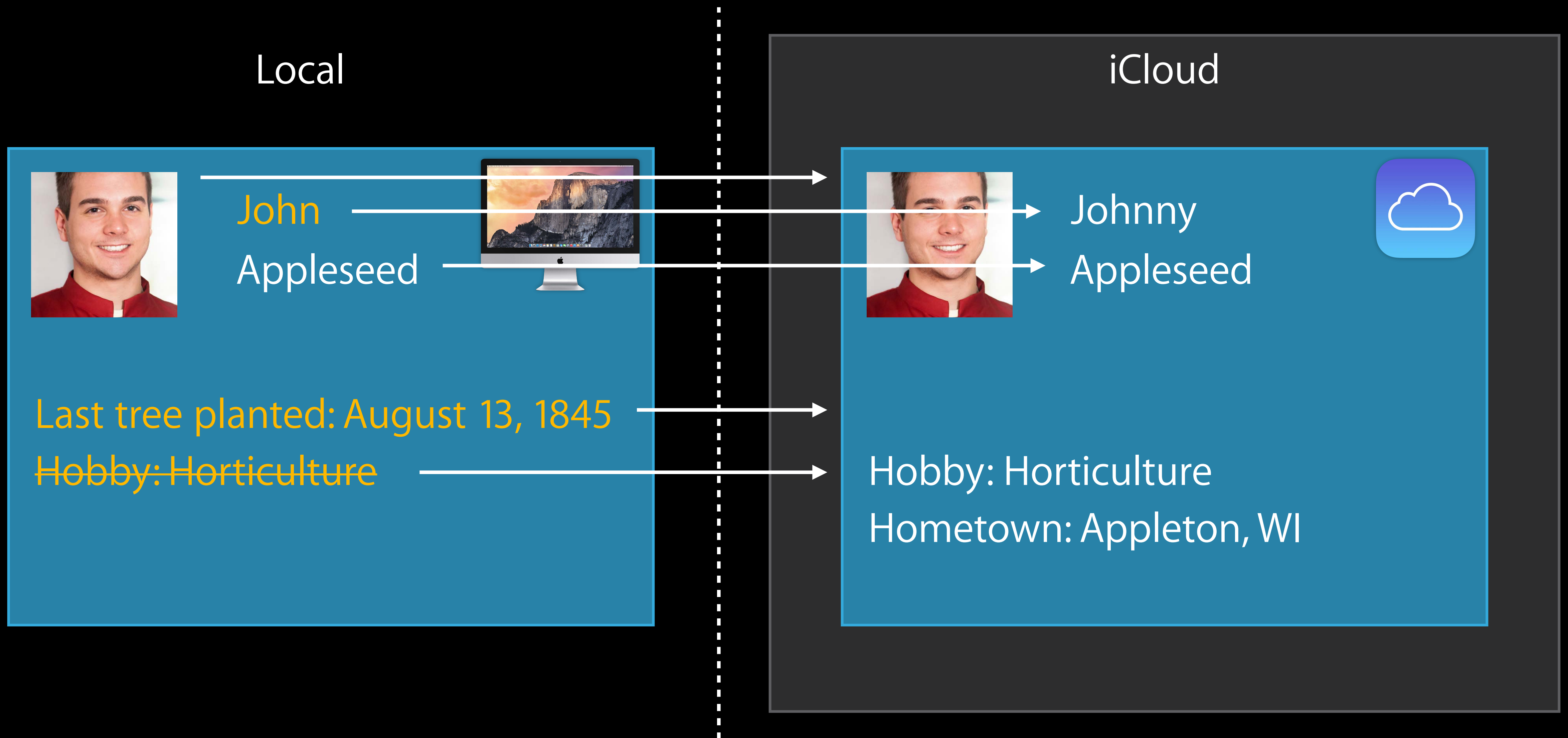
Johnny
Appleseed



Hobby: Horticulture
Hometown: Appleton, WI

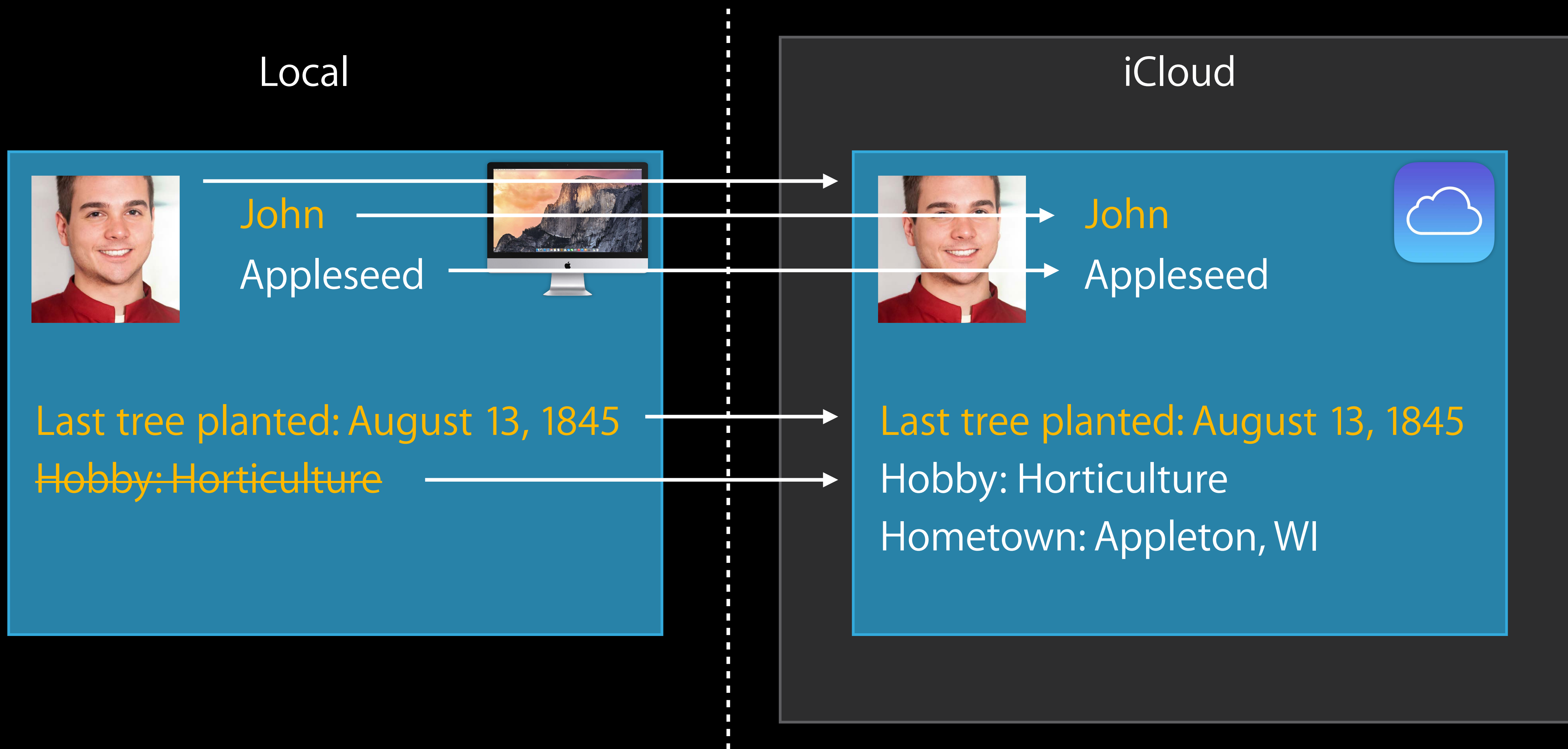
Save All Keys

Example



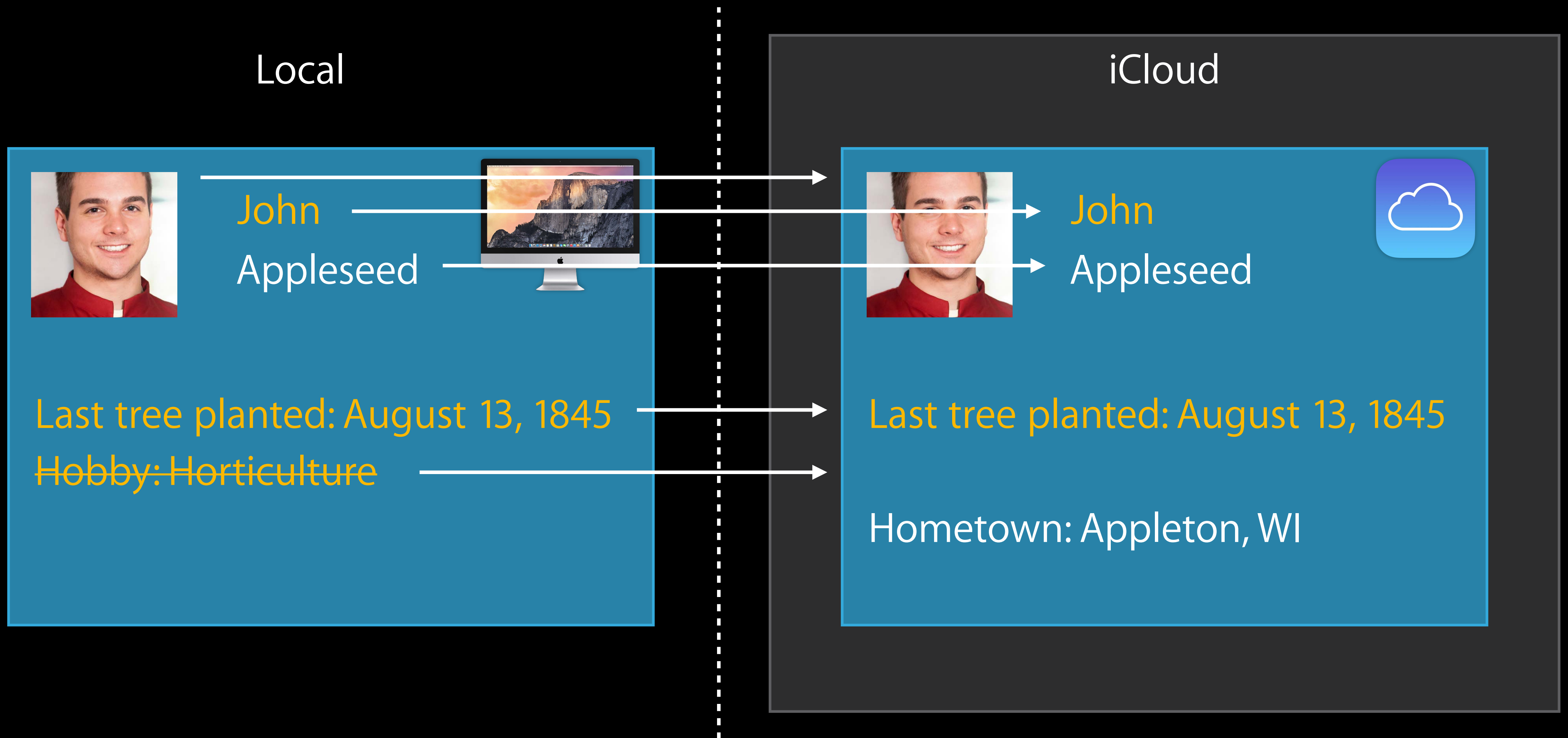
Save All Keys

Example



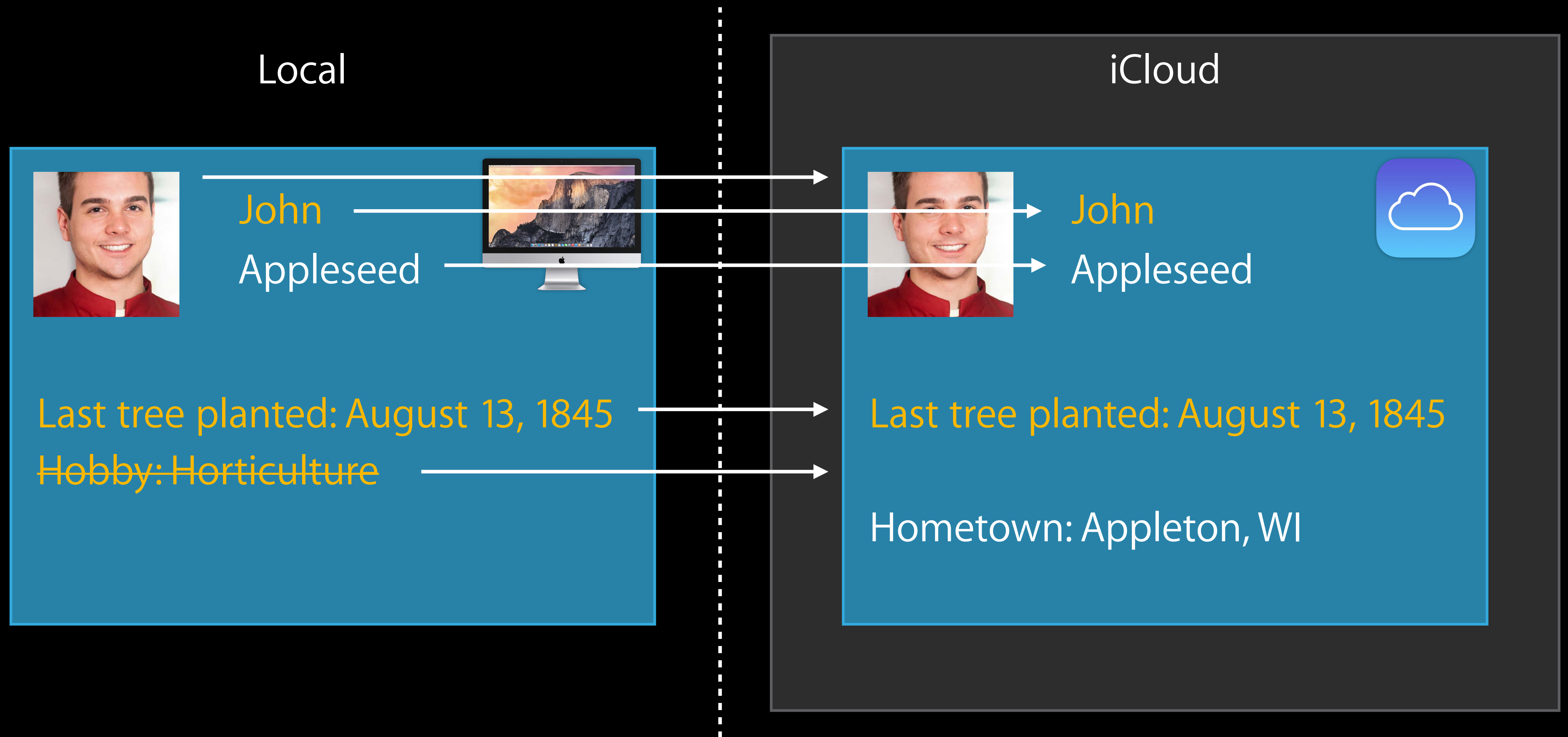
Save All Keys

Example



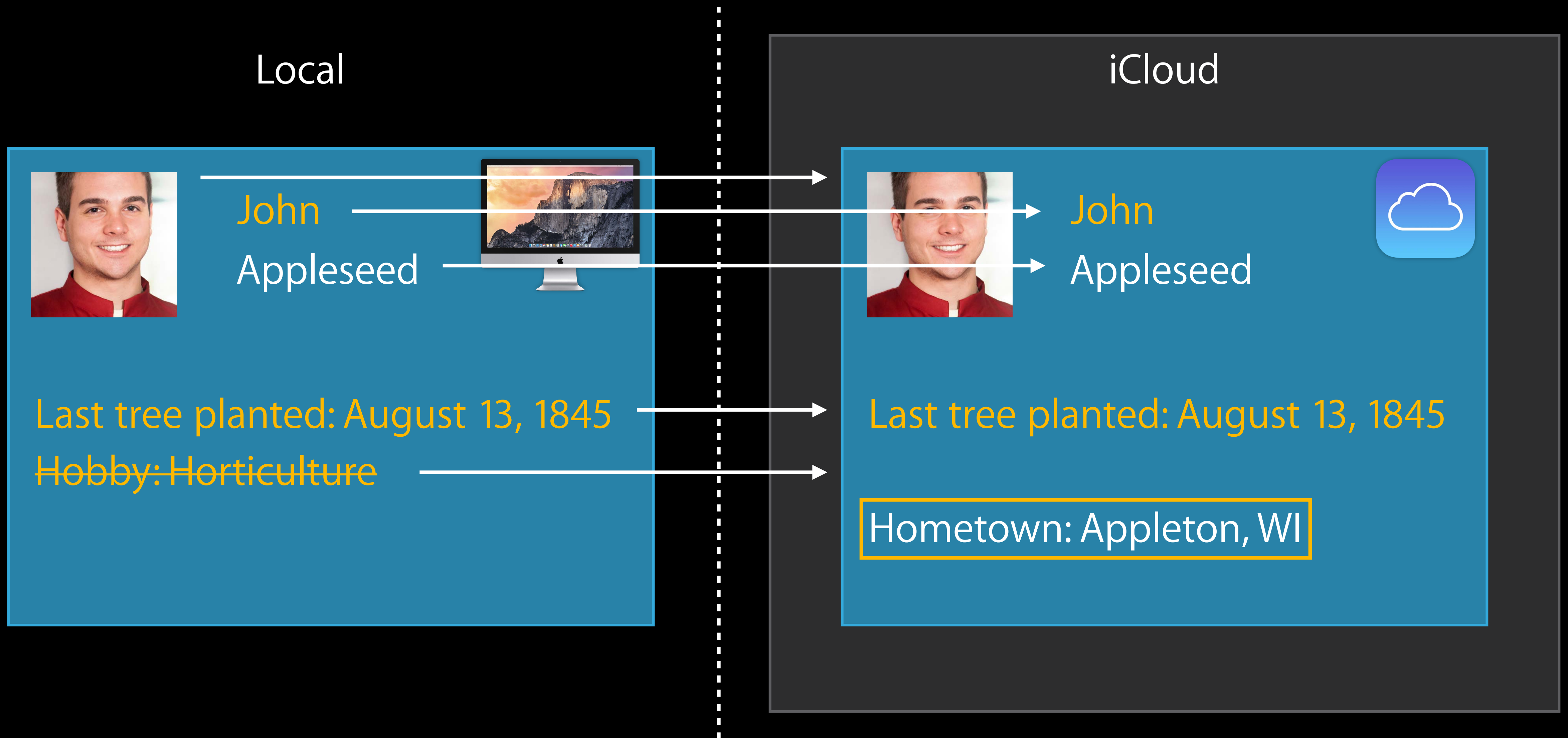
Save All Keys

Example



Save All Keys

Example



Save All Keys

Example

Local



John
Appleseed



Last tree planted: August 13, 1845
Hobby: Horticulture

iCloud



Johnny
Appleseed



Hobby: Horticulture
Hometown: Appleton, WI

Save All Keys

Example

Local



John
Appleseed



Last tree planted: August 13, 1845

Hobby: Horticulture

Hometown

iCloud



Johnny
Appleseed

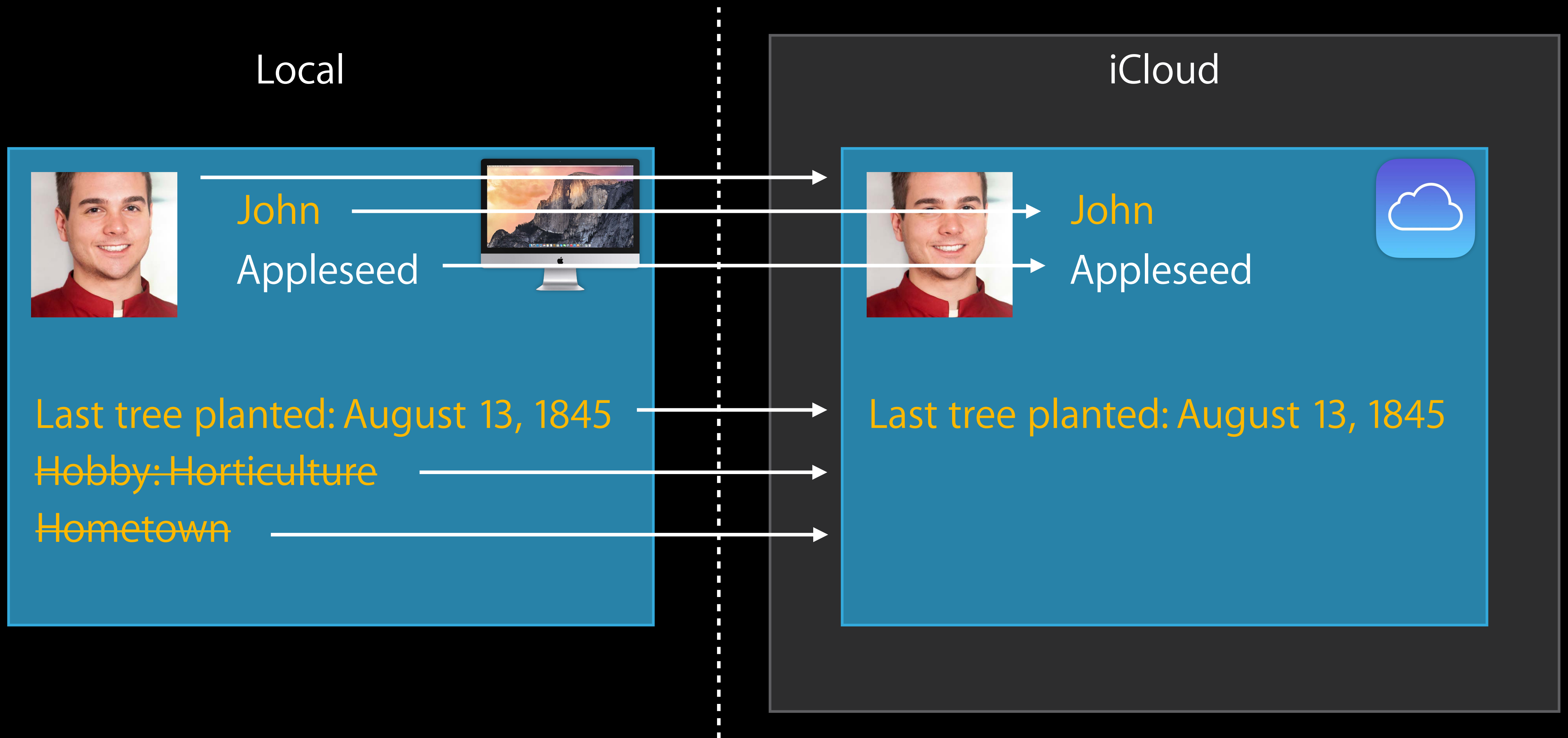


Hobby: Horticulture

Hometown: Appleton, WI

Save All Keys

Example



Partial Records

Partial Records

CKRecords don't need to contain everything from the server

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@interface CKFetchRecordsOperation : CKDatabaseOperation
@property (nonatomic, copy) NSArray /* NSString */ *desiredKeys;
@end
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- CKQueryOperation

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- CKFetchRecordChangesOperation

Partial Records

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desiredKeys property on

- CKFetchRecordsOperation
- CKQueryOperation
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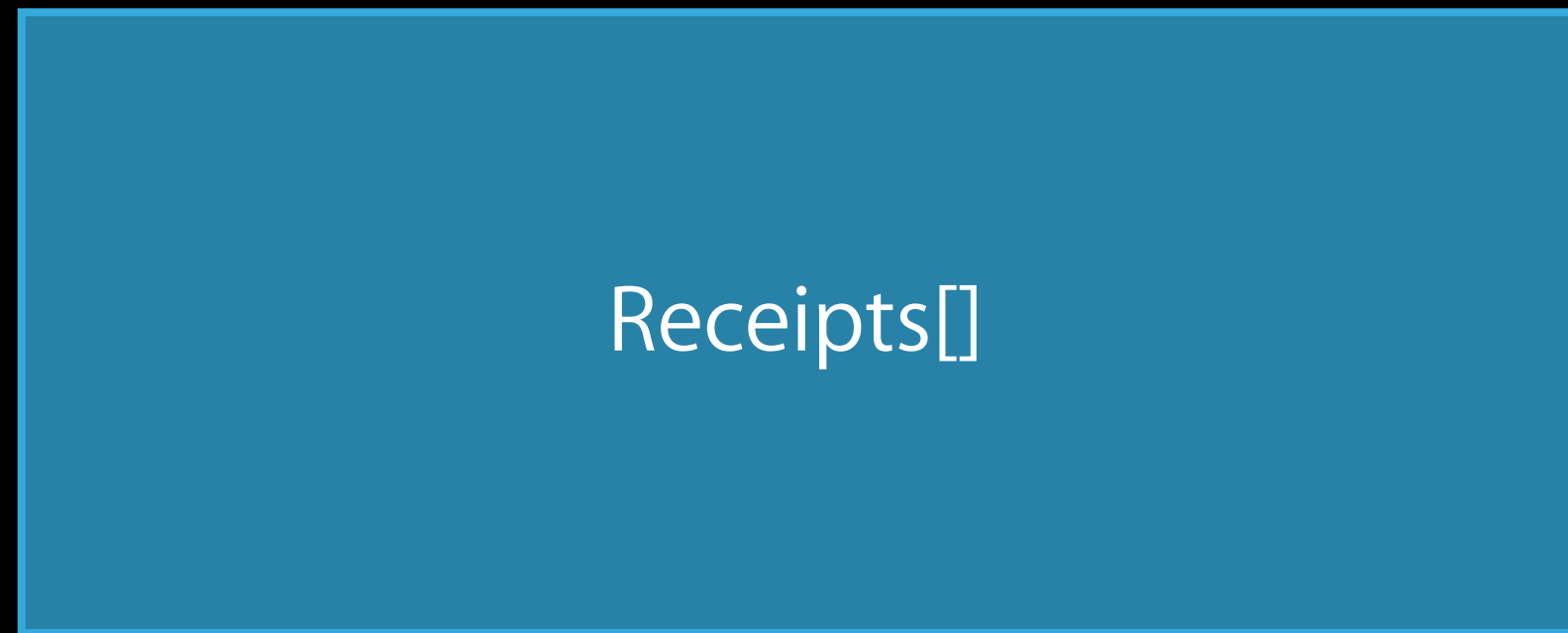
Partial records can be saved

CloudKit Data Modeling

References

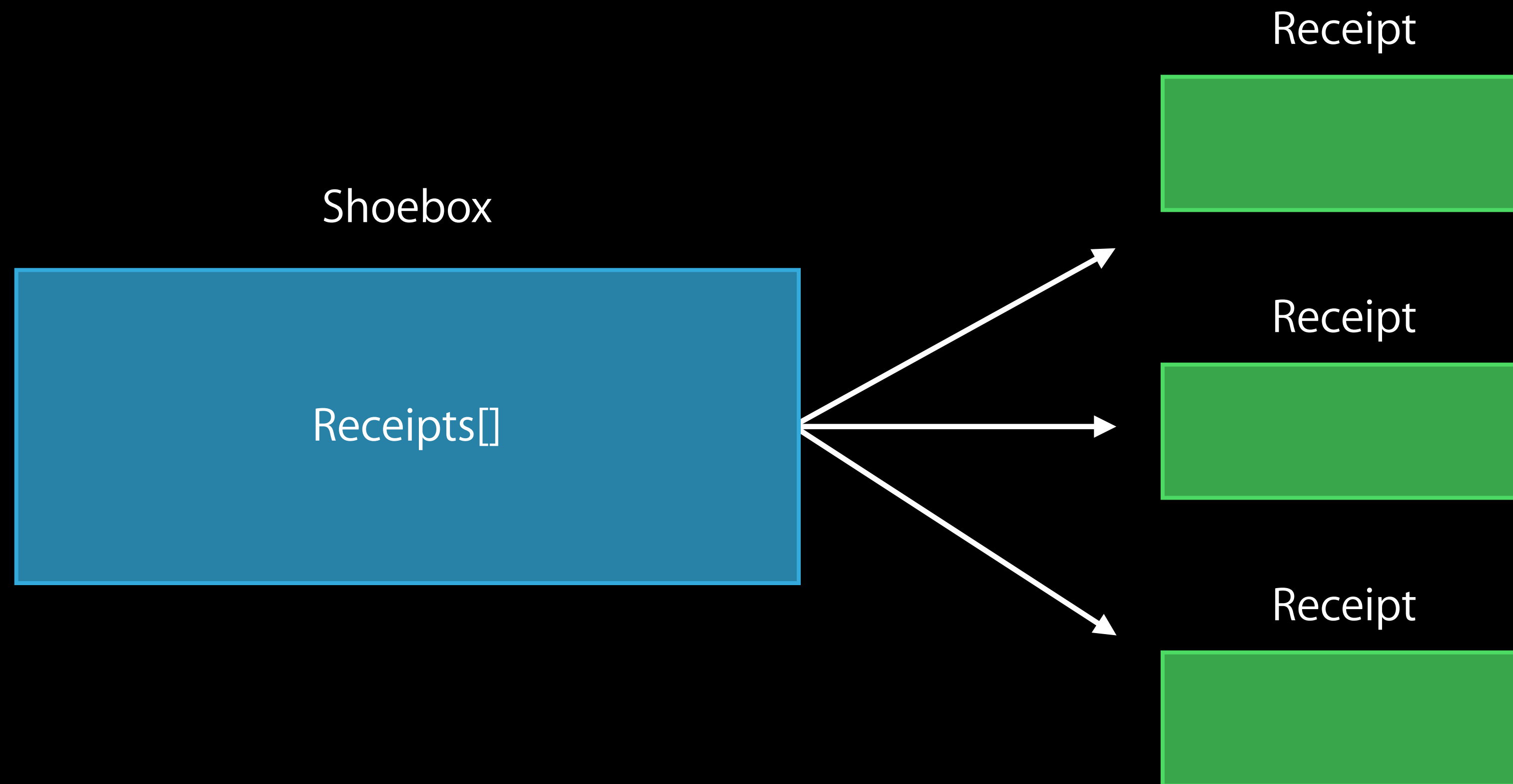
An example

Shoebox



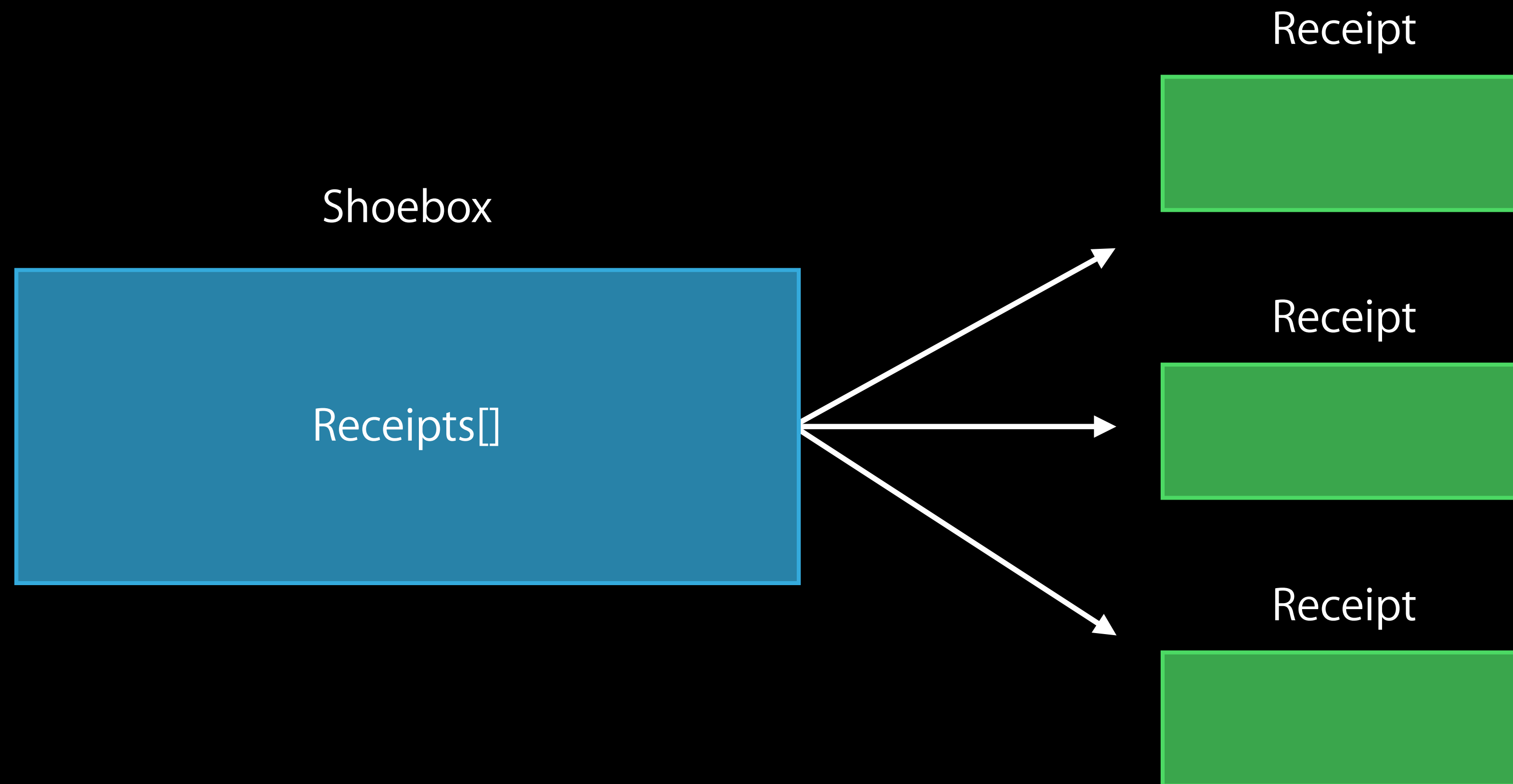
References

An example



References

An example



References

A better way

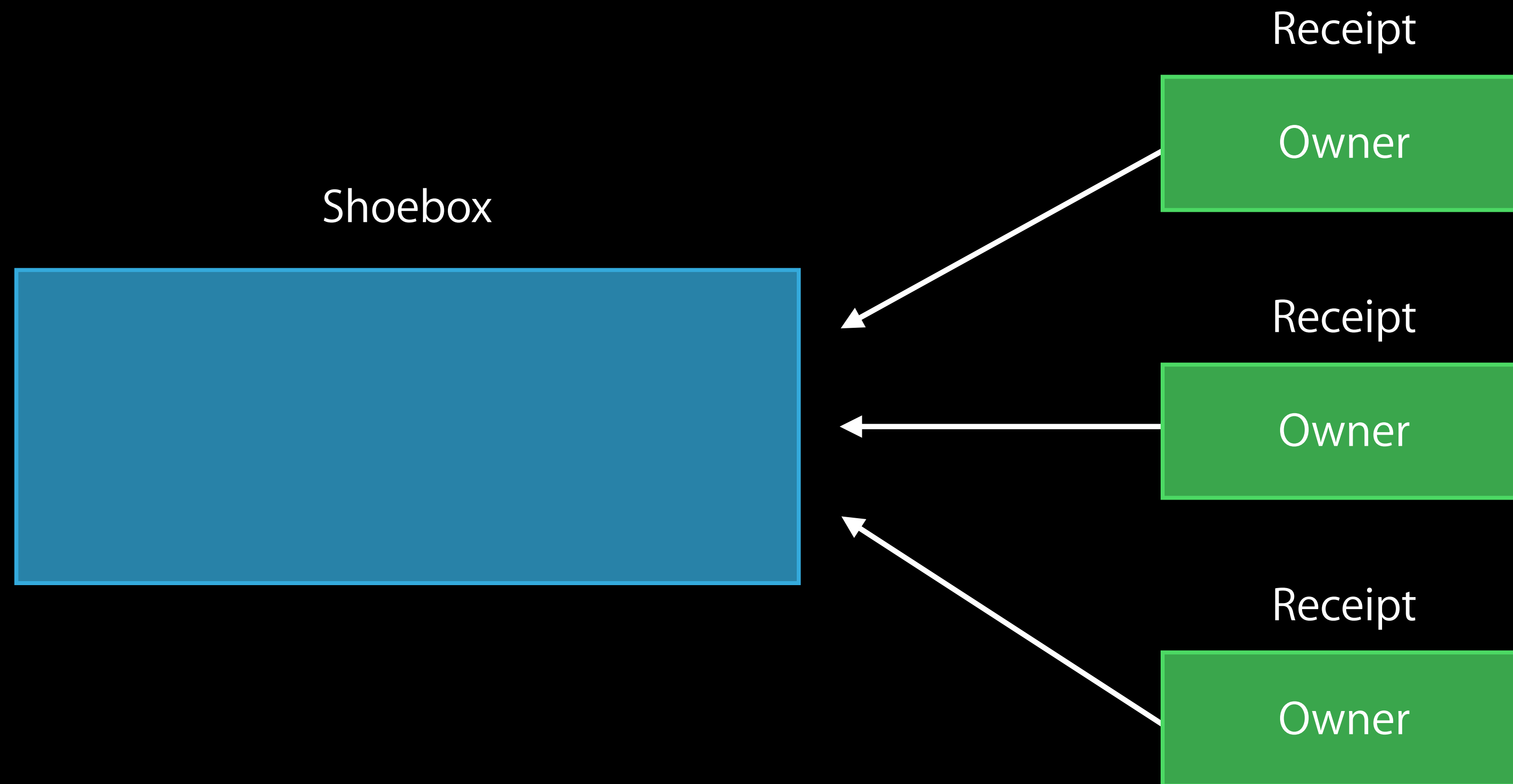


Shoebox



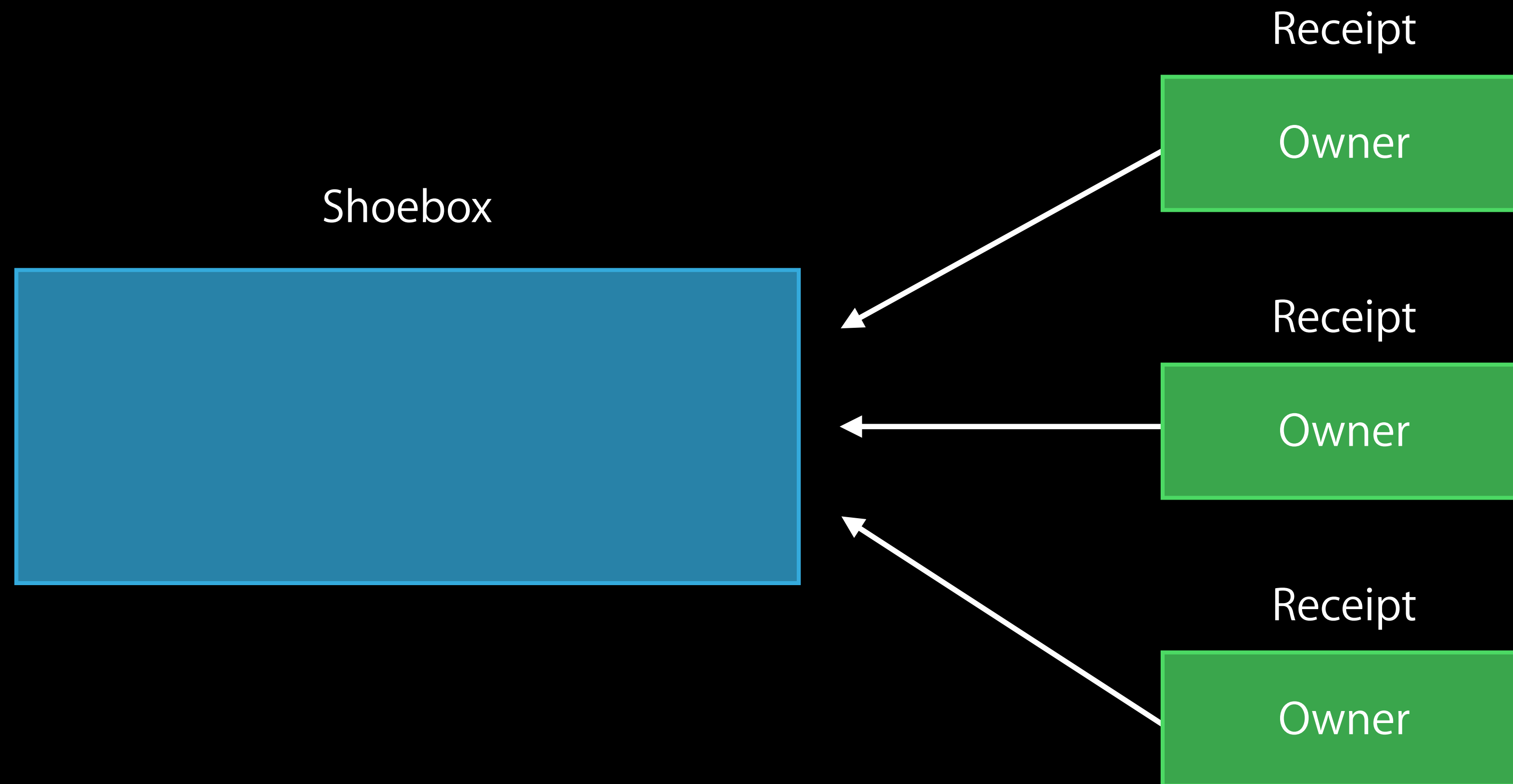
References

A better way



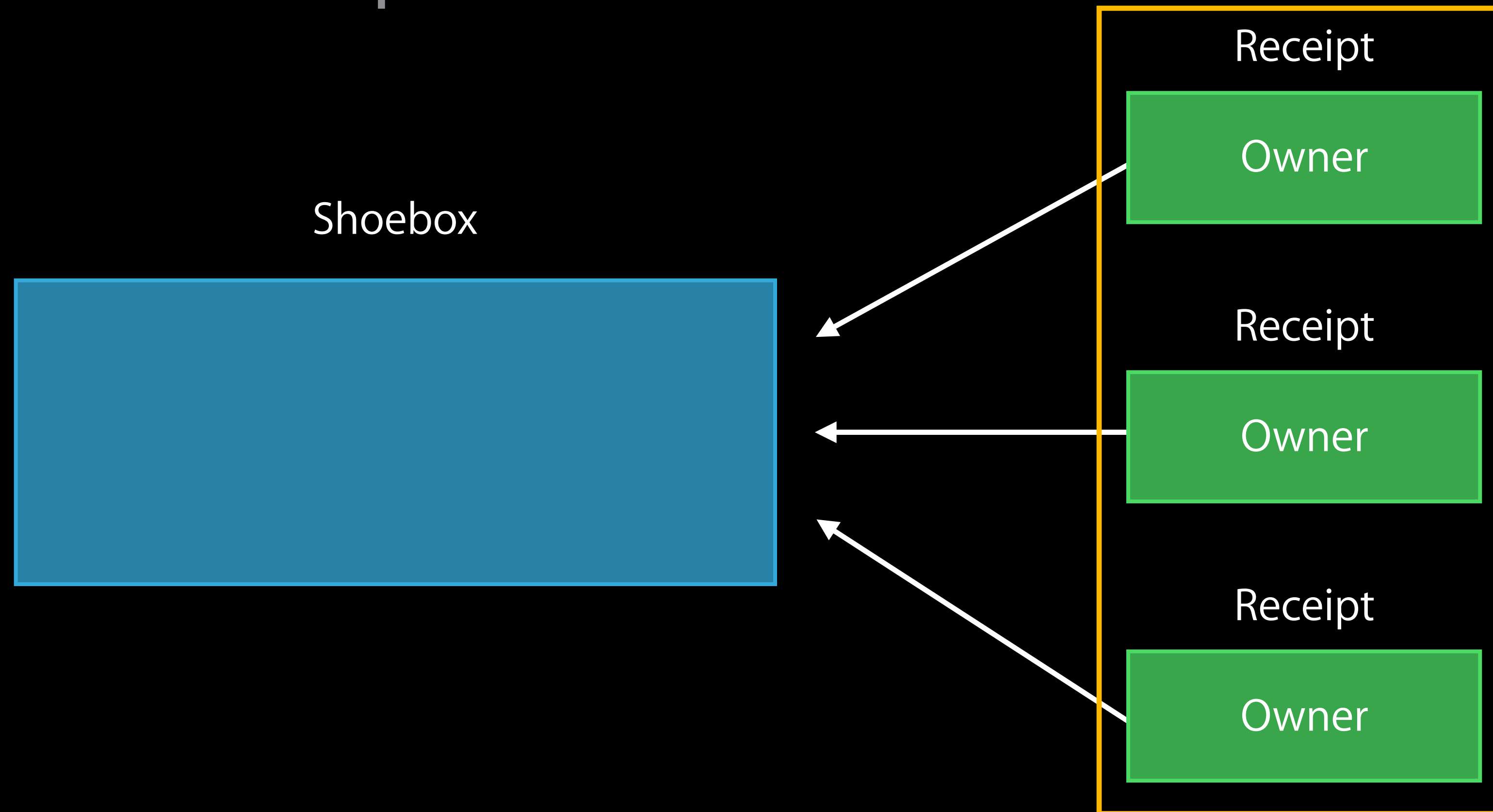
References

Fetch items with queries



References

Fetch items with queries



```
[[CKQuery alloc] initWithRecordType:@"Receipt"  
predicate:[NSPredicate predicateWithFormat:@"owner = %@", shoebox]];
```

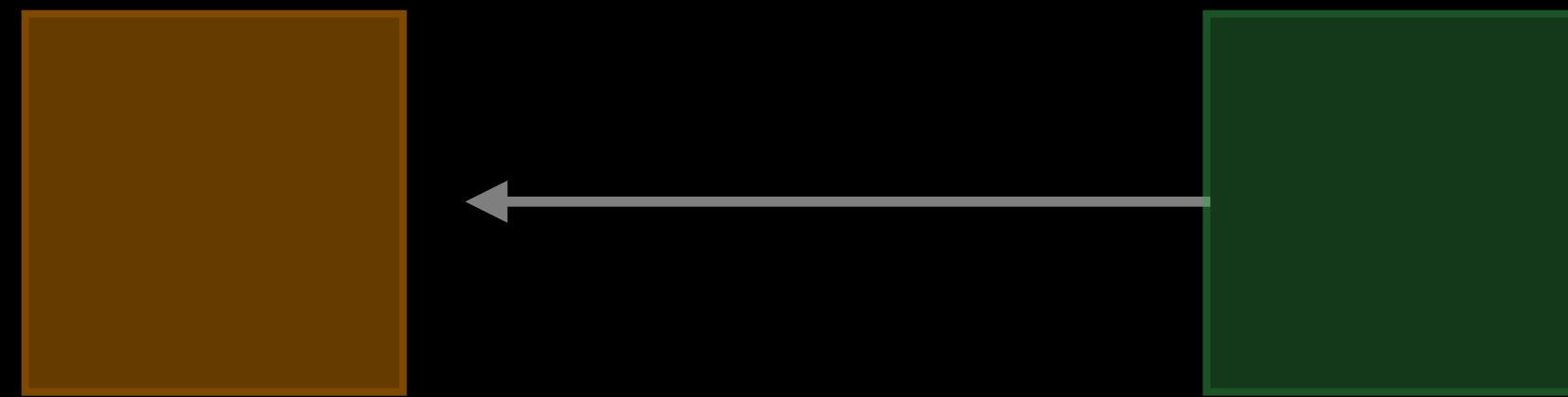
Delete Self References

Cascading deletes



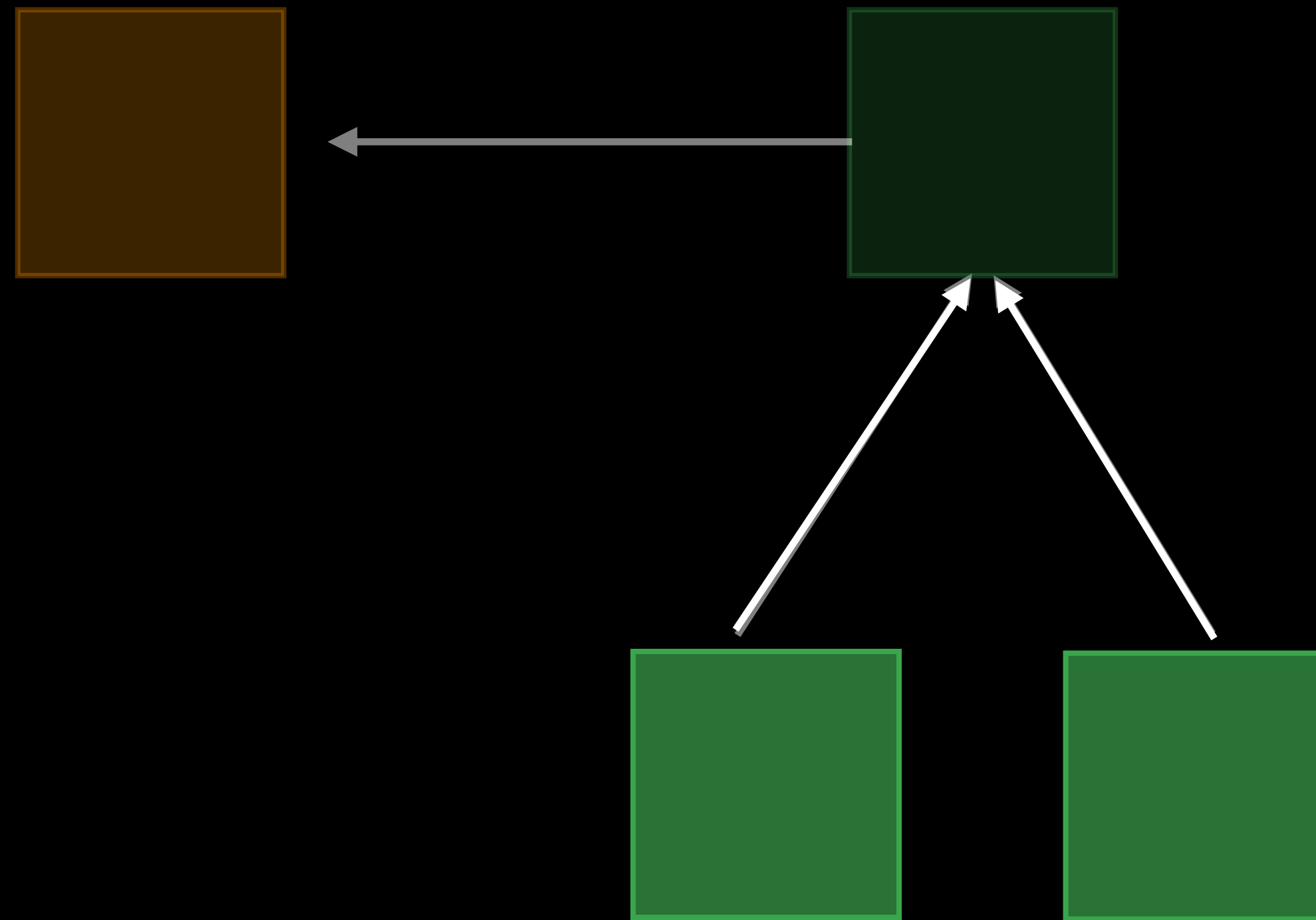
Delete Self References

Cascading deletes



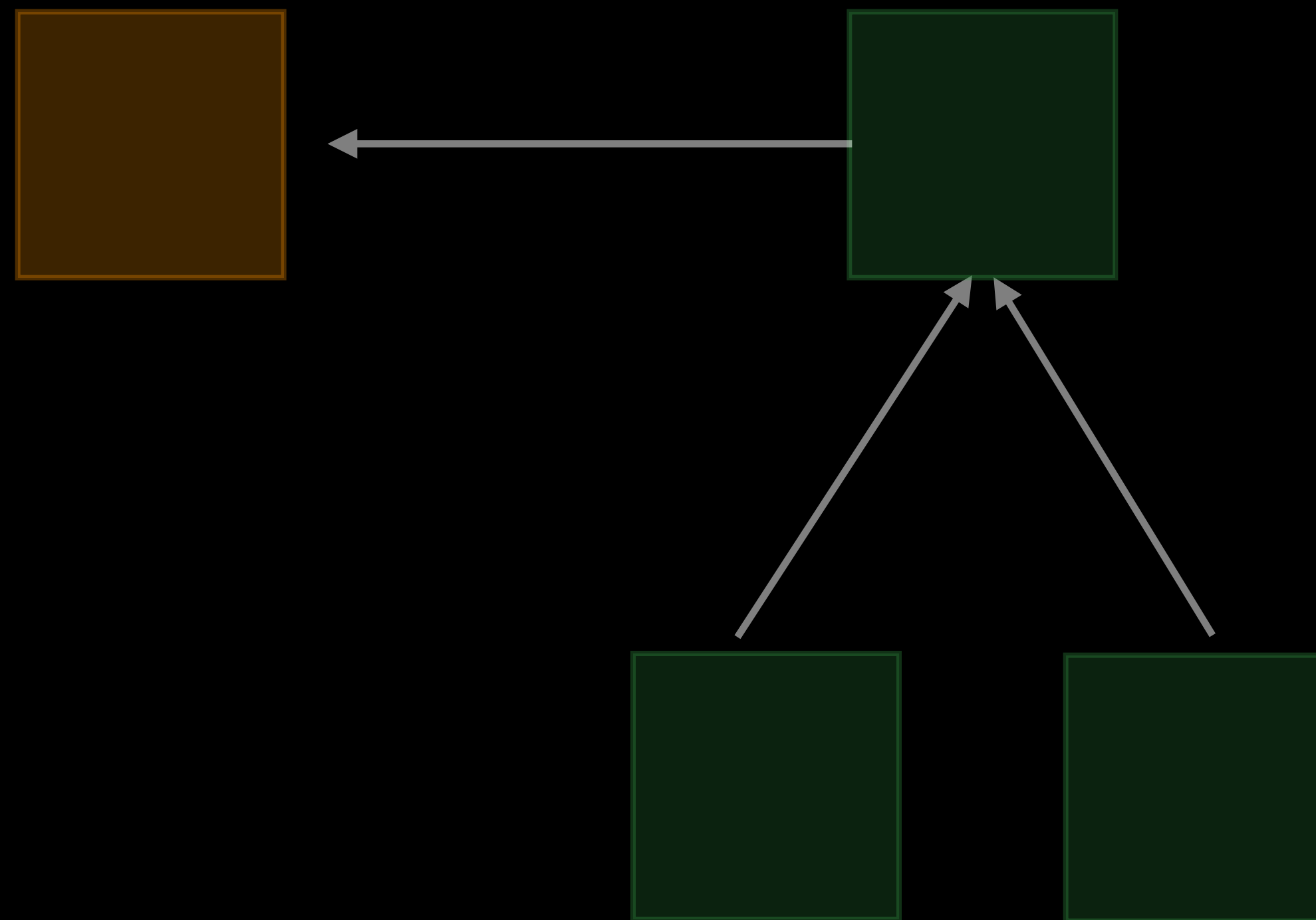
Delete Self References

Cascading deletes



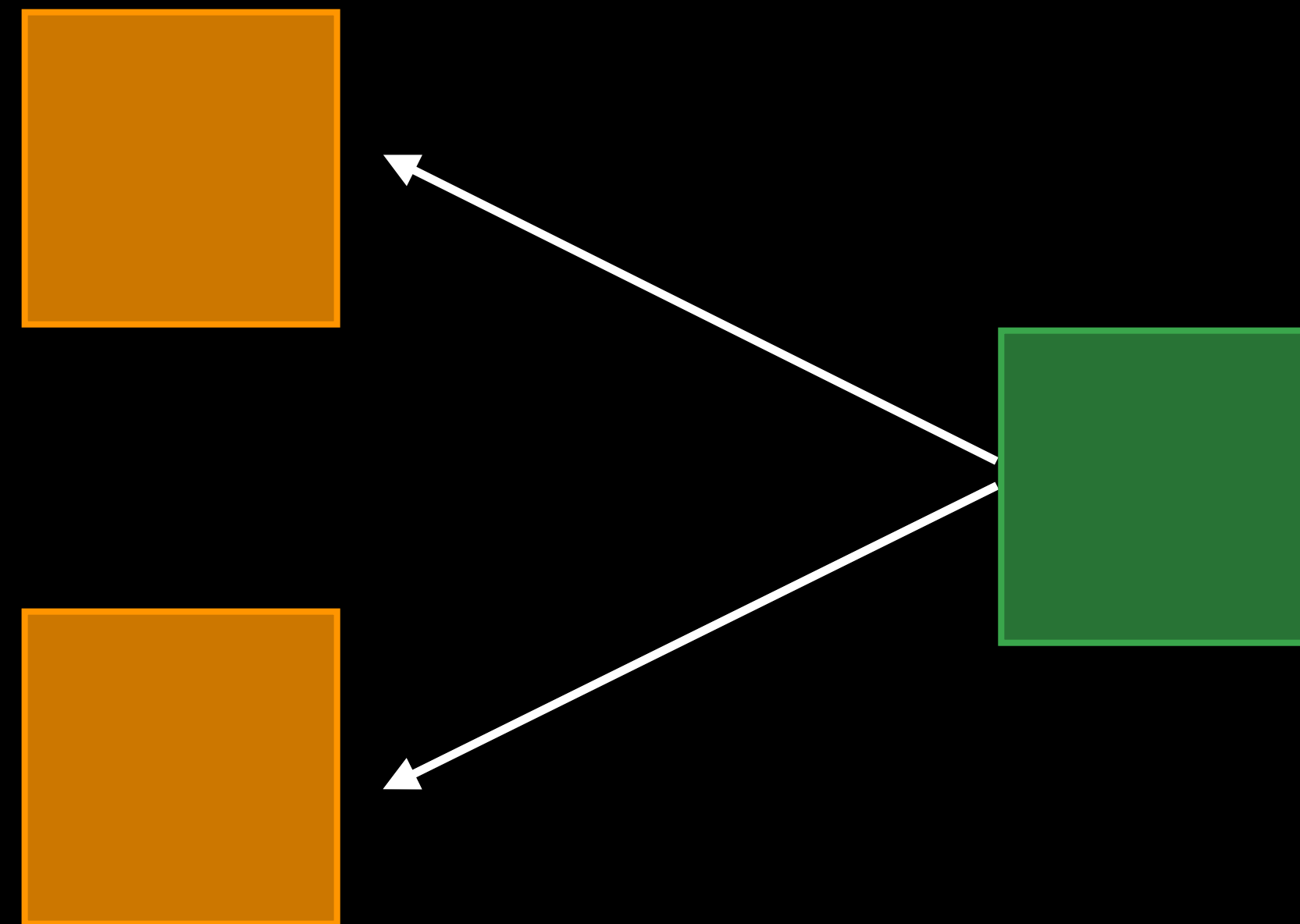
Delete Self References

Cascading deletes



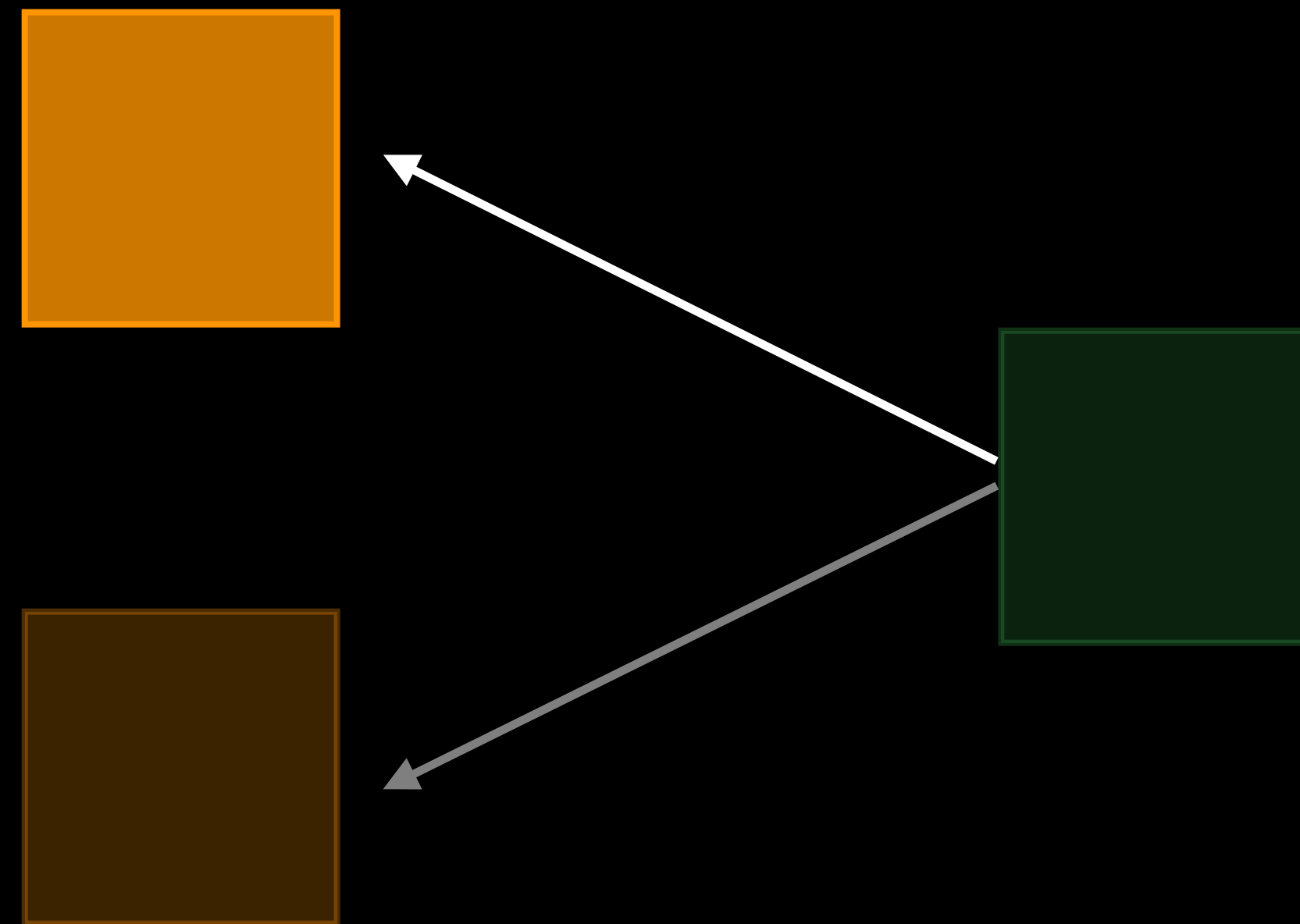
Delete Self References

First delete wins



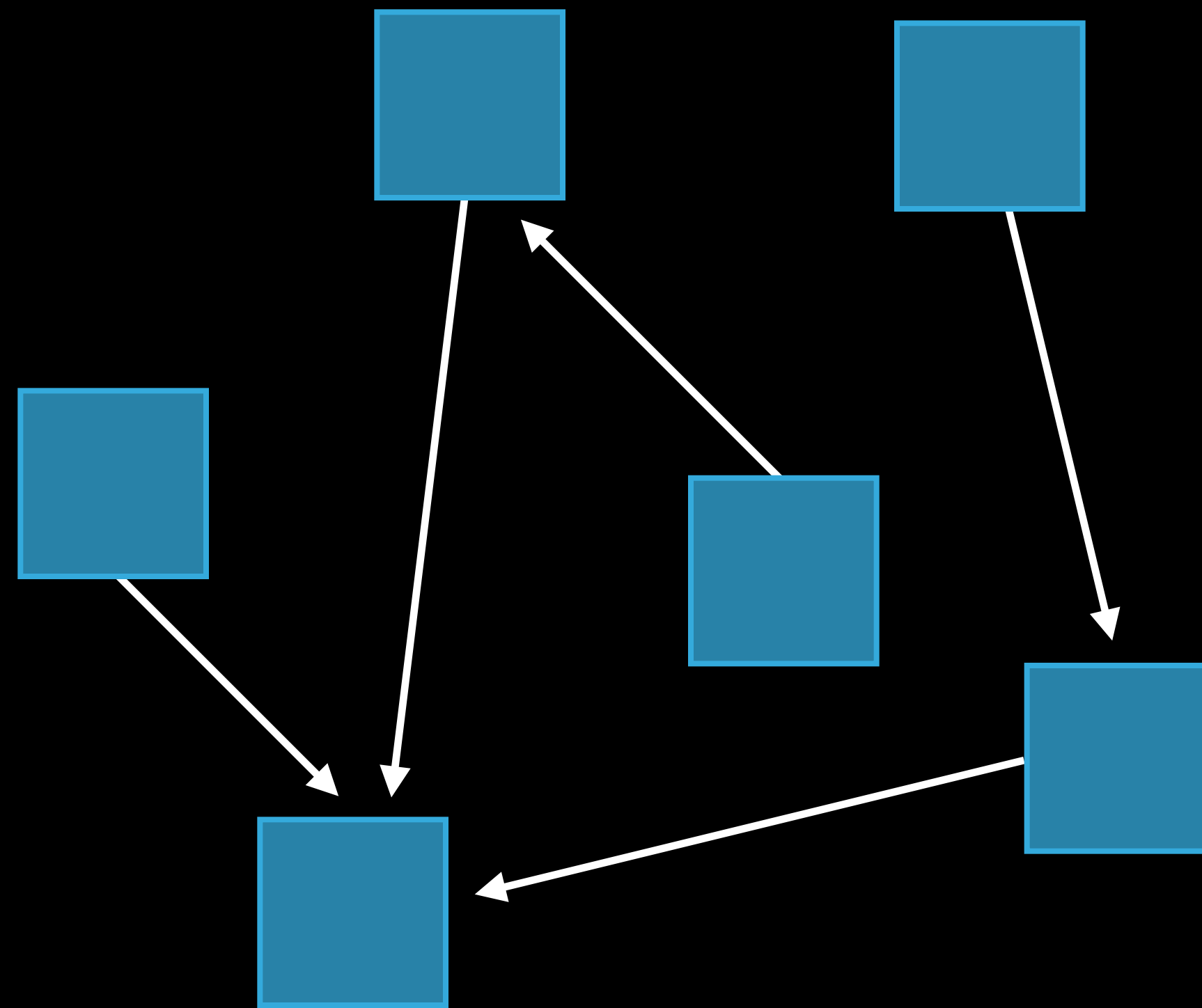
Delete Self References

First delete wins



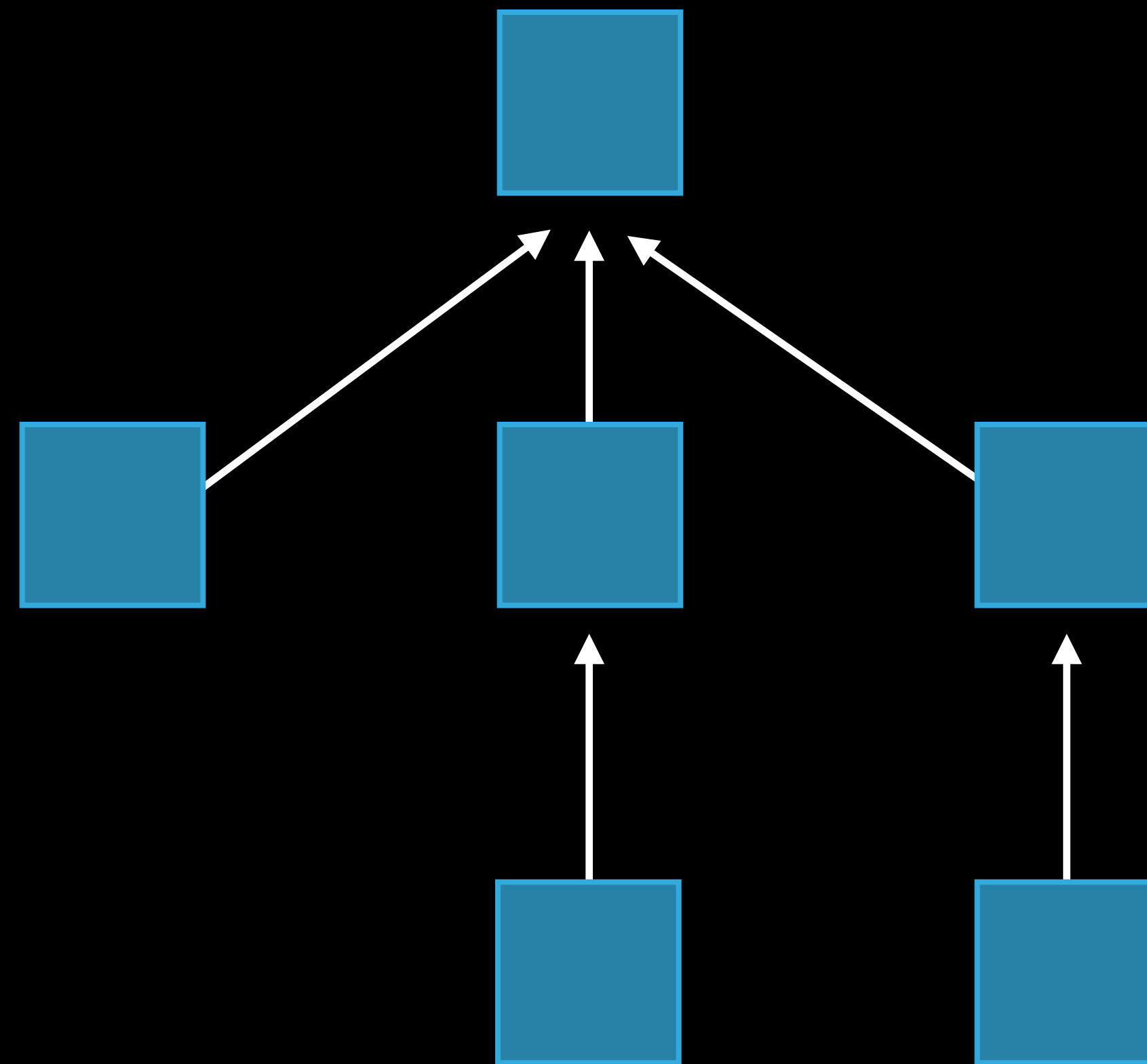
Delete Self References

Topological sort



Delete Self References

Topological sort



Why Should I Use a Reference?

CKReferenceActionNone seems useless!

```
NSString *myRecordIDToString(CKRecordID *recordID) {  
    return [NSString stringWithFormat:@"%@", recordID];  
}
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}
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```
@interface CKRecordID : NSObject  
@property (nonatomic, readonly, strong) NSString *recordName;  
@property (nonatomic, readonly, strong) CKRecordZoneID *zoneID;  
@end
```

Why Should I Use a Reference?

CKReferenceActionNone seems useless!

```
NSString *myRecordIDToString(CKRecordID *recordID) {  
    return [NSString stringWithFormat:@"%@.%@", recordID.name, recordID.zoneID];  
}
```

Why Should I Use a Reference?

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```
NSString *myRecordIDToString(CKRecordID *recordID) {  
    return [NSString stringWithFormat:@"%@.%@", recordID.name, recordID.zoneID];  
}
```

```
@interface CKRecordZoneID : NSObject  
@property (nonatomic, readonly, strong) NSString *zoneName;  
@property (nonatomic, readonly, strong) NSString *ownerName;  
@end
```


Why Should I Use a Reference?

CKReferenceActionNone seems useless!

```
NSString *myRecordIDToString(CKRecordID *recordID) {  
    return [NSString stringWithFormat:@"%@.%@",  
        recordID.recordName, myZoneIDToString(recordID.zoneID)];  
}
```

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NSString *myZoneIDToString(CKRecordZoneID *zoneID) {  
    return [NSString stringWithFormat:@"%@.%@",  
        zoneID.zoneName, zoneID.ownerName];  
}
```

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NSString *myRecordIDToString(CKRecordID *recordID) {  
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NSString *myZoneIDToString(CKRecordZoneID *zoneID) {  
    return [NSString stringWithFormat:@"%@.%@",  
        zoneID.zoneName, zoneID.ownerName];  
}
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```
NSString *myRecordIDToString(CKRecordID *recordID) {  
    return [NSString stringWithFormat:@"%@.%@",  
        recordID.recordName, myZoneIDToString(recordID.zoneID)];  
}
```

```
[NSPredicate predicateWithFormat:@"owner = %@",  
    myRecordIDToString(shoebox.recordID)]
```

Why Should I Use a Reference?

Queries are simple

```
[NSPredicate predicateWithFormat:@"owner = %@", shoebox]
```

Your Data Objects and CloudKit

Some notes

Your Data Objects and CloudKit

Some notes

CloudKit is a transport mechanism

Your Data Objects and CloudKit

Some notes

CloudKit is a transport mechanism

Don't subclass

Your Data Objects and CloudKit

Some notes

CloudKit is a transport mechanism

Don't subclass

Convert to/from CloudKit objects on save and fetch

The Notification Collection

Handling push notifications properly

Subscriptions and Notifications

Recap

Subscriptions and Notifications

Recap

Subscriptions are persistent queries

Subscriptions and Notifications

Recap

Subscriptions are persistent queries

Server sends a push notification

Subscriptions and Notifications

Recap

Subscriptions are persistent queries

Server sends a push notification

Pushes are sent via Apple Push Notification Service

Push Notifications Are Lossy

Push Notifications Are Lossy

No guarantees on delivery

Push Notifications Are Lossy

No guarantees on delivery

Server stores pushes

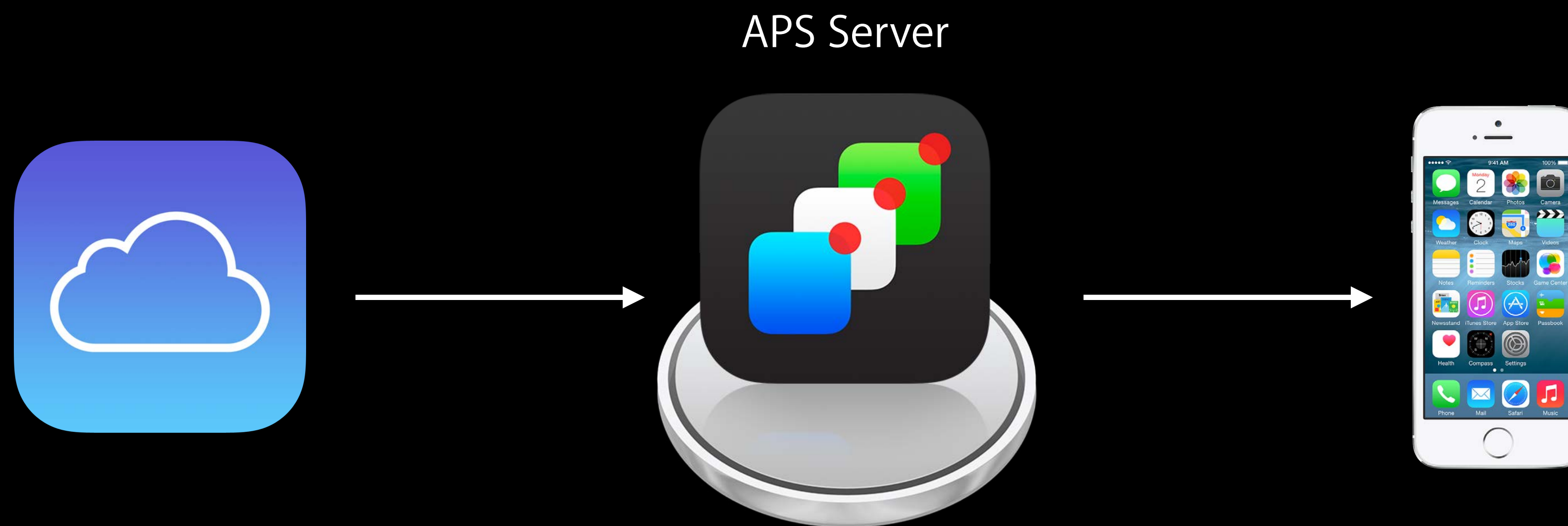
Push Notifications Are Lossy

No guarantees on delivery

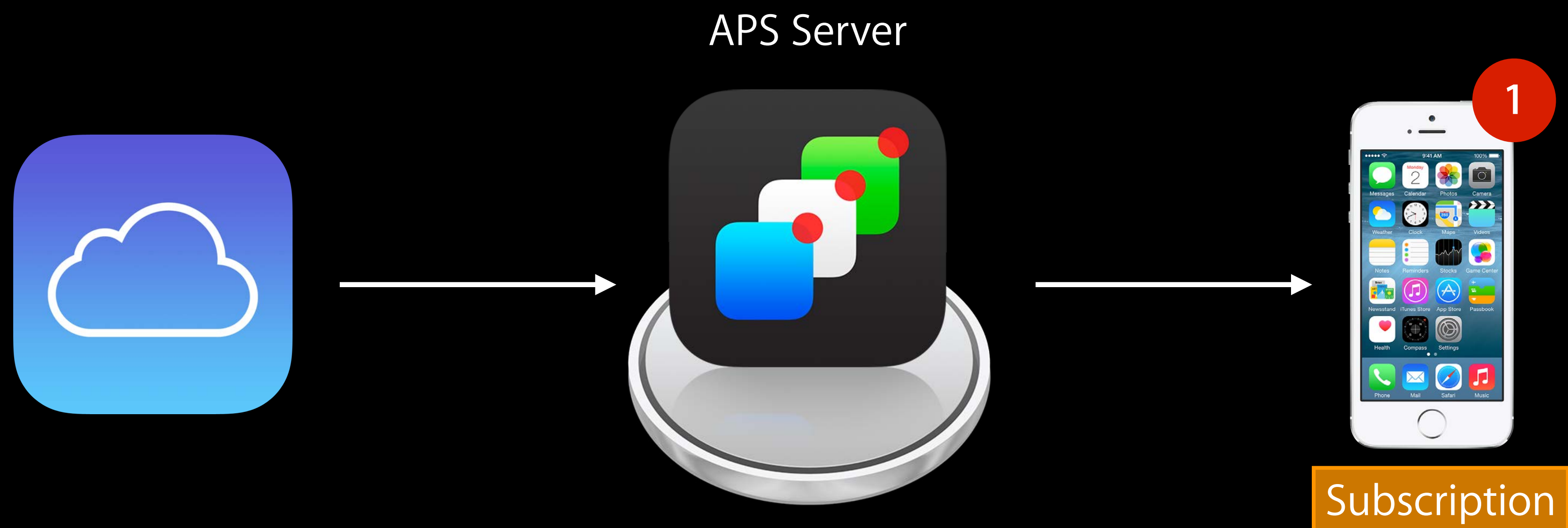
Server stores pushes

Server only stores the latest push

Push Notifications

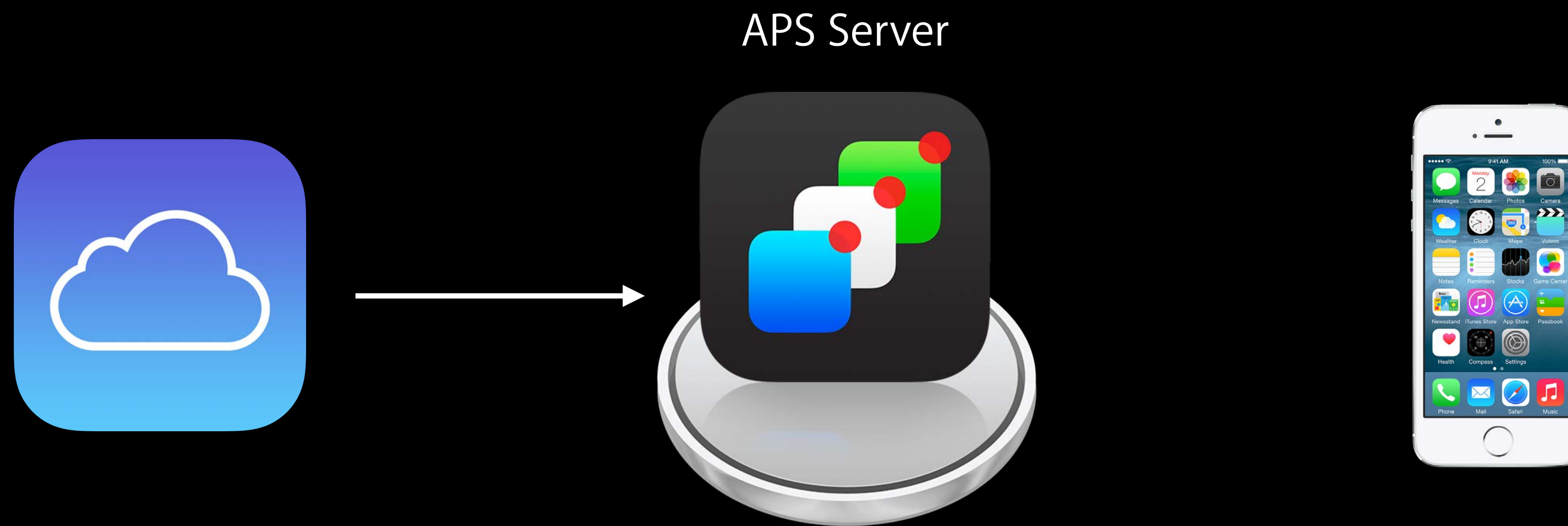


Push Notifications



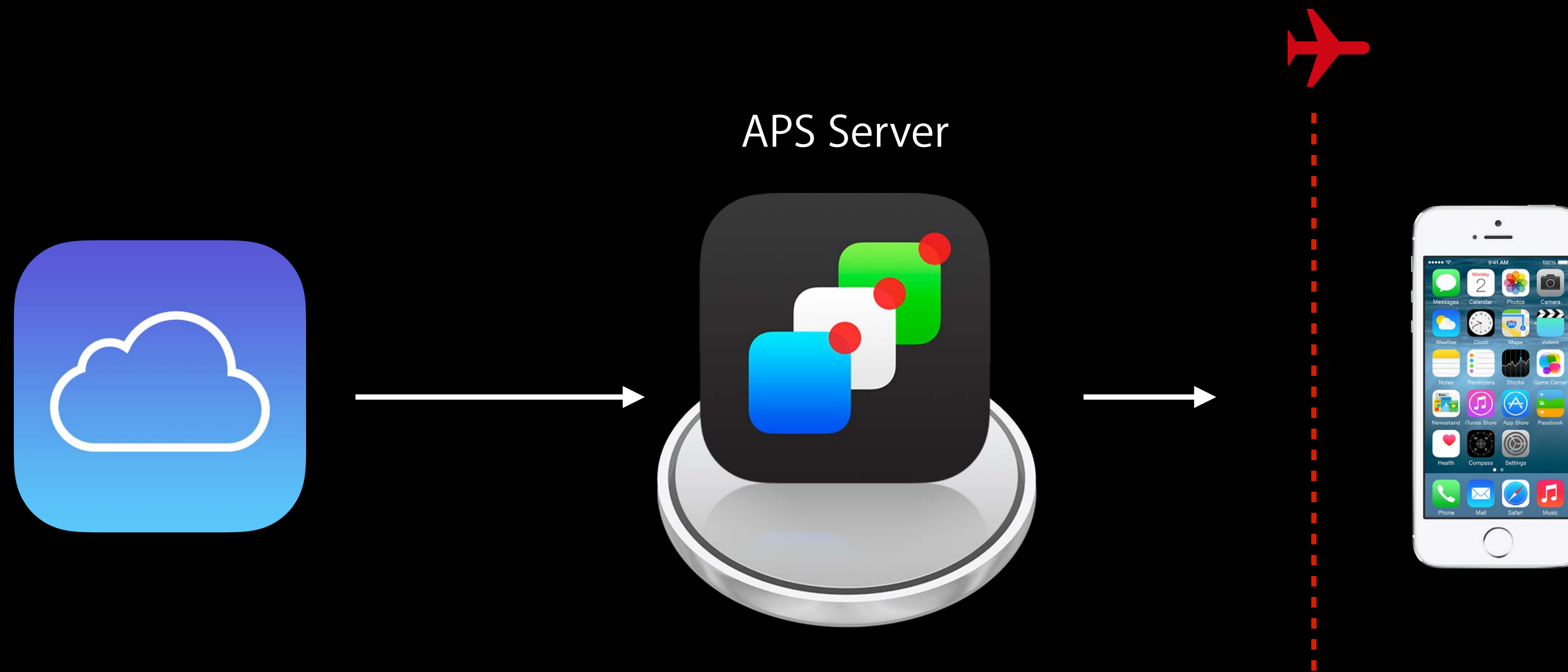
Push Notifications

Store and forward



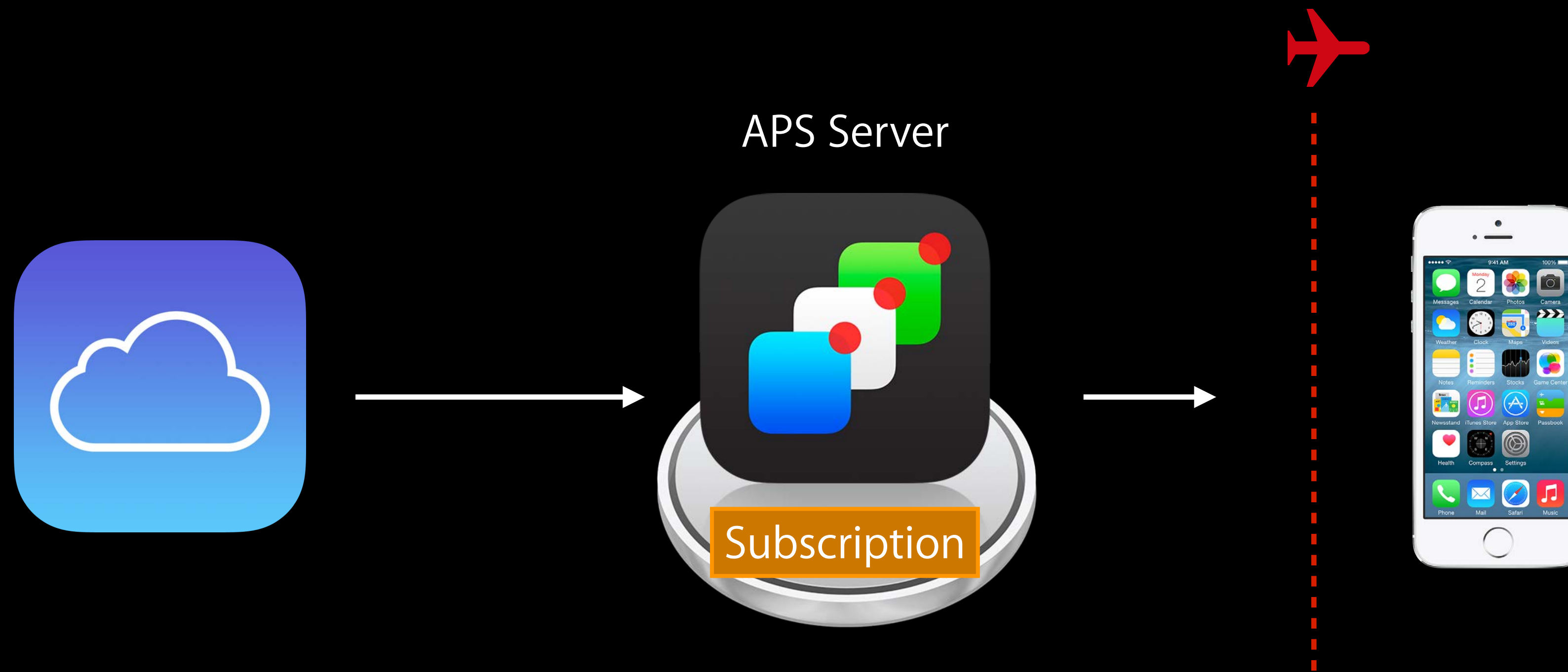
Push Notifications

Store and forward



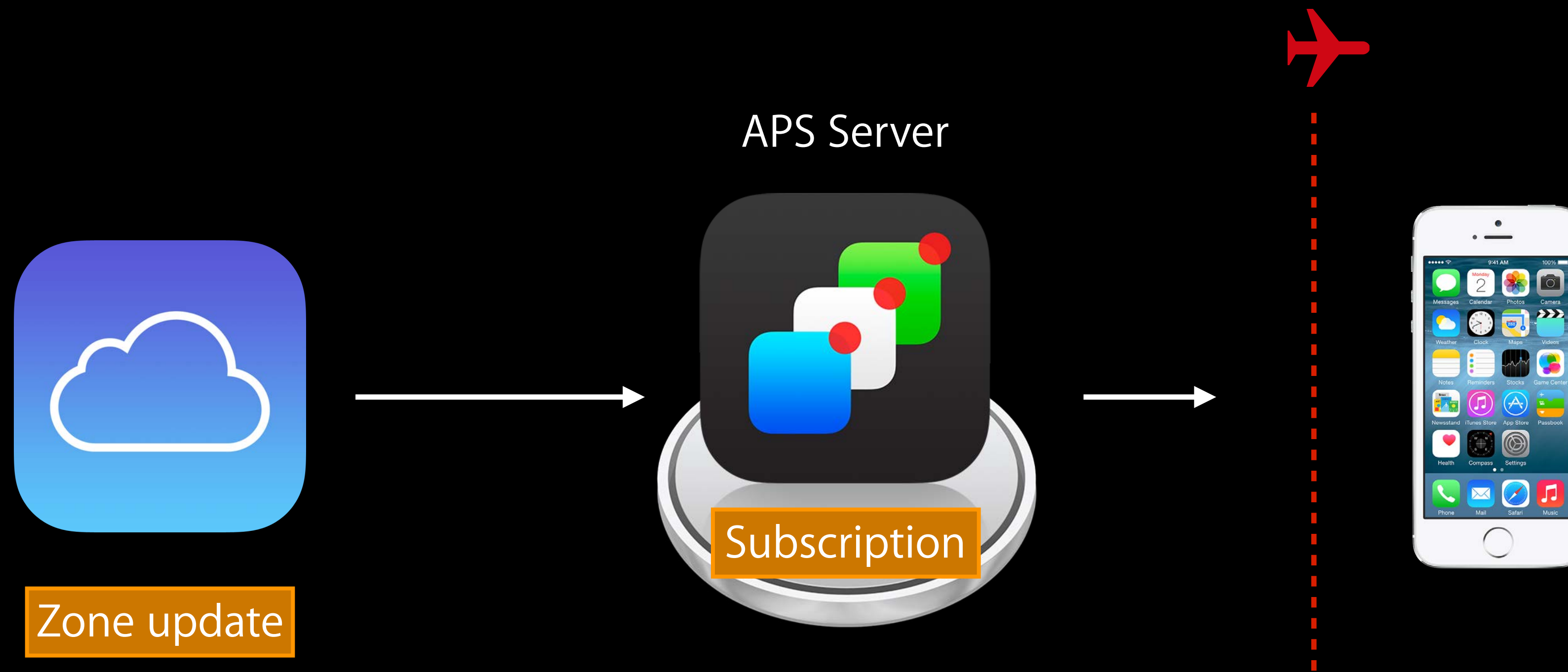
Push Notifications

Store and forward



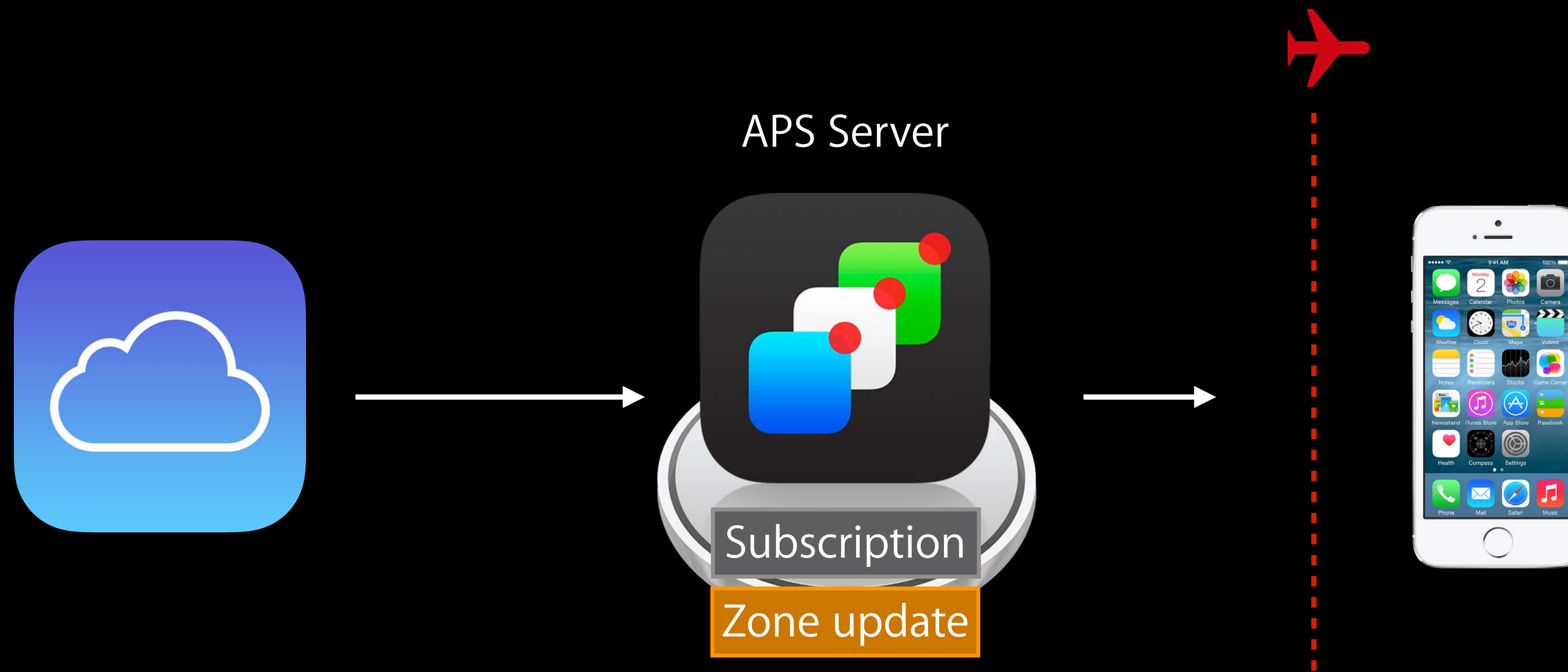
Push Notifications

Only the last push is delivered



Push Notifications

Only the last push is delivered



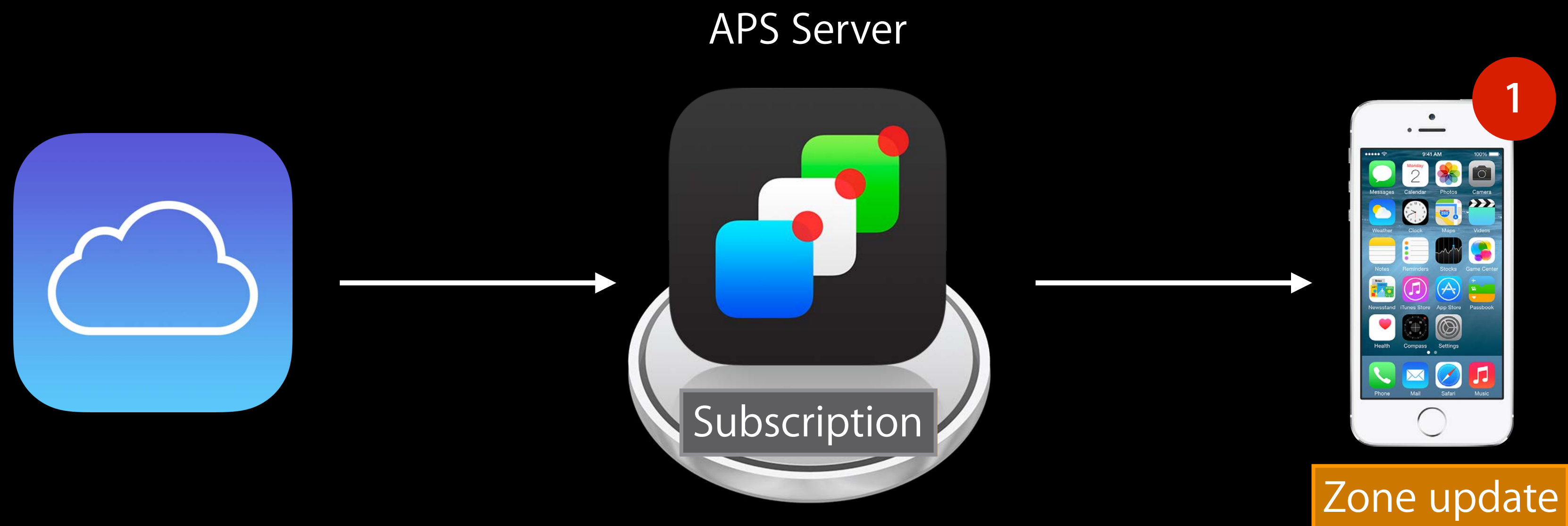
Push Notifications

Only the last push is delivered

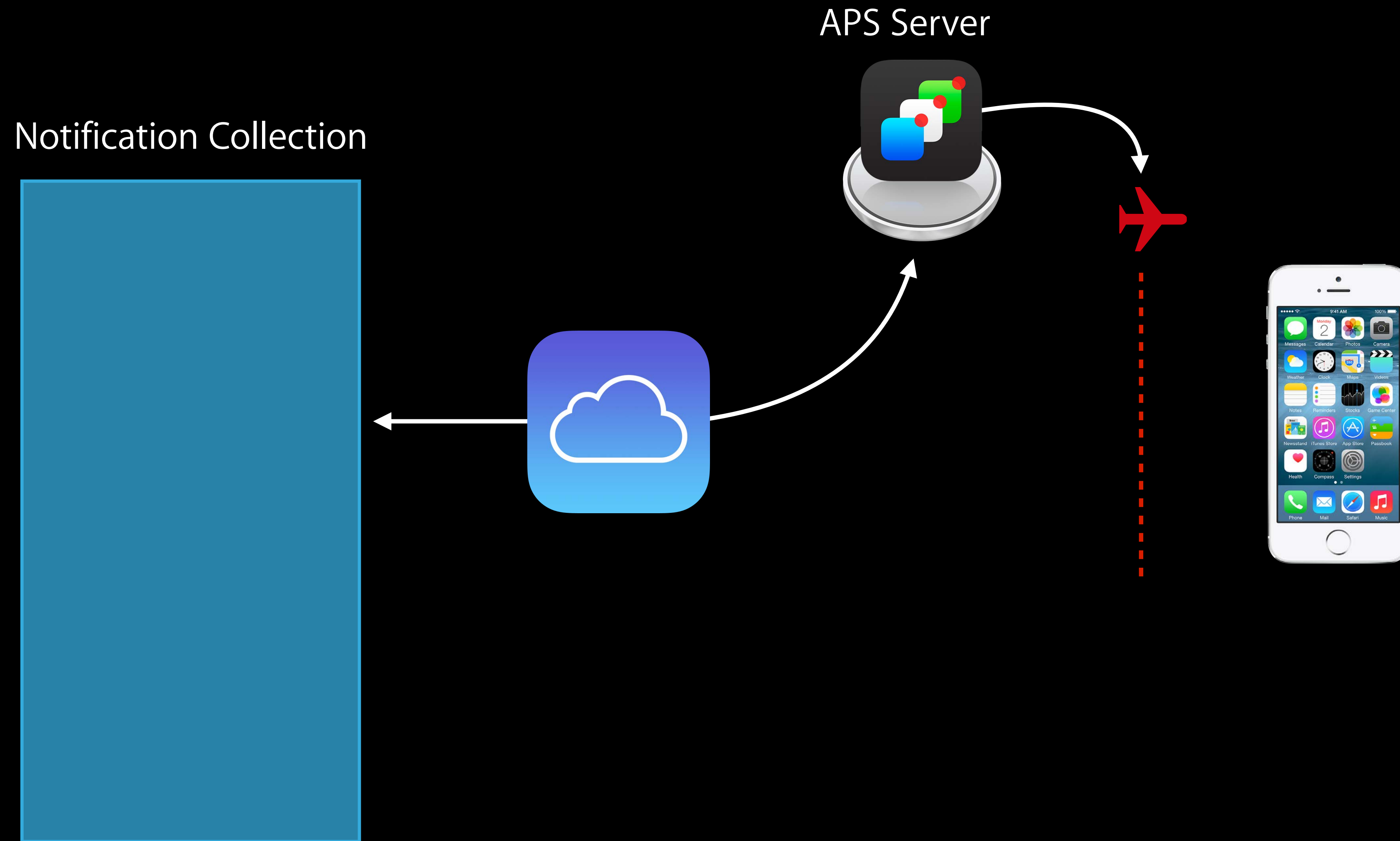


Push Notifications

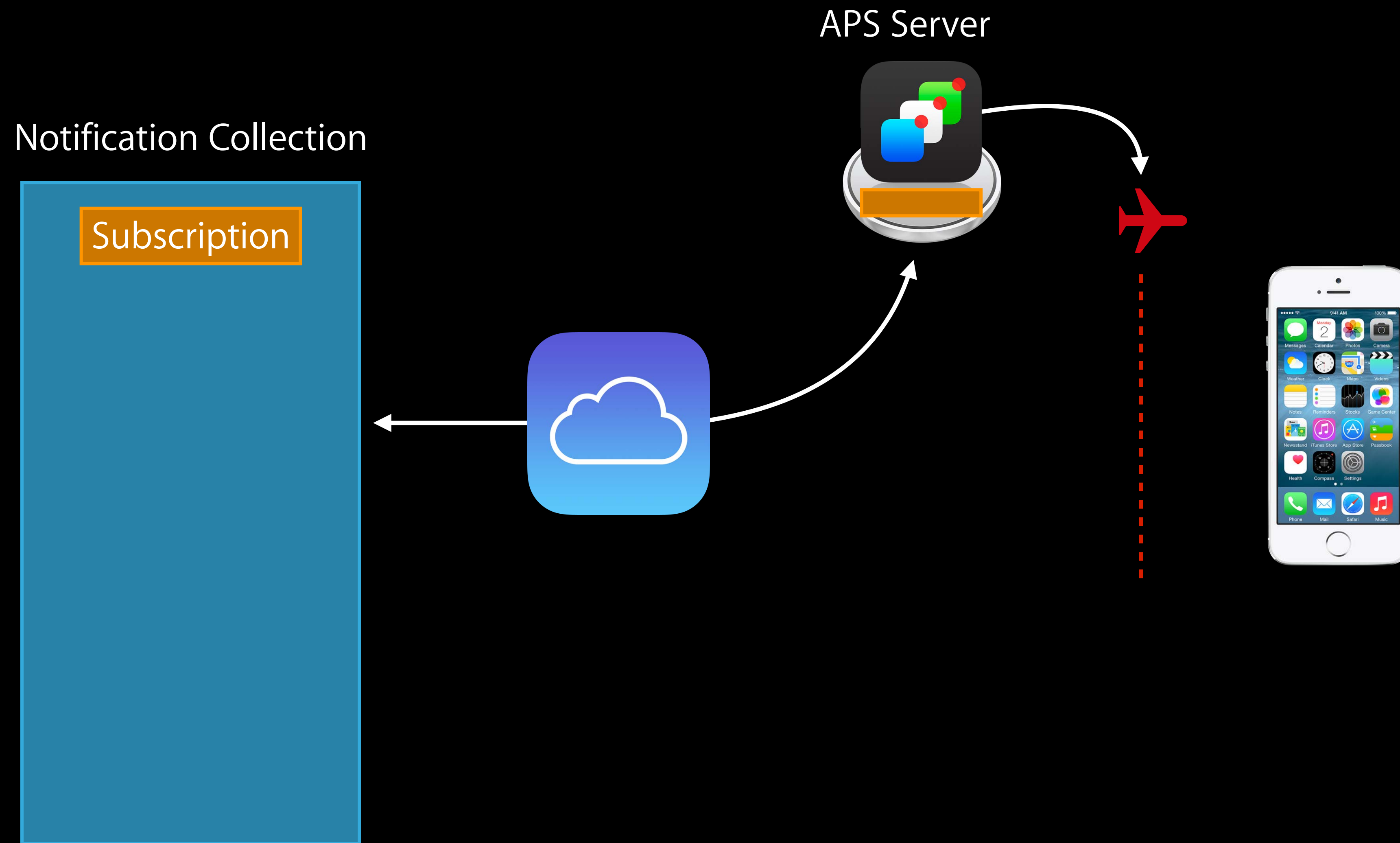
Only the last push is delivered



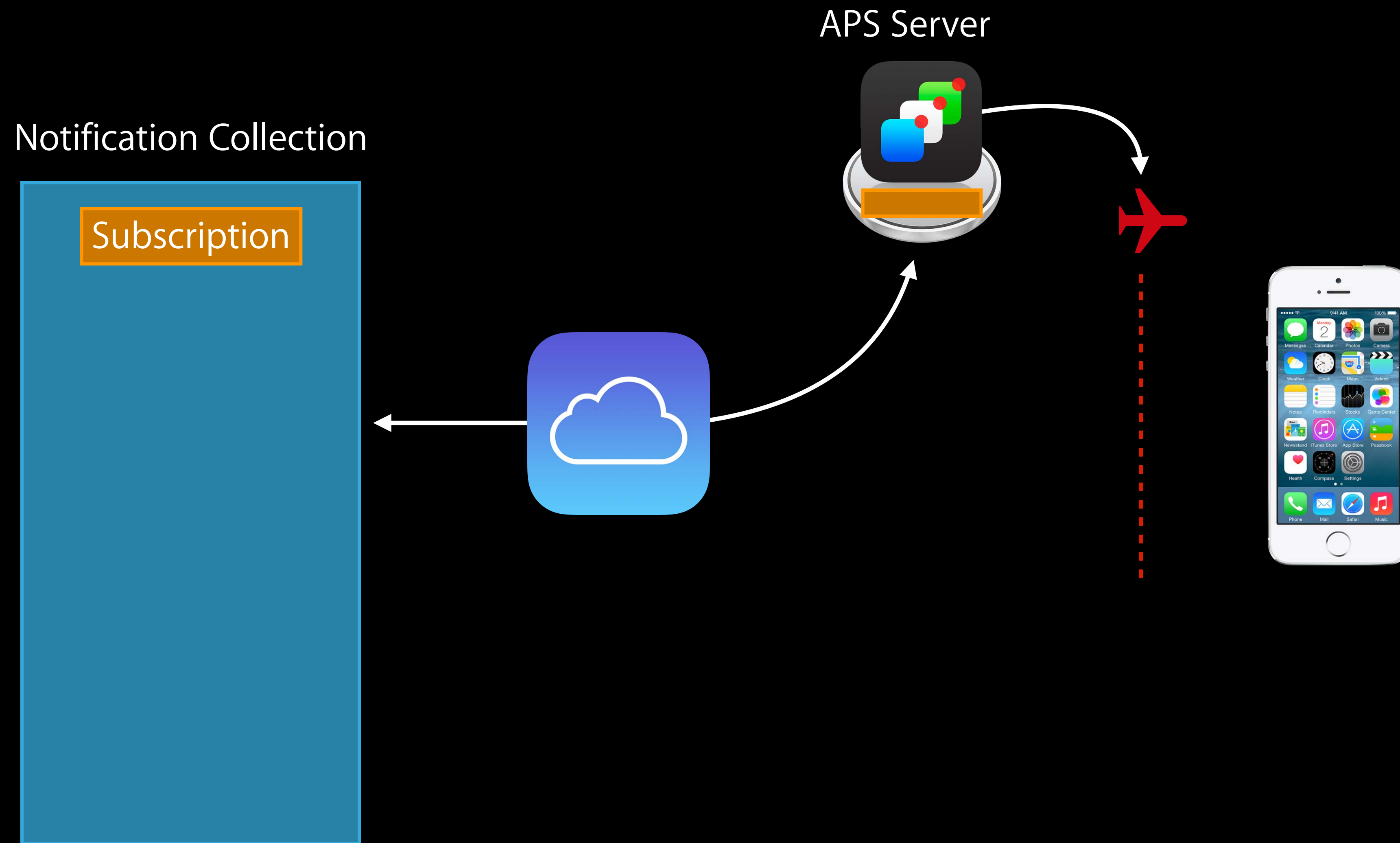
Notification Collection



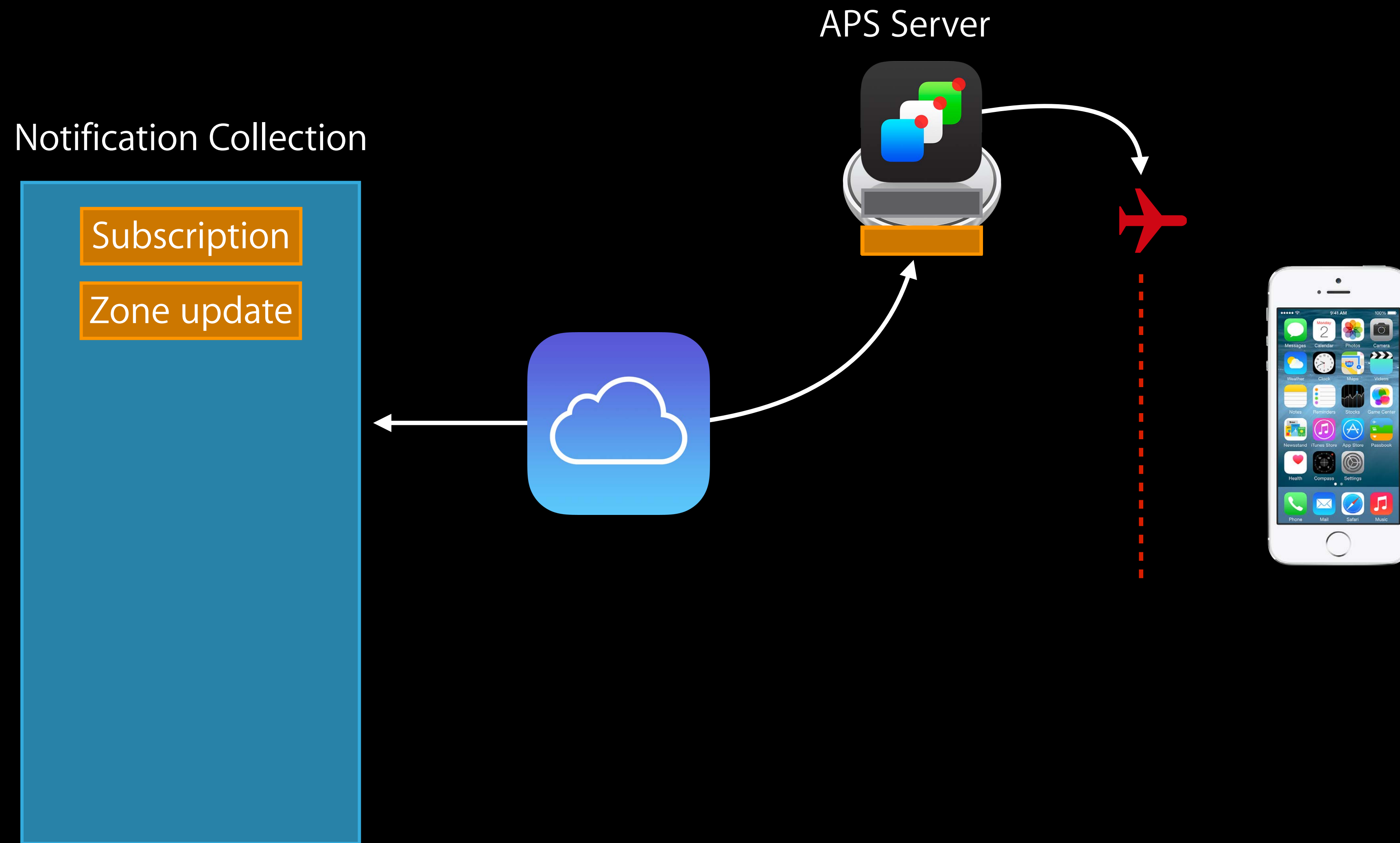
Notification Collection



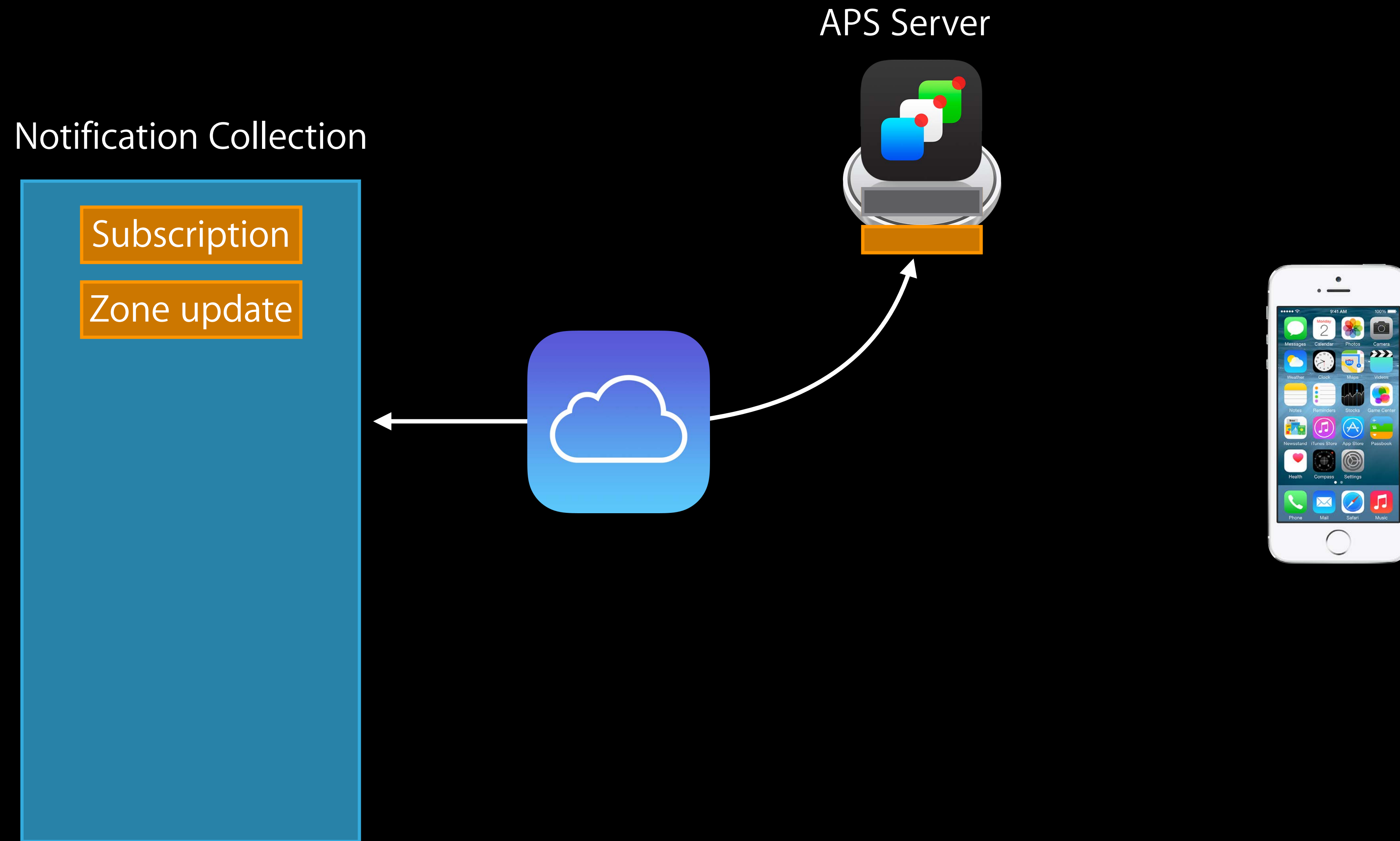
Notification Collection



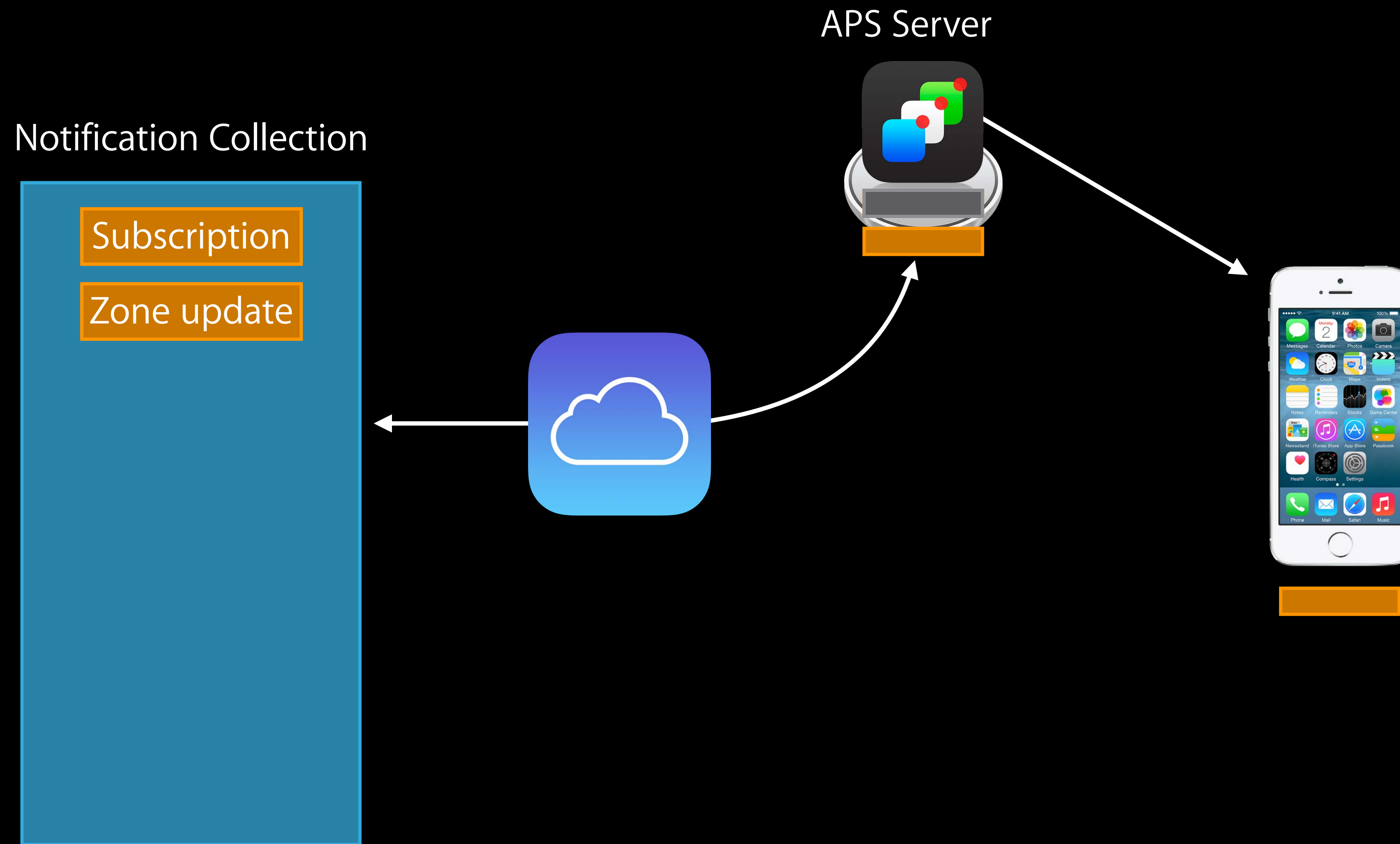
Notification Collection



Notification Collection



Notification Collection



Notification Collection



Notification Collection

Zone update

Subscription



Notification Collection



Notification Collection



Notification Collection



Notification Collection

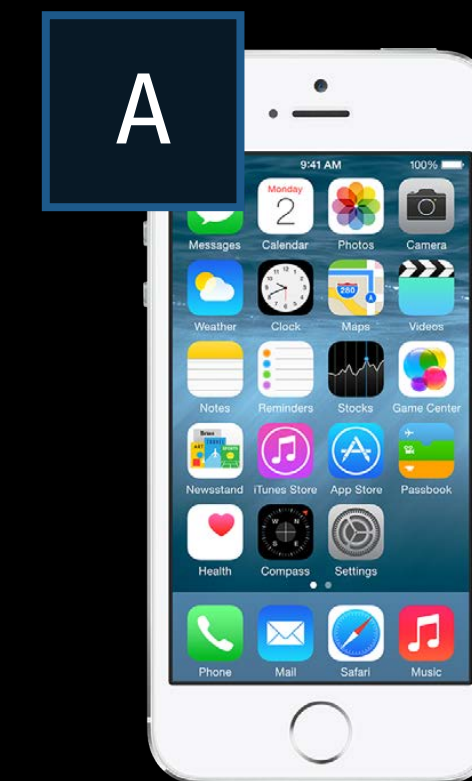
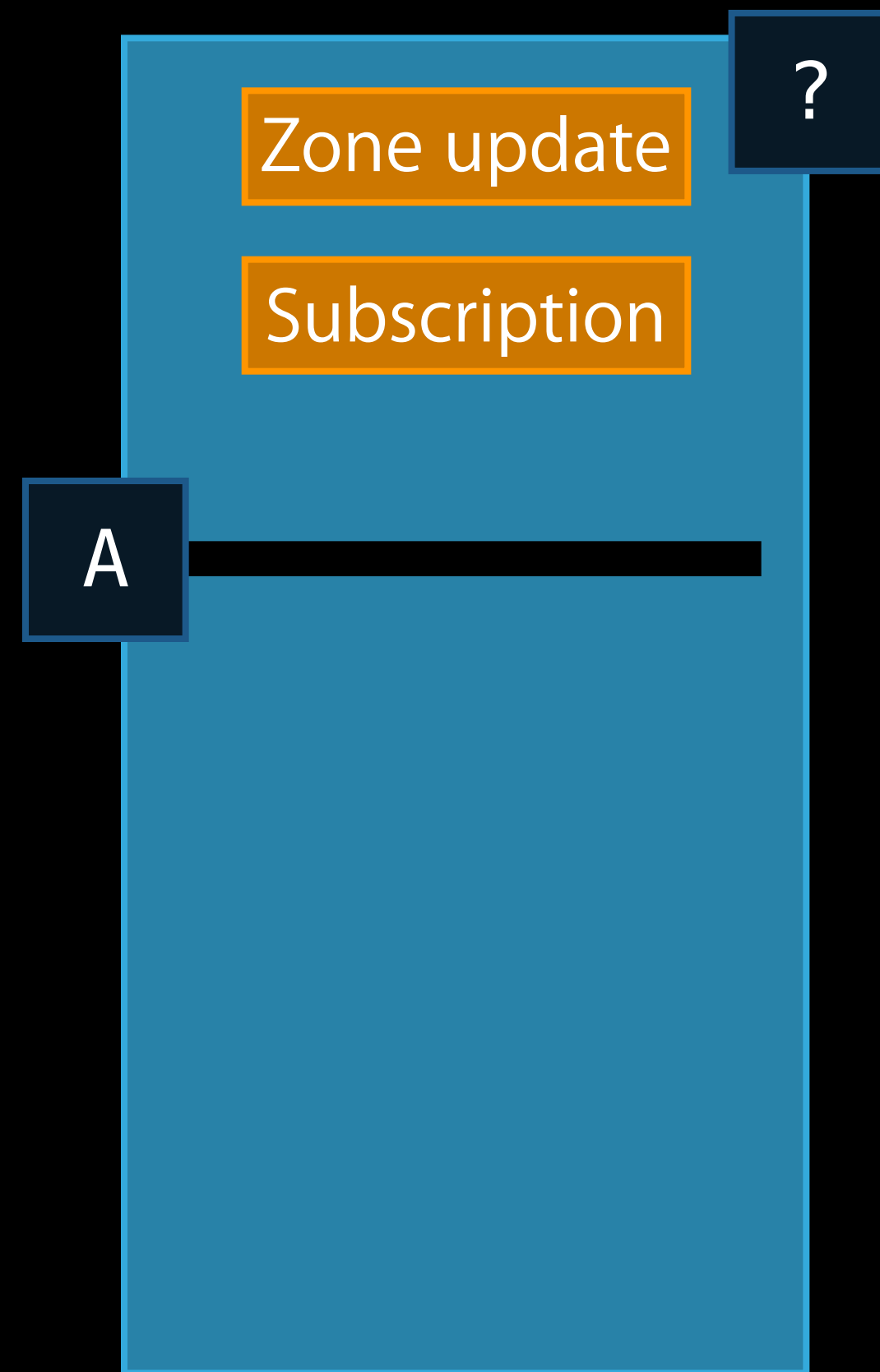


Zone update
Subscription

Notification Collection



Notification Collection



Zone update
Subscription

Notification Collection

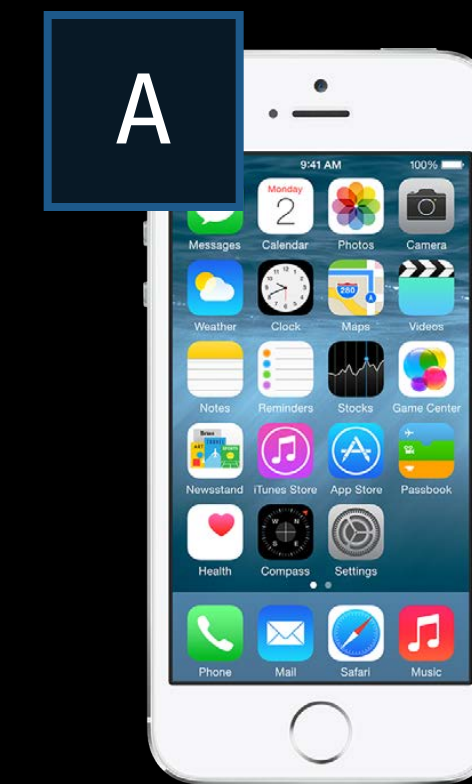


Notification Collection

Zone update

Subscription

A



Receipt

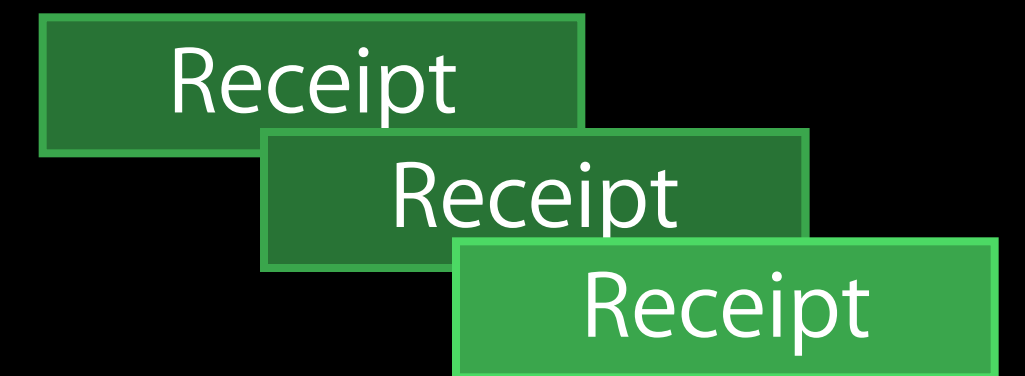
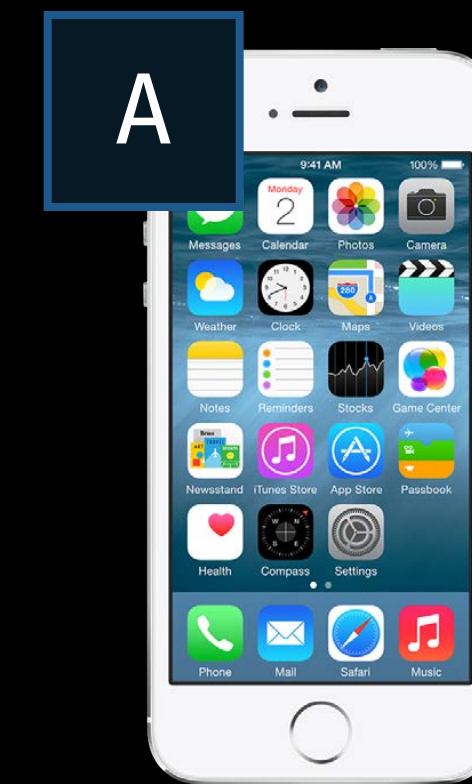
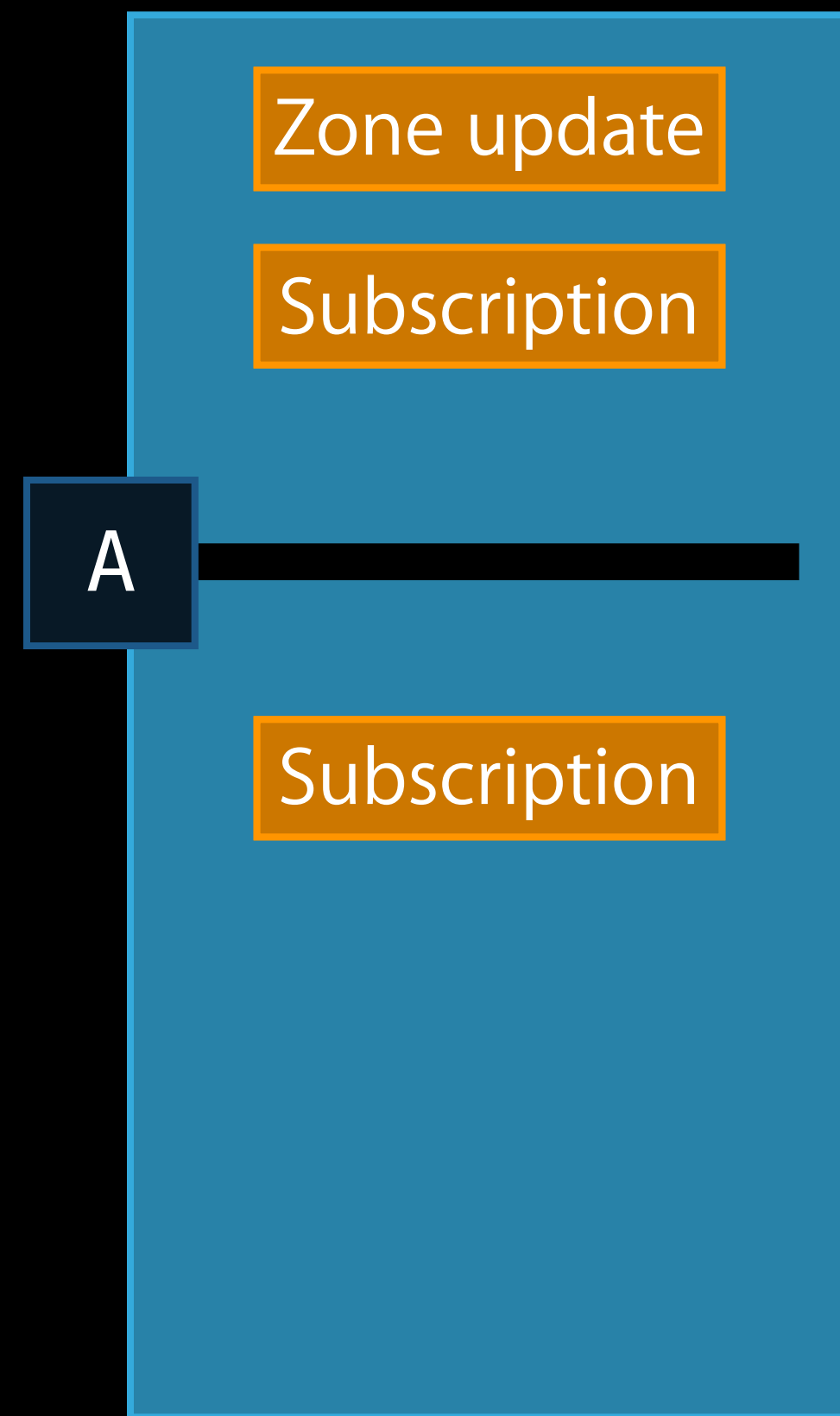
Receipt

Receipt

Notification Collection



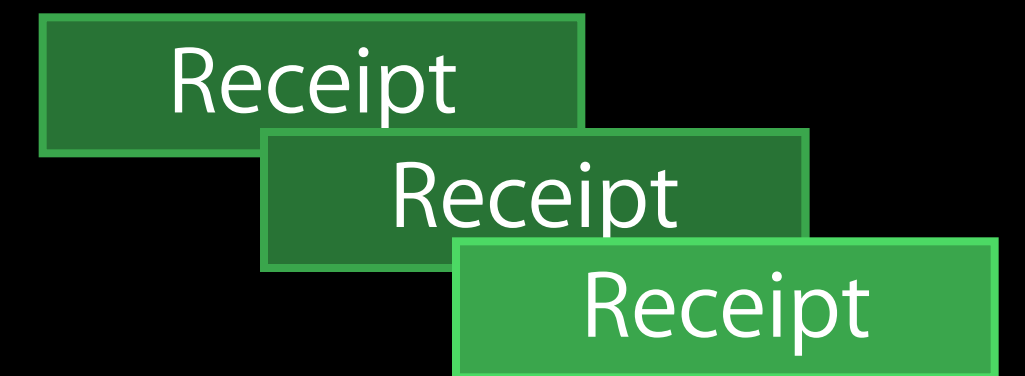
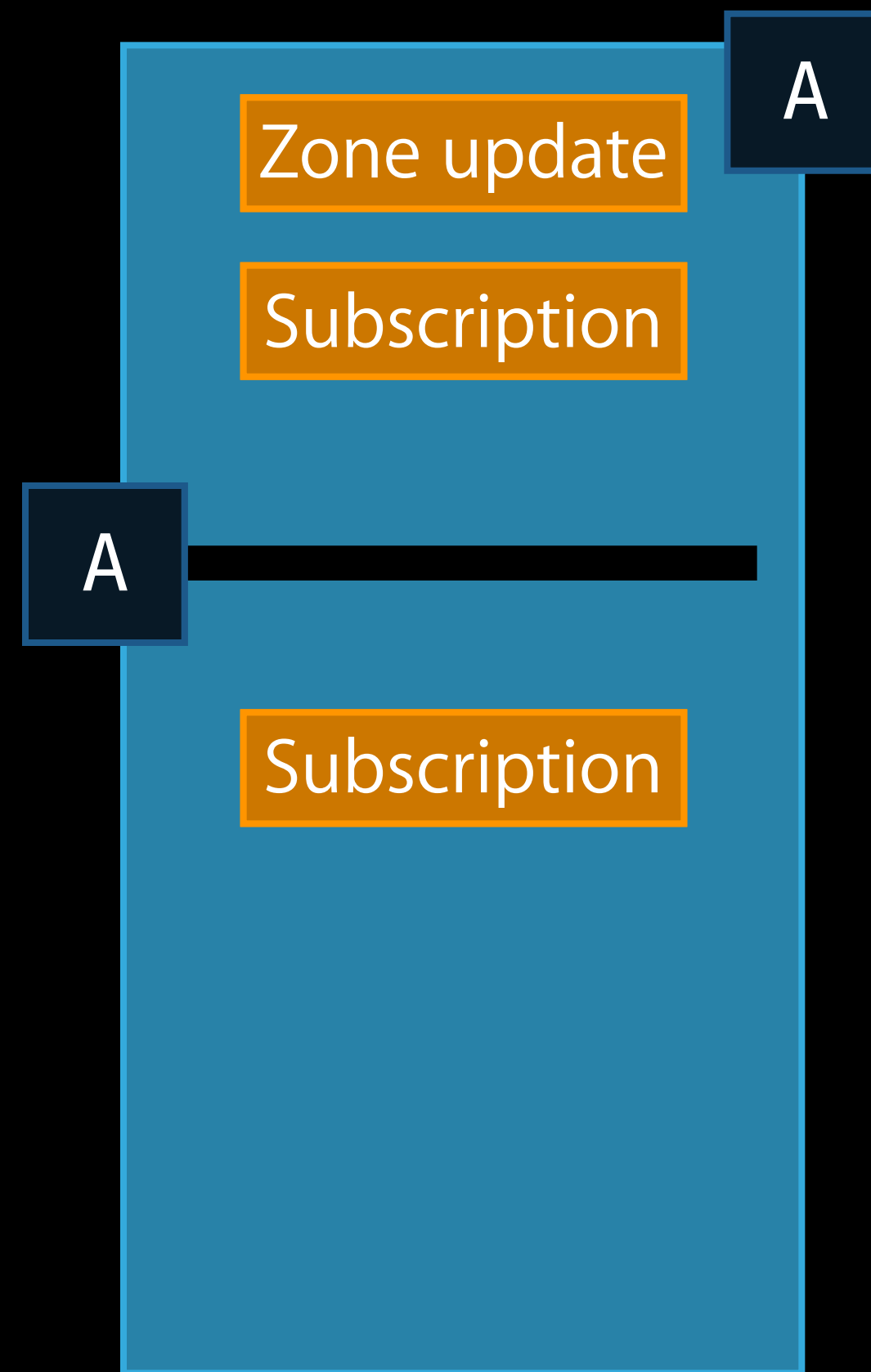
Notification Collection



Notification Collection



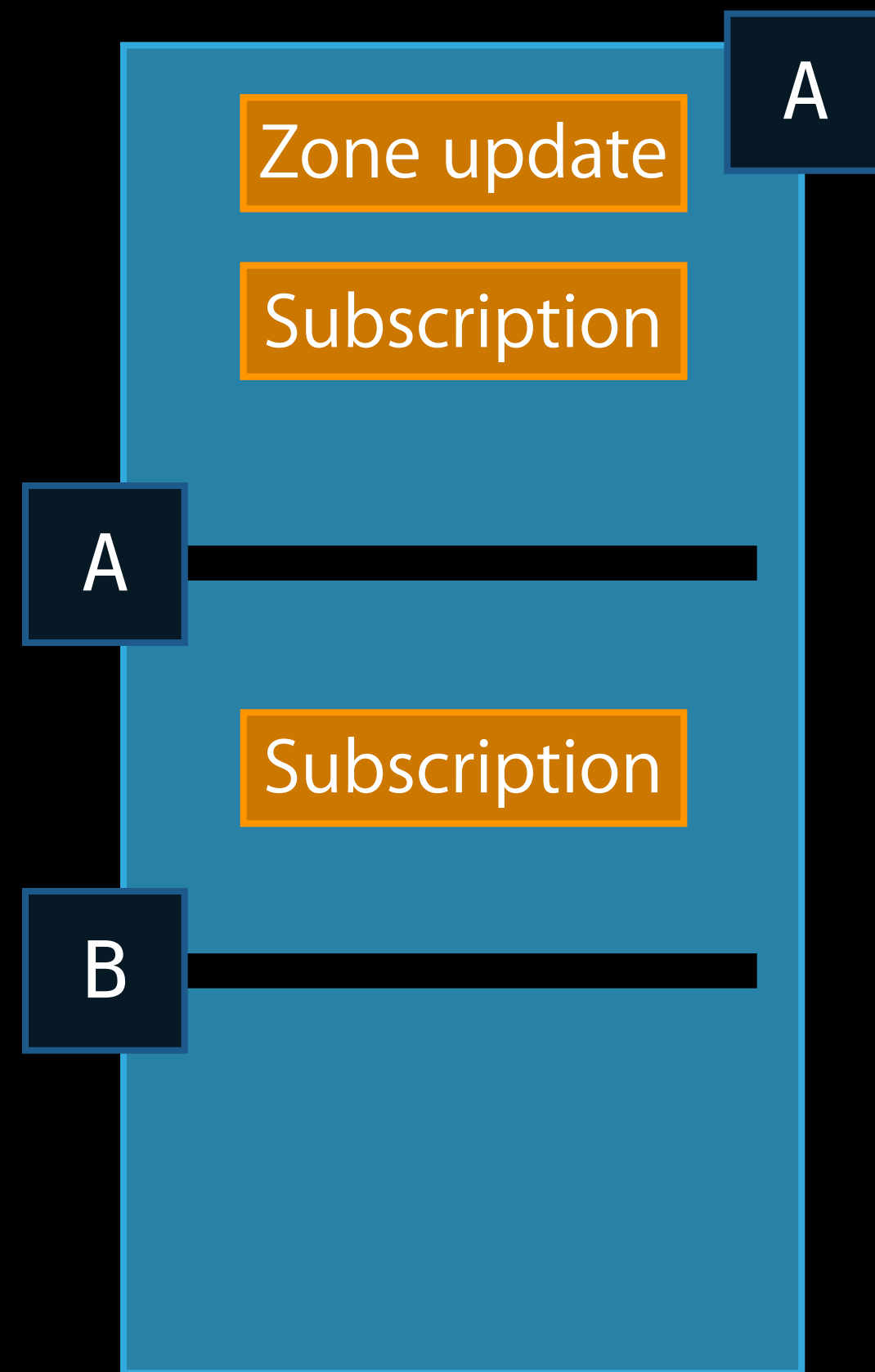
Notification Collection



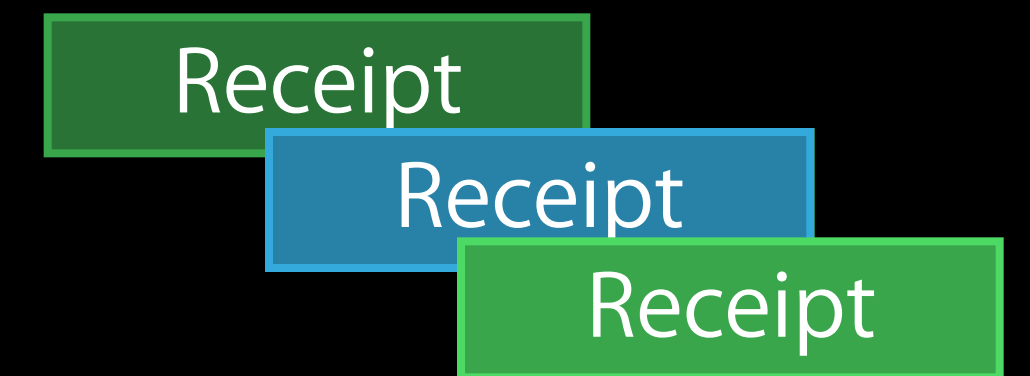
Notification Collection



Notification Collection



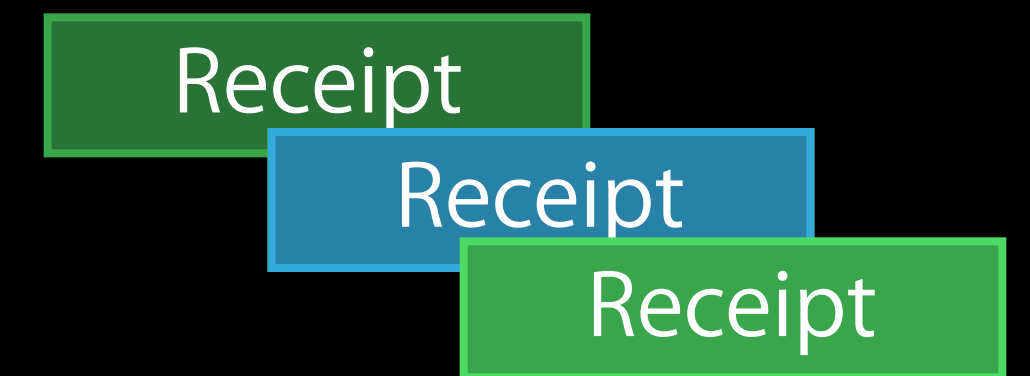
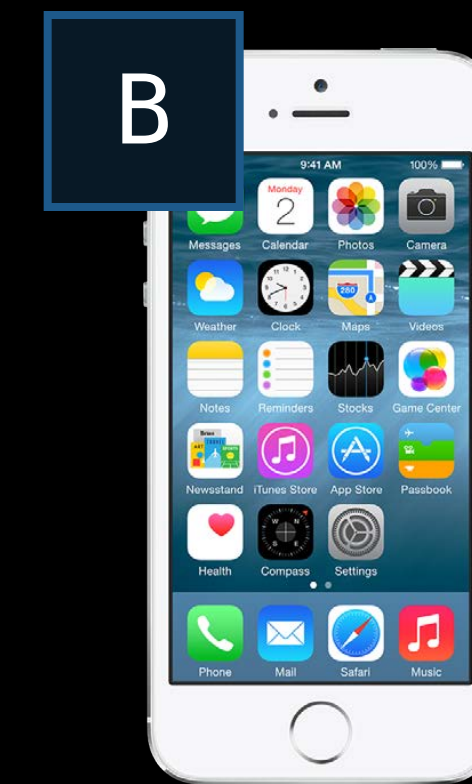
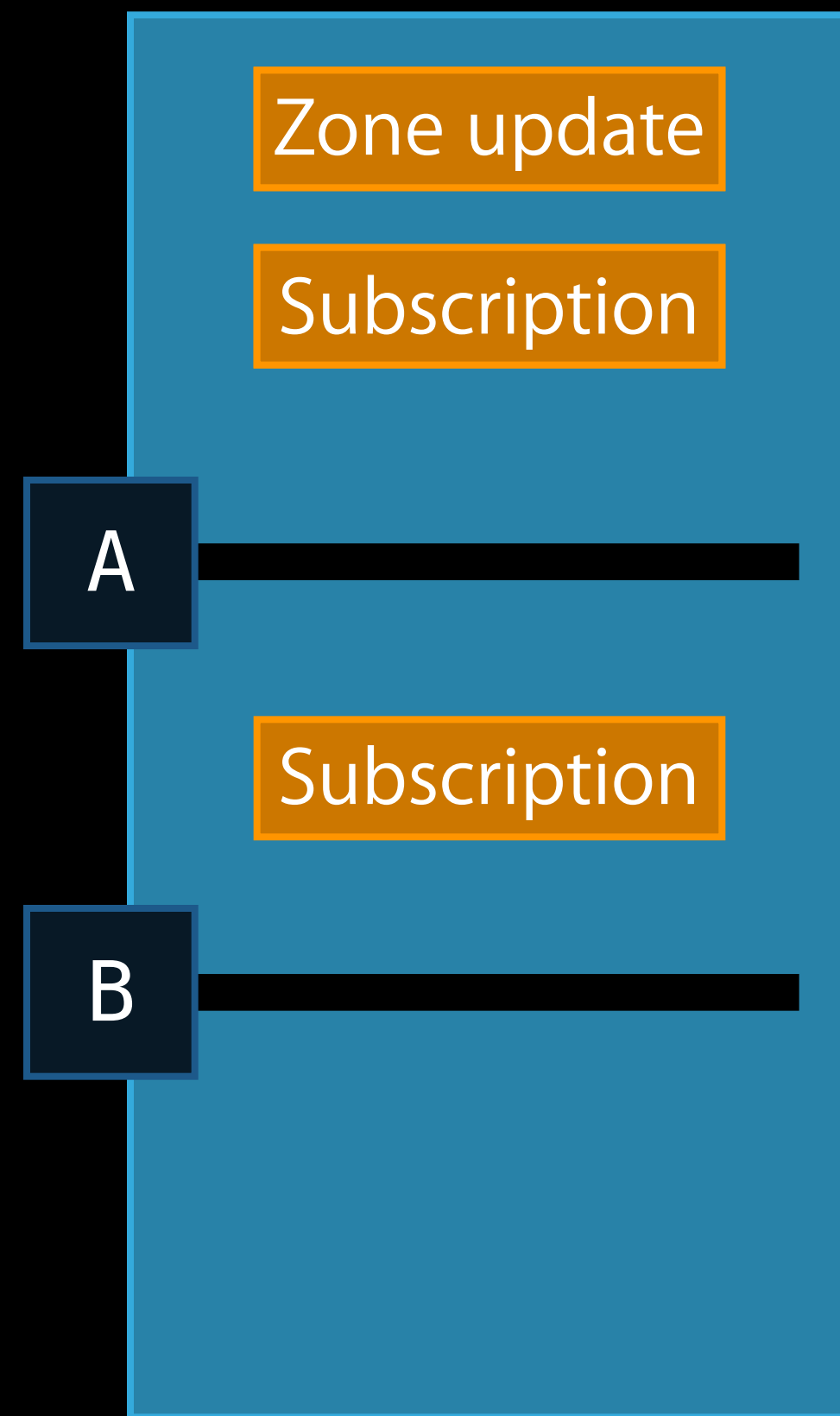
Subscription



Notification Collection



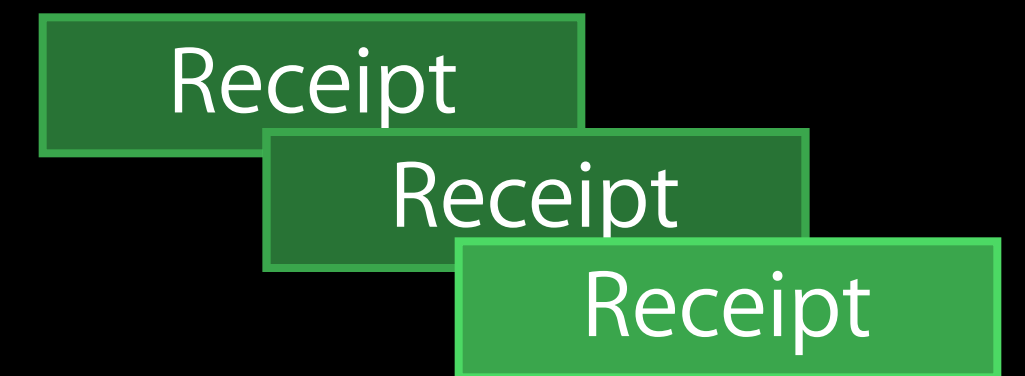
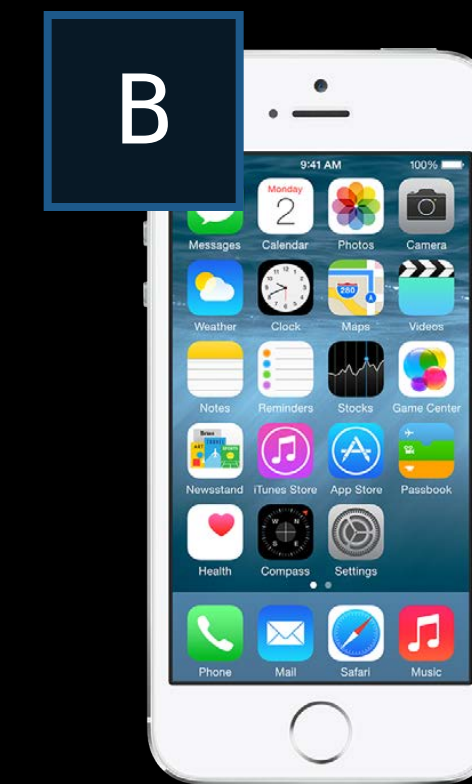
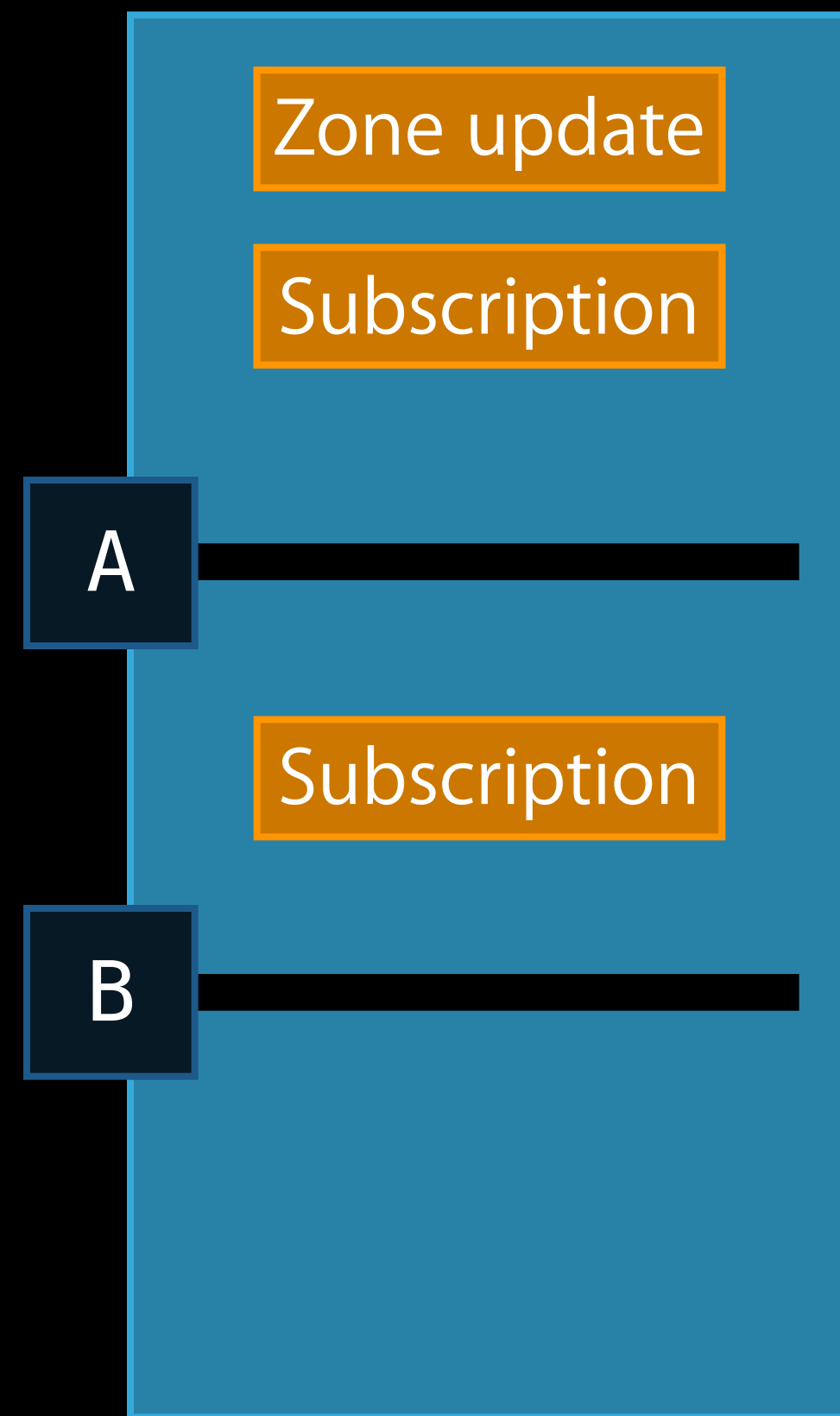
Notification Collection



Notification Collection



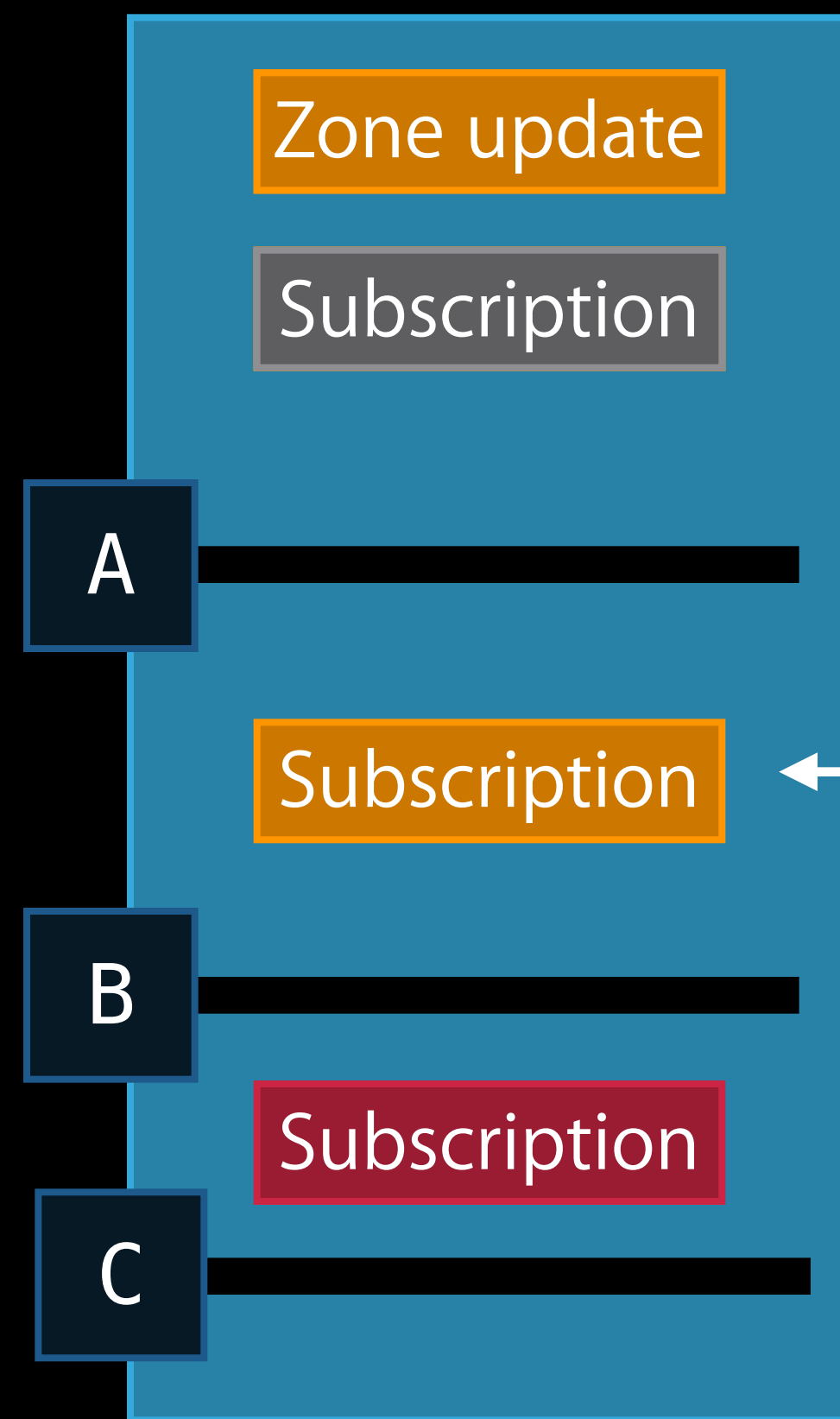
Notification Collection



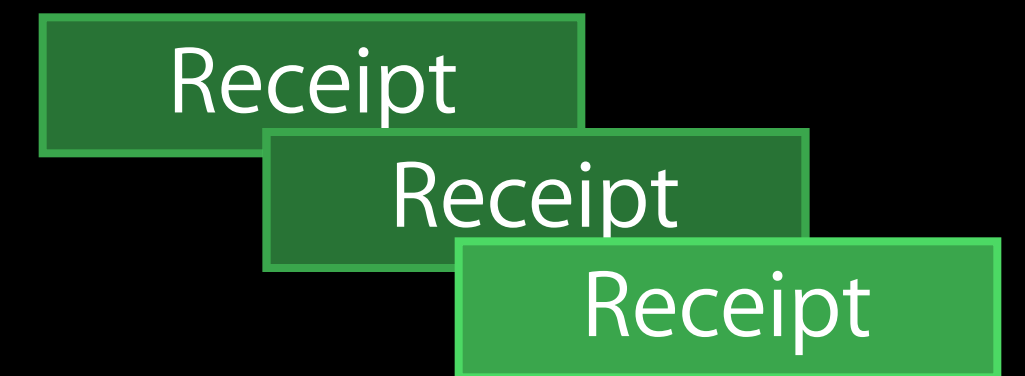
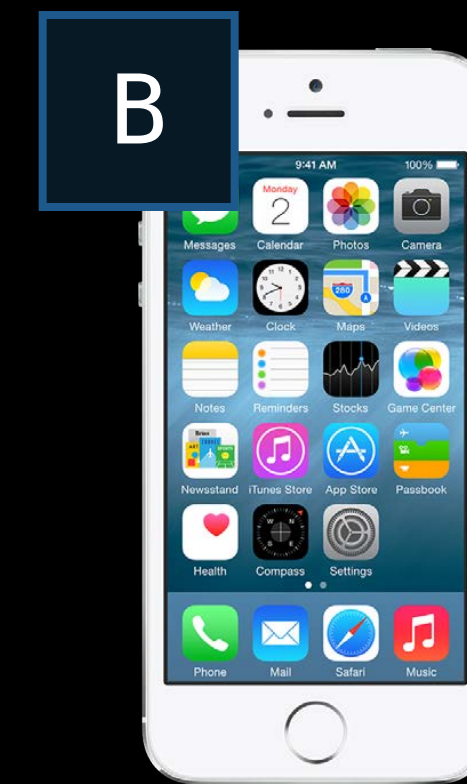
Notification Collection



Notification Collection



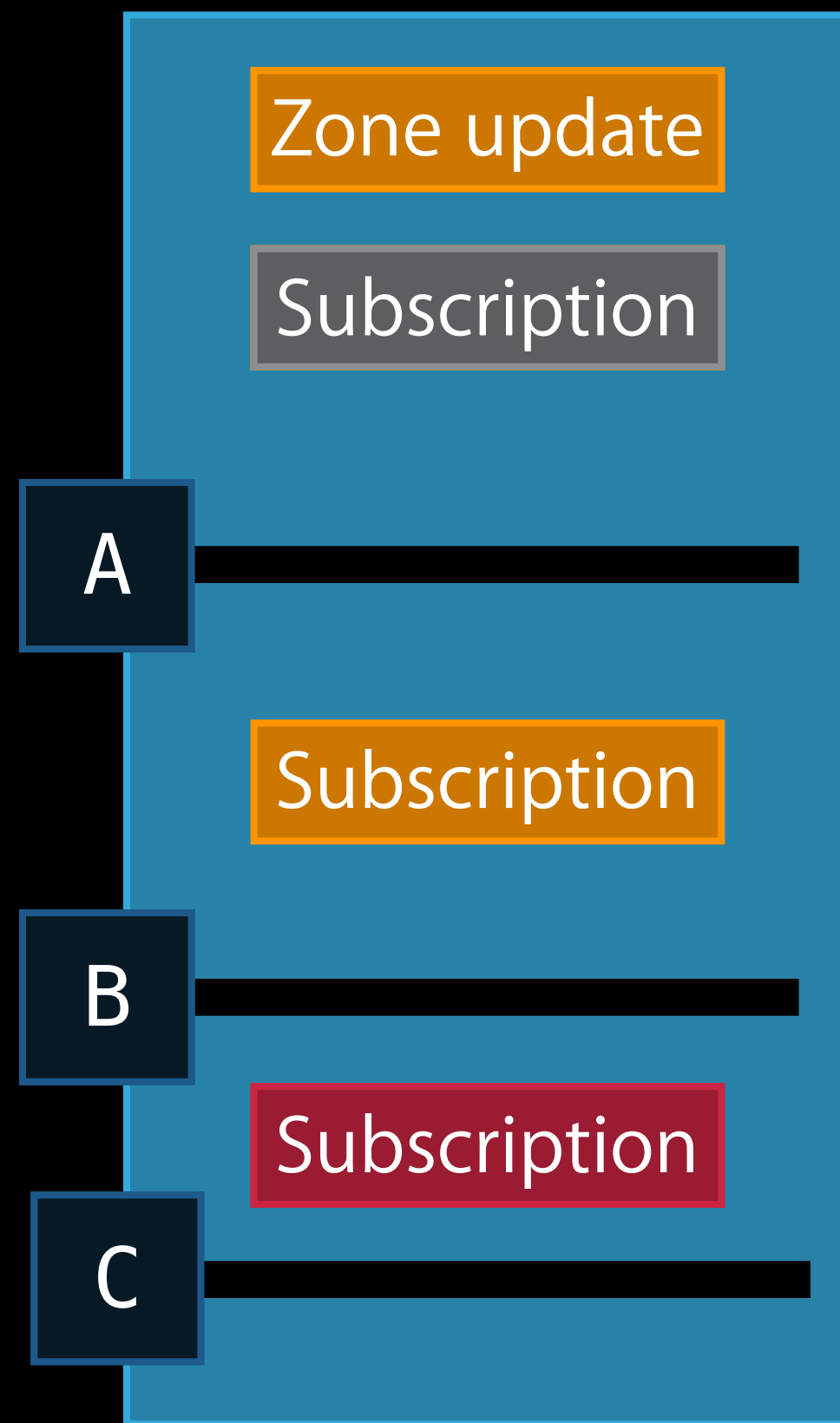
Mark read



Notification Collection



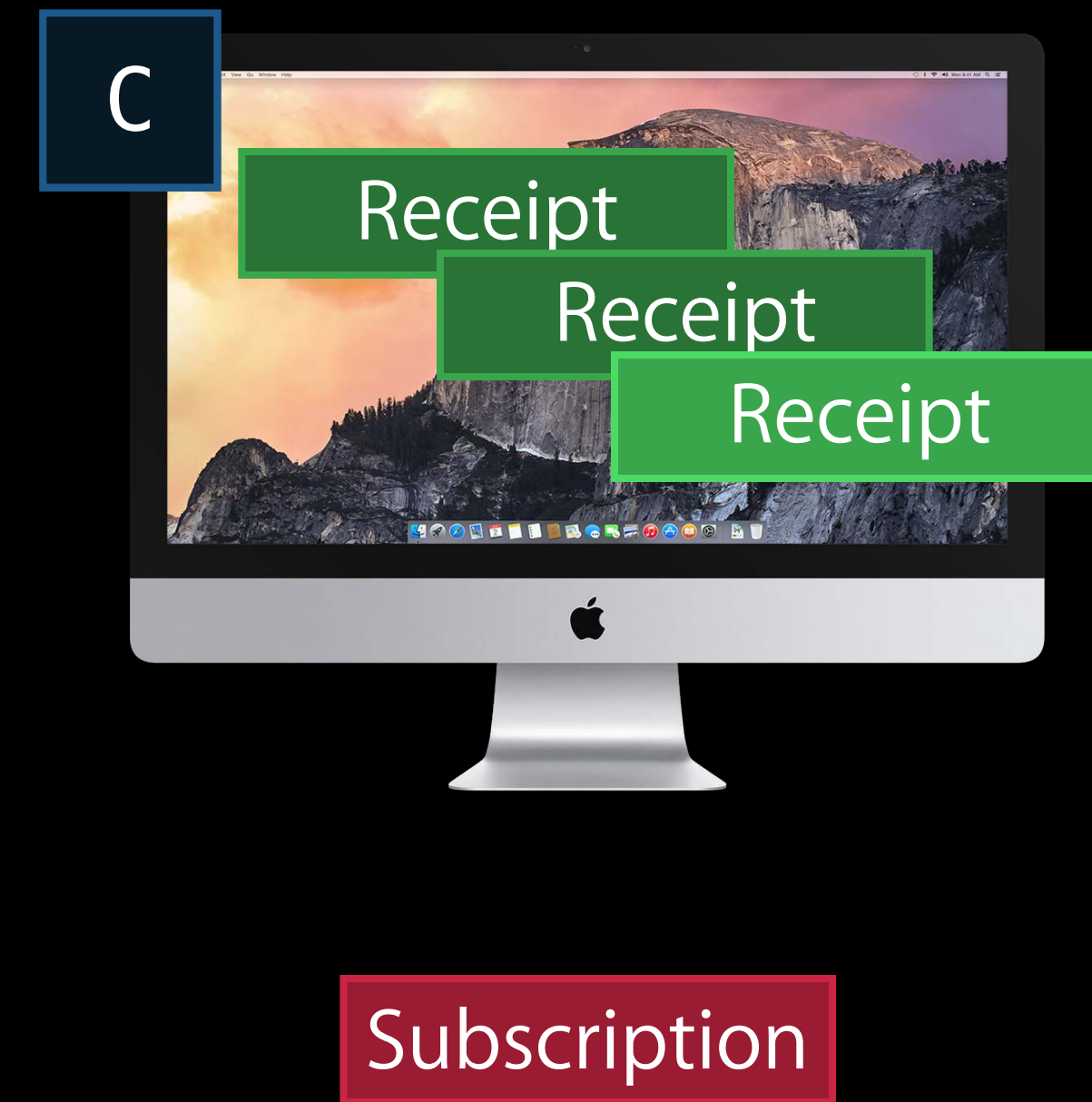
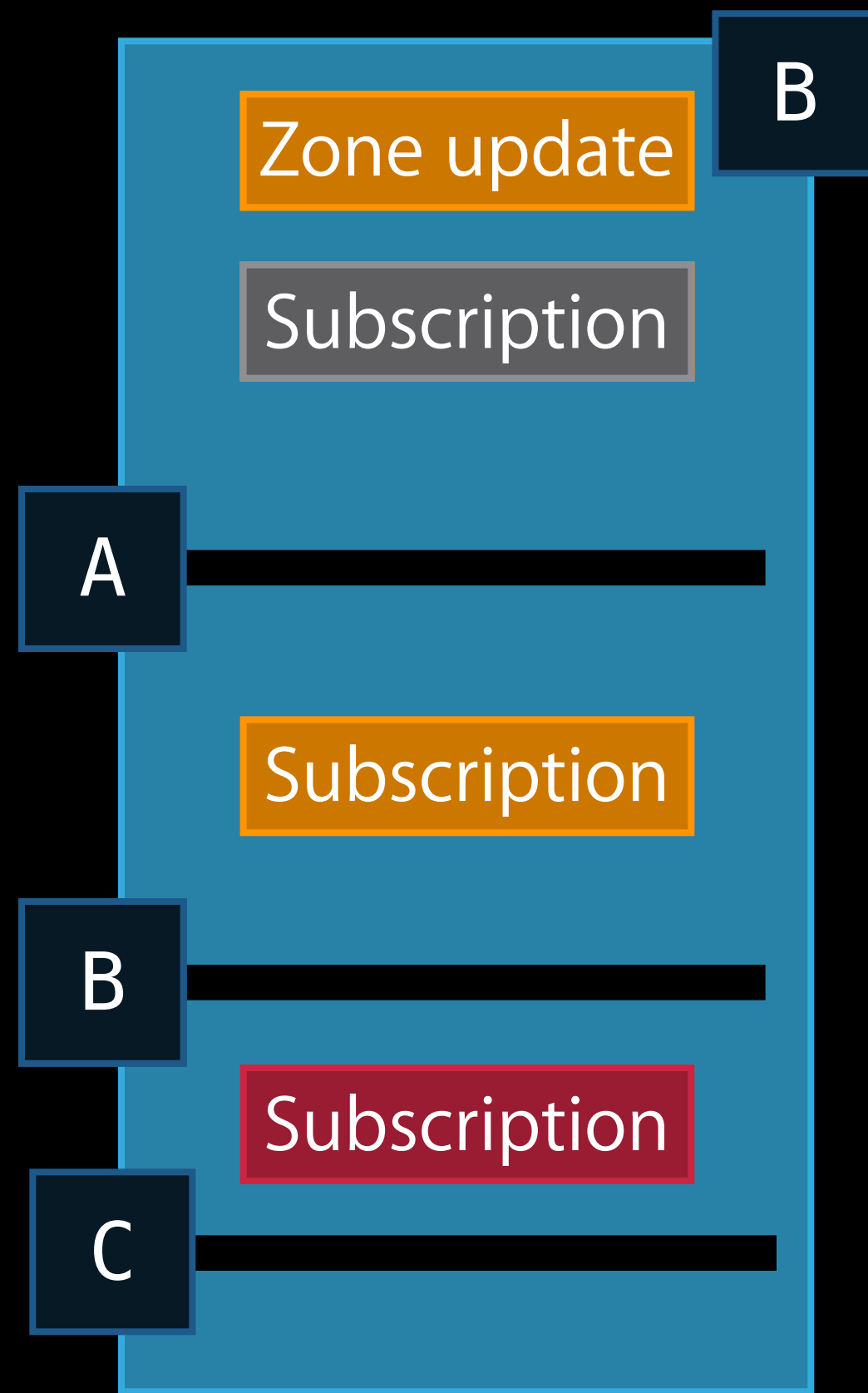
Notification Collection



Notification Collection



Notification Collection



Dropped Notifications

It's not just for airplane mode!

Dropped Notifications

It's not just for airplane mode!

Always check the notification collection

Dropped Notifications

It's not just for airplane mode!

Always check the notification collection

Rapid pushes can cause coalescing

Dropped Notifications

It's not just for airplane mode!

Always check the notification collection

Rapid pushes can cause coalescing

Bad network conditions are common

iCloud Dashboard

Managing your cloud data

iCloud Dashboard

Overview

iCloud Dashboard

Overview

[View data](#)

iCloud Dashboard

Overview

View data

Manage schema

iCloud Dashboard

Overview

View data

Manage schema

Control indexing

iCloud Dashboard

Overview

View data

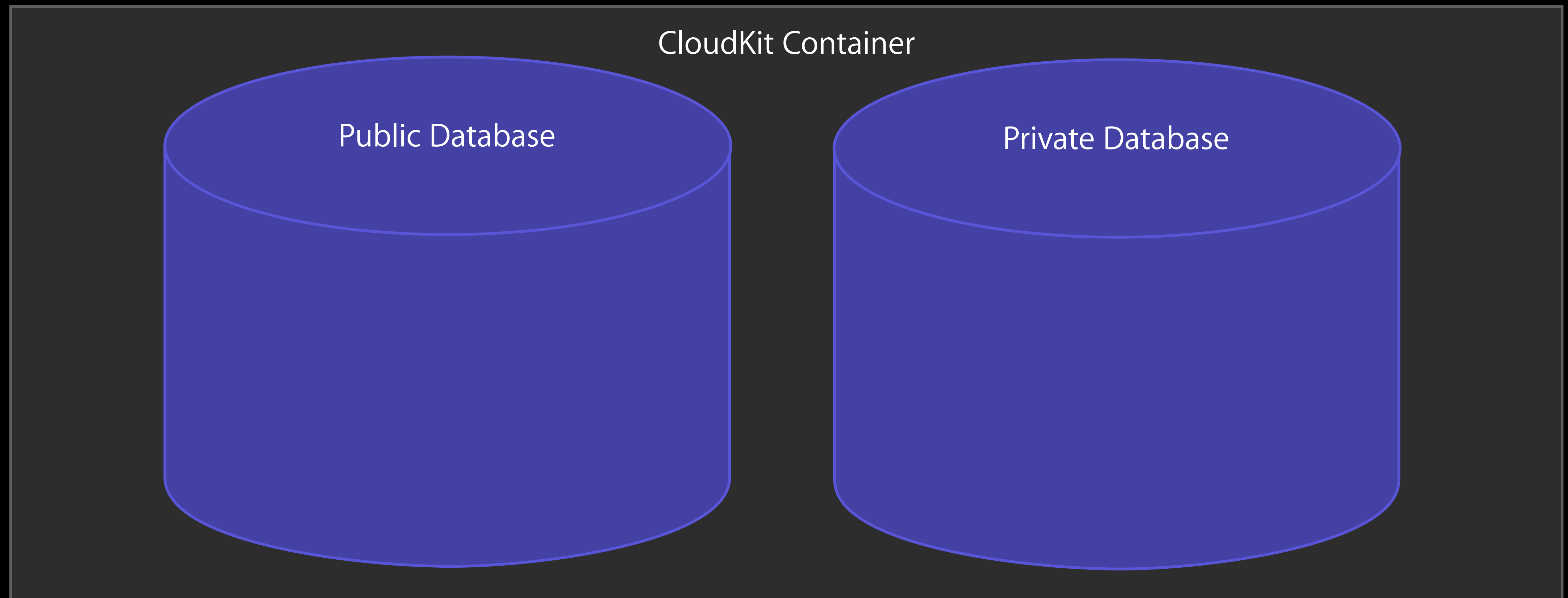
Manage schema

Control indexing

Move to production

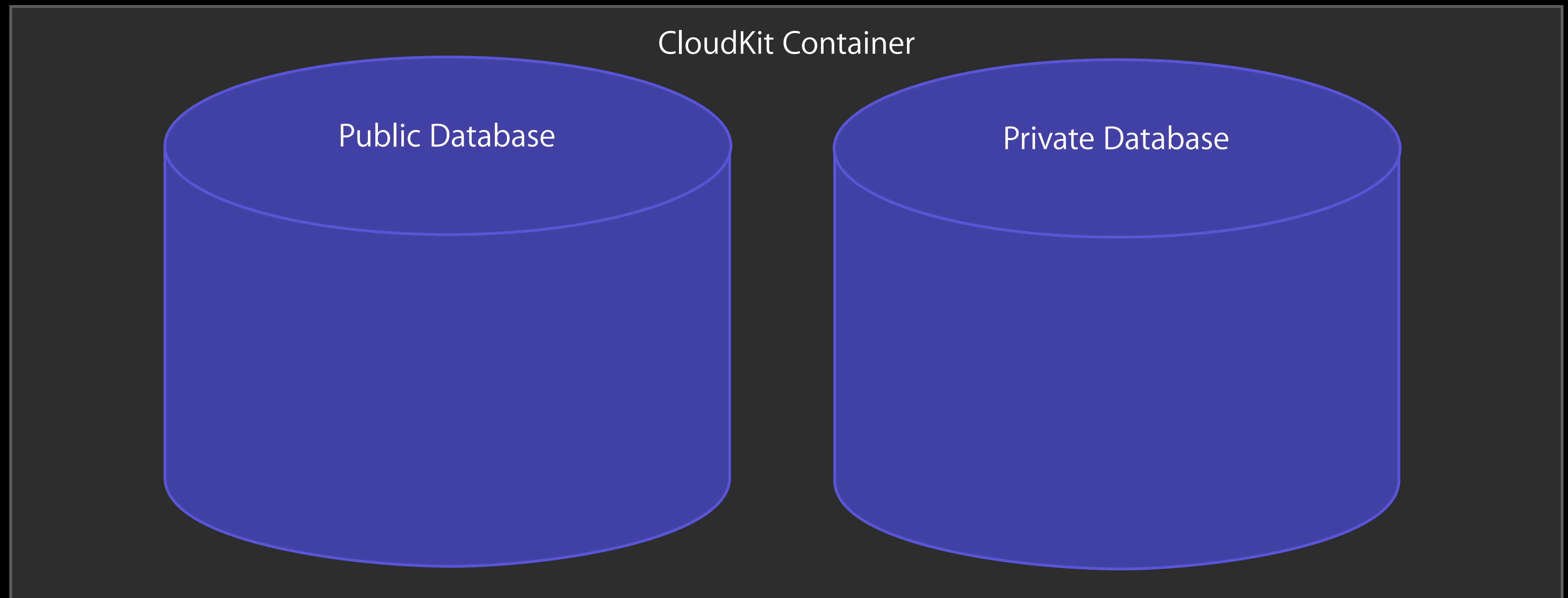
Viewing Data

What can you see?



Viewing Data

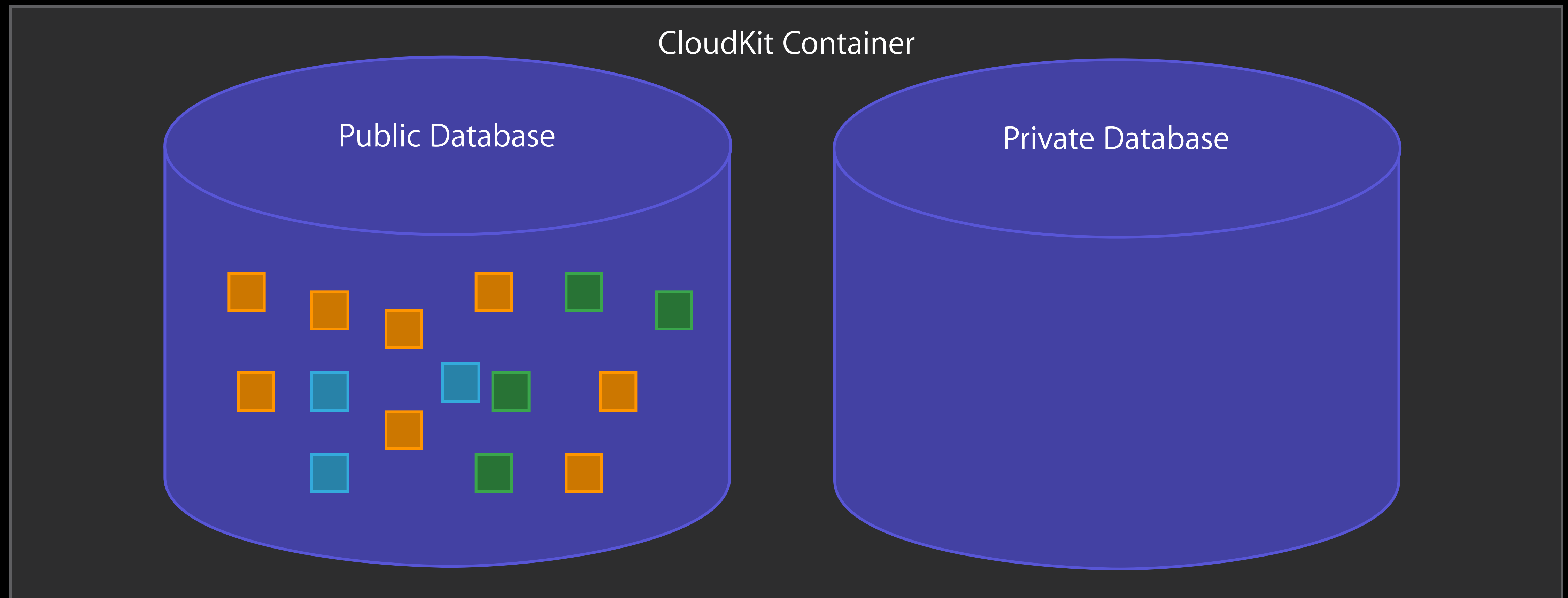
What can you see?



Everything is visible

Viewing Data

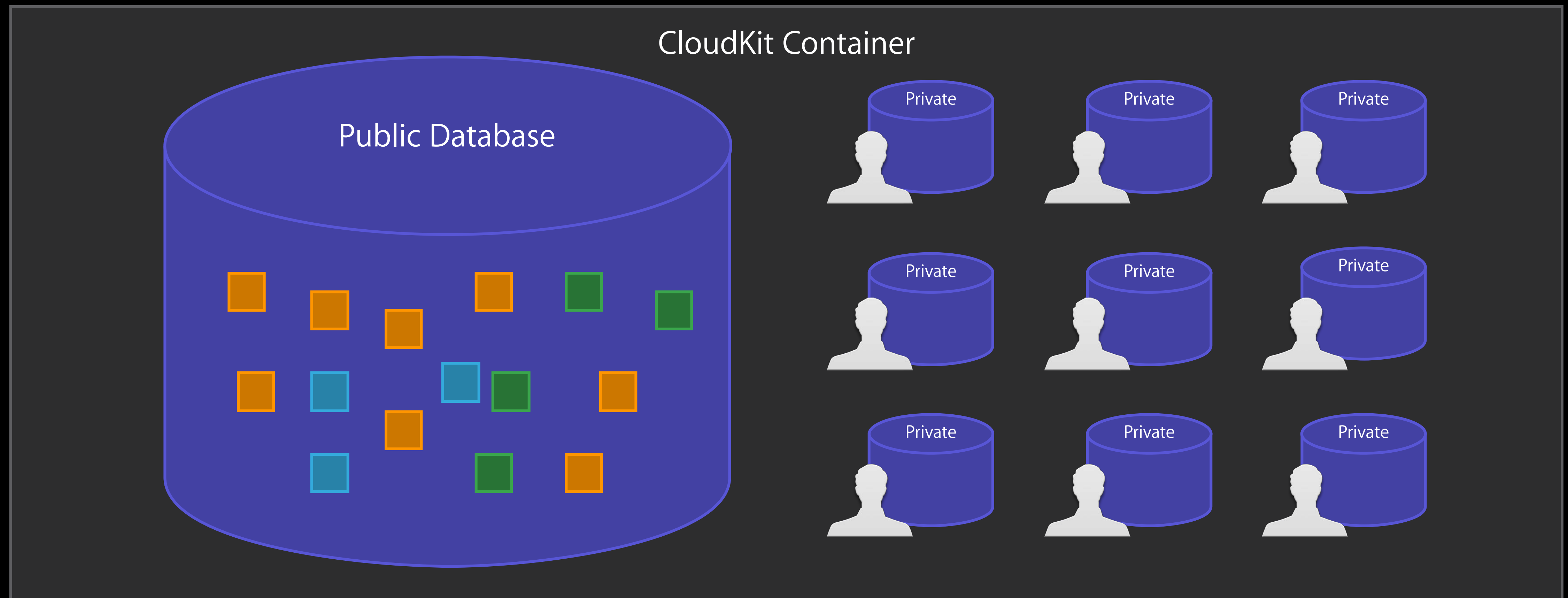
What can you see?



Everything is visible

Viewing Data

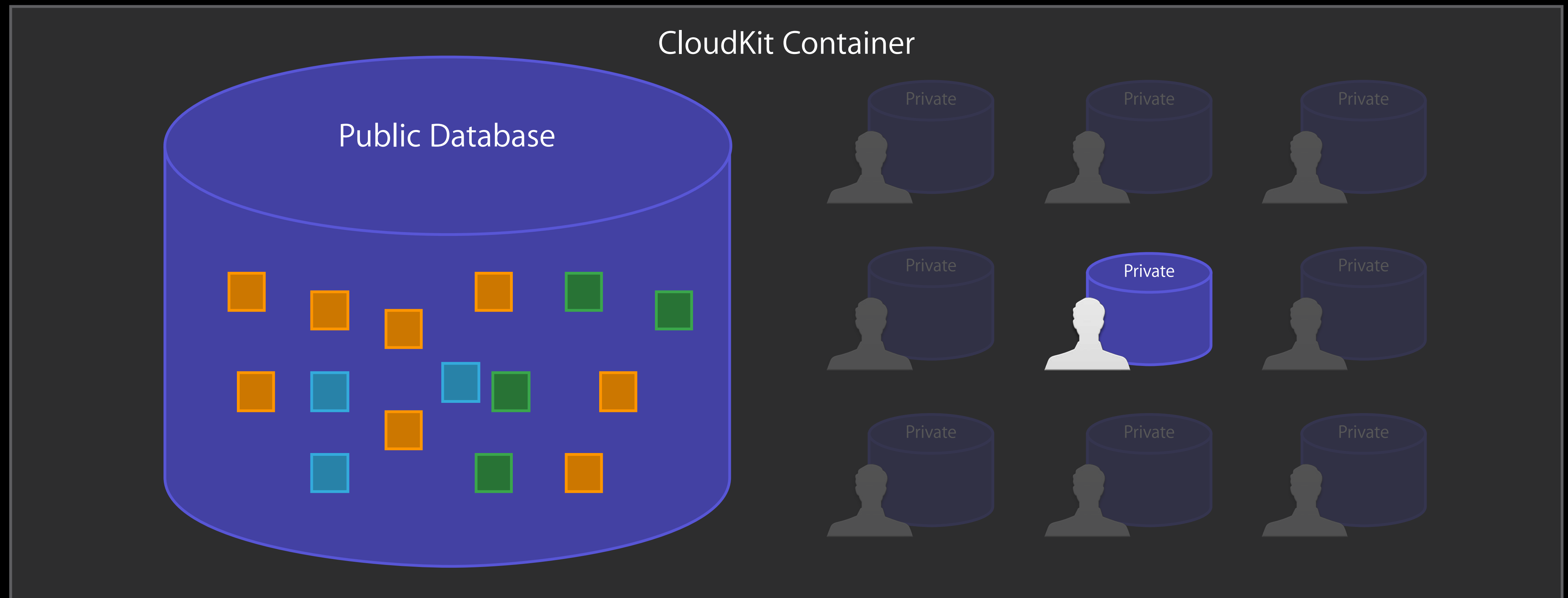
What can you see?



Everything is visible

Viewing Data

What can you see?



Everything is visible

Only your account is visible

 Developer

farkas@apple.com

.....

Register

Sign In

[Forgot ID or Password?](#)

SCHEMA

Sort by Name ▾

Record Types

CheckIns

1 Record

Security Roles

Parties

4 Records

Subscription Types

PUBLIC DATA

User Records

PhotoReps

5 Records

Default Zone

Photos

1 Record

PRIVATE DATA

Default Zone
For farkas@apple.com

Users

3 Records

ADMIN

Team

Parties

Created:

May 27 2014 02:03 PM

Modified:

May 27 2014 06:01 PM

Security:

Roles ▾

Attribute Name

Attribute Type

location

Location

name

String

radius

Double

description

String

date

String

[Add Attribute...](#)

SCHEMA

Sort by Name ▾

Record Types

CheckIns

1 Record

Security Roles

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Subscription Types

PUBLIC DATA

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PhotoReps

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Default Zone

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Created:

May 27 2014 02:03 PM

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Roles ▾

Attribute Name

Attribute Type

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[Add Attribute...](#)

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Team

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May 27 2014 02:03 PM

Modified:

May 27 2014 06:01 PM

Security:

Roles ▾

Attribute Name

Attribute Type

location

Location

name

String

radius

Double

description

String

date

String



[Add Attribute...](#)

SCHEMA

Sort by Name ▾

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1 Record

Security Roles

Parties

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PUBLIC DATA

User Records

PhotoReps

5 Records

Default Zone

Photos

1 Record

PRIVATE DATA

Default Zone
For farkas@apple.com

Users

3 Records

ADMIN

Team

Parties

Created:	Modified:	Security:
May 27 2014 02:03 PM	May 27 2014 06:01 PM	Roles ▾

Attribute Name	Attribute Type
----------------	----------------

Location

String

Double

description

String

date

String

[Add Attribute...](#)

Delete "date"?

Deleting this attribute will permanently remove it from this record type and associated records. Do you still want to remove it?

[Cancel](#) | [Delete](#)

SCHEMA

Sort by Name ▾

Record Types

CheckIns

1 Record

Security Roles

Parties

4 Records

Subscription Types

PUBLIC DATA

User Records

PhotoReps

5 Records

Default Zone

Photos

1 Record

PRIVATE DATA

Default Zone
For farkas@apple.com

Users

3 Records

ADMIN

Team

Parties

Created:

May 27 2014 02:03 PM

Modified:

May 27 2014 06:01 PM

Security:

Roles ▾

Attribute Name

Attribute Type

location

Location

name

String

radius

Double

description

String

[Add Attribute...](#)



SCHEMA

Sort by name ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Malia's Party

607a84ba-e618-42bc-8a59-981ee62752da

Gerard's Party

9d1f8f43-18f8-441d-aa85-9dcd0eaa0ae2

Jacob's Party

b704a5bd-70f2-4516-bda3-8117084ec56f

Jordan's Party

080549d4-c753-4602-a8f9-7c7a13d16f48

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

Malia's Party

ID: 607a84ba-e618-42bc-8a59-981ee62752da

Created:
May 27 2014 06:14 PM

Modified:
May 27 2014 06:15 PM

location	<input type="text" value="34.95289"/>	<input type="text" value="-120.435699"/>	Location
name	<input type="text" value="Malia's Party"/>		String
radius	<input type="text" value="10000"/>		Double
description	<input type="text" value="🍷🍷🍷🍷"/>		String



SCHEMA

Sort by name ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Malia's Party

607a84ba-e618-42bc-8a59-981ee62752da

Gerard's Party

9d1f8f43-18f8-441d-aa85-9dcd0eaa0ae2

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Jordan's Party

080549d4-c753-4602-a8f9-7c7a13d16f48

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

Malia's Party

ID: 607a84ba-e618-42bc-8a59-981ee62752da

Created:
May 27 2014 06:14 PM

Modified:
May 27 2014 06:15 PM

location	<input type="text" value="34.95289"/>	<input type="text" value="-120.435699"/>	Location
name	<input type="text" value="Malia's Party"/>		String
radius	<input type="text" value="10000"/>		Double
description	<input type="text" value="🍷🍷🍷🍷"/>		String



SCHEMA

Sort by name

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

No Name

657328b1-fa46-4189-ba95-eb4a56a5fe91

Malia's Party

607a84ba-e618-42bc-8a59-981ee62752da

Gerard's Party

9d1f8f43-18f8-441d-aa85-9dcd0eaa0ae2

Jacob's Party

b704a5bd-70f2-4516-bda3-8117084ec56f

Jordan's Party

080549d4-c753-4602-a8f9-7c7a13d16f48

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

No Name

ID: 657328b1-fa46-4189-ba95-eb4a56a5fe91

Created:

Modified:

-

-

location

Latitude

Longitude

Location

name

String

radius

Double

description

String



SCHEMA

Sort by name

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

No Name

657328b1-fa46-4189-ba95-eb4a56a5fe91

Malia's Party

607a84ba-e618-42bc-8a59-981ee62752da

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Jacob's Party

b704a5bd-70f2-4516-bda3-8117084ec56f

Jordan's Party

080549d4-c753-4602-a8f9-7c7a13d16f48

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

No Name

ID: 657328b1-fa46-4189-ba95-eb4a56a5fe91

Created:

-

Modified:

-

location

Longitude

Location

name

String

radius

Double

description

String



SCHEMA

Sort by name

Record Types

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PUBLIC DATA

User Records

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PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

No Name

657328b1-fa46-4189-ba95-eb4a56a5fe91

Malia's Party

607a84ba-e618-42bc-8a59-981ee62752da

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080549d4-c753-4602-a8f9-7c7a13d16f48

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

No Name

ID: 657328b1-fa46-4189-ba95-eb4a56a5fe91

Created:

-

Modified:

-

location

37.782394

-122.407707

Location

name

String

radius

Double

description

String



SCHEMA

Sort by name

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

No Name

657328b1-fa46-4189-ba95-eb4a56a5fe91

Malia's Party

607a84ba-e618-42bc-8a59-981ee62752da

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080549d4-c753-4602-a8f9-7c7a13d16f48

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

No Name

ID: 657328b1-fa46-4189-ba95-eb4a56a5fe91

Created:

Modified:

-

-

location

37.782394

-122.407707

Location

name

Friday Coffee

String

radius

Double

description

String



SCHEMA

Sort by name

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

No Name

657328b1-fa46-4189-ba95-eb4a56a5fe91

Malia's Party

607a84ba-e618-42bc-8a59-981ee62752da

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080549d4-c753-4602-a8f9-7c7a13d16f48

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

No Name

ID: 657328b1-fa46-4189-ba95-eb4a56a5fe91

Created:

-

Modified:

-

location

37.782394

-122.407707

Location

name

Friday Coffee

String

radius

100

Double

description

String



SCHEMA

Sort by name

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

No Name

657328b1-fa46-4189-ba95-eb4a56a5fe91

Malia's Party

607a84ba-e618-42bc-8a59-981ee62752da

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080549d4-c753-4602-a8f9-7c7a13d16f48

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

No Name

ID: 657328b1-fa46-4189-ba95-eb4a56a5fe91

Created:

Modified:

-

-

location

37.782394

-122.407707

Location

name

Friday Coffee

String

radius

100

Double

description

Grab a coffee on the last day of WWDC

String



SCHEMA

Sort by name ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

No Name

657328b1-fa46-4189-ba95-eb4a56a5fe91

Malia's Party

607a84ba-e618-42bc-8a59-981ee62752da

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Jordan's Party

080549d4-c753-4602-a8f9-7c7a13d16f48

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

No Name

ID: 657328b1-fa46-4189-ba95-eb4a56a5fe91

Created:

-

Modified:

-

location	<input type="text" value="37.782394"/>	<input type="text" value="-122.407707"/>	Location
name	<input type="text" value="Friday Coffee"/>		String
radius	<input type="text" value="100"/>		Double
description	<input type="text" value="Grab a coffee on the last day of WWDC"/>		String



SCHEMA

Sort by name ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Friday Coffee

657328b1-fa46-4189-ba95-eb4a56a5fe91

Malia's Party

607a84ba-e618-42bc-8a59-981ee62752da

Gerard's Party

9d1f8f43-18f8-441d-aa85-9dcd0eaa0ae2

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Jordan's Party

080549d4-c753-4602-a8f9-7c7a13d16f48

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

Friday Coffee

ID: 657328b1-fa46-4189-ba95-eb4a56a5fe91

Created:
May 27 2014 06:22 PM

Modified:
May 27 2014 06:22 PM

location	<input type="text" value="37.782394"/>	<input type="text" value="-122.407707"/>	Location
name	<input type="text" value="Friday Coffee"/>		String
radius	<input type="text" value="100"/>		Double
description	<input type="text" value="Grab a coffee on the last day of WWDC"/>		String



SCHEMA

Sort by name ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Friday Coffee

657328b1-fa46-4189-ba95-eb4a56a5fe91

Malia's Party

607a84ba-e618-42bc-8a59-981ee62752da

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b30c40bf-df34-4f20-9889-65d6ddd78c95

Friday Coffee

ID: 657328b1-fa46-4189-ba95-eb4a56a5fe91

Created:
May 27 2014 06:22 PM

Modified:
May 27 2014 06:22 PM

location	<input type="text" value="37.782394"/>	<input type="text" value="-122.407707"/>	Location
name	<input type="text" value="Friday Coffee"/>		String
radius	<input type="text" value="100"/>		Double
description	<input type="text" value="Grab a coffee on the last day of WWDC"/>		String

SCHEMA

- Record Types
- Security Roles
- Subscription Types

PUBLIC DATA

- User Records
- Default Zone

PRIVATE DATA

- Default Zone
For farkas@apple.com

ADMIN

- Team

Sort by name

- Friday Coffee**
657328b1-fa46-4189-ba95-eb4a56a5fe91
- Malia's Party**
607a84ba-e618-42bc-8a59-981ee62752da
- Gerard's Party**
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- Jordan's Party**
080549d4-c753-4602-a8f9-7c7a13d16f48
- Julie's Party**
b30c40bf-df34-4f20-9889-65d6ddd78c95

Friday Coffee

ID: 657328b1-fa46-4189-ba95-eb4a56a5fe91

Created: May 27 2014 06:22 PM

Modified: May 27 2014 06:22 PM

location	<input type="text" value="37.782394"/>	<input type="text" value="-122.407707"/>	Location
name	<input type="text" value="Friday Coffee"/>		String
radius	<input type="text" value="100"/>		Double
description	<input type="text" value="Grab a coffee on the last day of WWDC"/>		String

SCHEMA

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Searching Parties for "WWDC"

Sort by name

Friday Coffee

657328b1-fa46-4189-ba95-eb4a56a5fe91

Jacob's Party

b704a5bd-70f2-4516-bda3-8117084ec56f

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

Julie's Party

ID: b30c40bf-df34-4f20-9889-65d6ddd78c95

Created:
May 27 2014 05:32 PM

Modified:
May 27 2014 06:13 PM

location	<input type="text" value="61.003886"/>	<input type="text" value="-149.672372"/>	Location
name	<input type="text" value="Julie's Party"/>		String
radius	<input type="text" value="10"/>		Double
description	<input type="text" value="WWDC party in Alaska!"/>		String

SCHEMA

- Record Types
- Security Roles
- Subscription Types

PUBLIC DATA

- User Records
- Default Zone

PRIVATE DATA

- Default Zone
For farkas@apple.com

ADMIN

- Team

Searching Parties for "WWDC"

Created By =

Sort by name

Friday Coffee
657328b1-fa46-4189-ba95-eb4a56a5fe91

Jacob's Party
b704a5bd-70f2-4516-bda3-8117084ec56f

Julie's Party
b30c40bf-df34-4f20-9889-65d6ddd78c95

Julie's Party

ID: b30c40bf-df34-4f20-9889-65d6ddd78c95

Created:	Modified:
May 27 2014 05:32 PM	May 27 2014 06:13 PM

location	<input type="text" value="61.003886"/>	<input type="text" value="-149.672372"/>	Location
name	<input type="text" value="Julie's Party"/>		String
radius	<input type="text" value="10"/>		Double
description	<input type="text" value="WWDC party in Alaska!"/>		String

SCHEMA

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Searching Parties for "WWDC"

- Created By
- Date Created
- Date Modified
- Record ID
- Text Search
- location
- name
- radius
- description

Sort by name

Julie's Party

ID: b30c40bf-df34-4f20-9889-65d6ddd78c95

Created:
May 27 2014 05:32 PM

Modified:
May 27 2014 06:13 PM

location	61.003886	-149.672372	Location
name	Julie's Party		String
radius	10		Double
description	WWDC party in Alaska!		String

SCHEMA

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Searching Parties for "WWDC"

location is

Latitude Longitude

Sort by name ▾

Friday Coffee

657328b1-fa46-4189-ba95-eb4a56a5fe91

Jacob's Party

b704a5bd-70f2-4516-bda3-8117084ec56f

Julie's Party

b30c40bf-df34-4f20-9889-65d6ddd78c95

ID: b30c40bf-df34-4f20-9889-65d6ddd78c95

Created: May 27 2014 05:32 PM

Modified: May 27 2014 06:13 PM

location	61.003886 -149.672372	Location
name	Julie's Party	String
radius	10	Double
description	WWDC party in Alaska!	String

- Record Types
- Security Roles
- Subscription Types

User Records

Default Zone

Default Zone
For farkas@apple.com

Team

Searching Parties for "WWDC"

location is

Latitude is not

is within

Sort by name

Friday Coffee
657328b1-fa46-4189-ba95-eb4a56a5fe91

Jacob's Party
b704a5bd-70f2-4516-bda3-8117084ec56f

Julie's Party
b30c40bf-df34-4f20-9889-65d6ddd78c95

Julie's Party

ID: b30c40bf-df34-4f20-9889-65d6ddd78c95

Created: May 27 2014 05:32 PM Modified: May 27 2014 06:13 PM

location	<input type="text" value="61.003886"/>	<input type="text" value="-149.672372"/>	Location
name	<input type="text" value="Julie's Party"/>		String
radius	<input type="text" value="10"/>		Double
description	<input type="text" value="WWDC party in Alaska!"/>		String

- Record Types
- Security Roles
- Subscription Types

User Records

Default Zone

Default Zone
For farkas@apple.com

Team

Searching Parties for "WWDC"

location is within 5 km
 of Latitude Longitude

Sort by name

Friday Coffee
657328b1-fa46-4189-ba95-eb4a56a5fe91

Jacob's Party
b704a5bd-70f2-4516-bda3-8117084ec56f

Julie's Party
b30c40bf-df34-4f20-9889-65d6ddd78c95

Julie's Party

ID: b30c40bf-df34-4f20-9889-65d6ddd78c95

Created: May 27 2014 05:32 PM Modified: May 27 2014 06:13 PM

location	61.003886 -149.672372	Location
name	Julie's Party	String
radius	10	Double
description	WWDC party in Alaska!	String

SCHEMA

- Record Types
- Security Roles
- Subscription Types

PUBLIC DATA

- User Records
- Default Zone

PRIVATE DATA

- Default Zone
For farkas@apple.com

ADMIN

- Team

Searching Parties for "WWDC"

location is within 5 km of 37.3829224 Longitude

Sort by name

Friday Coffee
657328b1-fa46-4189-ba95-eb4a56a5fe91

Jacob's Party
b704a5bd-70f2-4516-bda3-8117084ec56f

Julie's Party
b30c40bf-df34-4f20-9889-65d6ddd78c95

Julie's Party

ID: b30c40bf-df34-4f20-9889-65d6ddd78c95

Created: May 27 2014 05:32 PM Modified: May 27 2014 06:13 PM

location	61.003886 -149.672372	Location
name	Julie's Party	String
radius	10	Double
description	WWDC party in Alaska!	String

SCHEMA

- Record Types
- Security Roles
- Subscription Types

PUBLIC DATA

- User Records
- Default Zone

PRIVATE DATA

- Default Zone
For farkas@apple.com

ADMIN

- Team

Searching Parties for "WWDC"

location is within 5 km

of 37.3829224 -122.4045278

Sort by name

Friday Coffee
657328b1-fa46-4189-ba95-eb4a56a5fe91

Jacob's Party
b704a5bd-70f2-4516-bda3-8117084ec56f

Jacob's Party

ID: b704a5bd-70f2-4516-bda3-8117084ec56f

Created:
May 27 2014 05:29 PM

Modified:
May 27 2014 05:55 PM

location	37.7829224	-122.4045278	Location
name	Jacob's Party		String
radius	1000		Double
description	Immediately following the WWDC beer bash		String

SCHEMA

Sort by Name ▾

📁 Record Types

📌 Security Roles

📄 Subscription Types

PUBLIC DATA

👤 User Records

📄 Default Zone

PRIVATE DATA

🔒 Default Zone
For farkas@apple.com

ADMIN

👥 Team



“Party” has no Roles

[Add Role](#)



SCHEMA

Sort by Name ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team



“Party” has no Roles

[Add Role](#)



SCHEMA

Sort by Name ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

NewRole

NewRole

Record Type

Permissions

Add Record Type...

SCHEMA

Sort by Name ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

PartyAdmin

PartyAdmin

Record Type

Permissions

Add Record Type...

SCHEMA

Sort by Name ▾

📁 Record Types

📌 Security Roles

📄 Subscription Types

PUBLIC DATA

👤 User Records

📄 Default Zone

PRIVATE DATA

🔒 Default Zone
For farkas@apple.com

ADMIN

👥 Team

PartyAdmin

PartyAdmin

Record Type

Permissions

[Add Record Type...](#)

SCHEMA

Sort by Name ▾

Record Types

PartyAdmin

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

PartyAdmin

Record Type

Permissions

CheckIns

- Create
- Read
- Write

[Add Record Type...](#)

SCHEMA

Sort by Name ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

PartyAdmin

PartyAdmin

Record Type

Permissions

✓ CheckIns

Parties

PhotoReps

Photos

Users

Create

Read

Write

SCHEMA

Sort by Name ▾

Record Types

PartyAdmin

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

PartyAdmin

Record Type

Permissions

Parties

- Create
- Read
- Write

[Add Record Type...](#)

SCHEMA

Sort by Name ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

PartyAdmin

PartyAdmin

Record Type

Permissions

Parties

Create

Read

Write

[Add Record Type...](#)

SCHEMA

Sort by Name ▾

Record Types

PartyAdmin

PartyAdmin

Security Roles

Record Type

Permissions

Subscription Types

Parties

Create

PUBLIC DATA

User Records

Read

Default Zone

Write

PRIVATE DATA

Default Zone
For farkas@apple.com

[Add Record Type...](#)

ADMIN

Team

SCHEMA

Sort by Name ▾

📁 Record Types

PartyAdmin

PartyAdmin

📌 Security Roles

📄 Subscription Types

PUBLIC DATA

👤 User Records

📄 Default Zone

PRIVATE DATA

🔒 Default Zone
For farkas@apple.com

ADMIN

👥 Team

Record Type

Permissions

Parties

- Create
- Read
- Write

[Add Record Type...](#)

SCHEMA

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Record Types

Sort by Name ▾

CheckIns

1 Record

Parties

6 Records

PhotoReps

5 Records

Photos

1 Record

Users

5 Records



Parties

Created: May 27 2014 02:03 PM	Modified: May 29 2014 08:56 PM	Security: Roles ▾
---	--	-----------------------------

Attribute Name	Attribute Type
location	Location
name	String
radius	Double
description	String

[Add Attribute...](#)

SCHEMA

Sort by Name ▾

Record Types

CheckIns

1 Record

Security Roles

Parties

6 Records

Subscription Types

PUBLIC DATA

User Records

PhotoReps

5 Records

Default Zone

Photos

1 Record

PRIVATE DATA

Default Zone
For farkas@apple.com

Users

5 Records

ADMIN

Team

Parties

Created:
May 27 2014 02:03 PM

Modified:
May 29 2014 08:59 PM

Security:
Roles ▾

Roles	Create	Read	Write
World	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Authenticated	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Creator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
PartyAdmin	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Attribute Name

location

name

radius

Double

description

String

[Add Attribute...](#)

SCHEMA

Sort by Name ▾

Record Types

CheckIns

1 Record

Security Roles

Parties

6 Records

Subscription Types

PUBLIC DATA

User Records

PhotoReps

5 Records

Default Zone

Photos

1 Record

PRIVATE DATA

Default Zone
For farkas@apple.com

Users

5 Records

ADMIN

Team

Parties

Created:
May 27 2014 02:03 PM

Modified:
May 29 2014 08:59 PM

Security:
Roles ▾

Roles	Create	Read	Write
World	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Authenticated	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Creator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
PartyAdmin	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Attribute Name

location

name

radius

Double

description

String

[Add Attribute...](#)

SCHEMA

Sort by Name ▾

Record Types

CheckIns

1 Record

Security Roles

Parties

6 Records

Subscription Types

PUBLIC DATA

User Records

PhotoReps

5 Records

Default Zone

Photos

1 Record

PRIVATE DATA

Default Zone
For farkas@apple.com

Users

5 Records

ADMIN

Team

Parties

Created:
May 27 2014 02:03 PM

Modified:
May 29 2014 08:59 PM

Security:
Roles ▾

Roles	Create	Read	Write
World	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Authenticated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Creator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
PartyAdmin	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Attribute Name

location

name

radius

Double

description

String

[Add Attribute...](#)

Party ▾

SCHEMA

- Record Types
- Security Roles
- Subscription Types

PUBLIC DATA

- User Records**
- Default Zone

PRIVATE DATA

- Default Zone
For farkas@apple.com

ADMIN

- Team

Environment: **DEVELOPMENT**

Record Types Sort by Name ▾

- CheckIns
1 Record
- Parties
6 Records**
- PhotoReps
5 Records
- Photos
1 Record
- Users
5 Records

Parties

Created: **May 27 2014 02:03 PM** Modified: **May 29 2014 08:59 PM** Security: **Roles ▾**

Roles	Create	Read	Write
World	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Authenticated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Creator	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
PartyAdmin	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Attribute Name	
location	
name	
radius	Double
description	String

[Add Attribute...](#)

Cancel | Save



SCHEMA

Sort by party_lastName ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Appleseed

_7ccff311708896ec2e828e2405f922f6

Bluth

_7dedae37dba22ab6550d55cbcad56292

Farkas

_e651147b522de6a77b597a88a6065b85

Lavagnino

_0ce19e7423ecdd6d1cde45a57e7c4fbc

Vikingstad

_738a7591b98626a2ebc9d7335aef7044

Appleseed

ID: _7ccff311708896ec2e828e2405f922f6

Created:

May 28 2014 01:00 AM

Modified:

May 29 2014 08:40 PM

Security:

Roles ▾

party_firstName

Johnny

String

party_lastName

Appleseed

String

profilePhoto

deleteSelf

Reference



SCHEMA

Sort by party_lastName ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Appleseed

_7ccff311708896ec2e828e2405f922f6

Bluth

_7dedae37dba22ab6550d55cbcad56292

Farkas

_e651147b522de6a77b597a88a6065b85

Lavagnino

_0ce19e7423ecdd6d1cde45a57e7c4fbc

Vikingstad

_738a7591b98626a2ebc9d7335aef7044

Farkas

ID: **_e651147b522de6a77b597a88a6065b85**

Created:

May 27 2014 04:18 PM

Modified:

May 29 2014 08:38 PM

Security:

Roles ▾

party_firstName

Jacob

String

party_lastName

Farkas

String

profilePhoto

deleteSelf

Reference



SCHEMA

Sort by party_lastName ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Appleseed

_7ccff311708896ec2e828e2405f922f6

Bluth

_7dedae37dba22ab6550d55cbcad56292

Farkas

_e651147b522de6a77b597a88a6065b85

Lavagnino

_0ce19e7423ecdd6d1cde45a57e7c4fbc

Vikingstad

_738a7591b98626a2ebc9d7335aef7044

Farkas

ID: **_e651147b522de6a77b597a88a6065b85**

Created:
May 27 2014 04:18 PM

Modified:
May 29 2014 08:38 PM

Security:
Roles ▾

Roles	Granted
PartyAdmin	<input type="checkbox"/>

party_firstName	<input type="text" value="Jacob"/>	
party_lastName	<input type="text" value="Farkas"/>	String
profilePhoto	<input type="text"/> <input type="checkbox"/> deleteSelf	Reference



SCHEMA

Sort by party_lastName ▾

Record Types

Security Roles

Subscription Types

PUBLIC DATA

User Records

Default Zone

PRIVATE DATA

Default Zone
For farkas@apple.com

ADMIN

Team

Appleseed

_7ccff311708896ec2e828e2405f922f6

Bluth

_7dedae37dba22ab6550d55cbcad56292

Farkas

_e651147b522de6a77b597a88a6065b85

Lavagnino

_0ce19e7423ecdd6d1cde45a57e7c4fbc

Vikingstad

_738a7591b98626a2ebc9d7335aef7044

Farkas

ID: **_e651147b522de6a77b597a88a6065b85**

Created:
May 27 2014 04:18 PM

Modified:
May 29 2014 08:38 PM

Security:
Roles ▾

Roles	Granted
PartyAdmin	<input checked="" type="checkbox"/>

party_firstName	<input type="text" value="Jacob"/>	
party_lastName	<input type="text" value="Farkas"/>	String
profilePhoto	<input type="text"/> <input type="checkbox"/> deleteSelf	Reference

Records in Development

Schema and indices



Records in Development

Schema and indices

Party



Party

Party Name="WWDC Bash"
Date=June 5th, 2014
Location=Yerba Buena Gardens

Records in Development

Schema and indices

Party

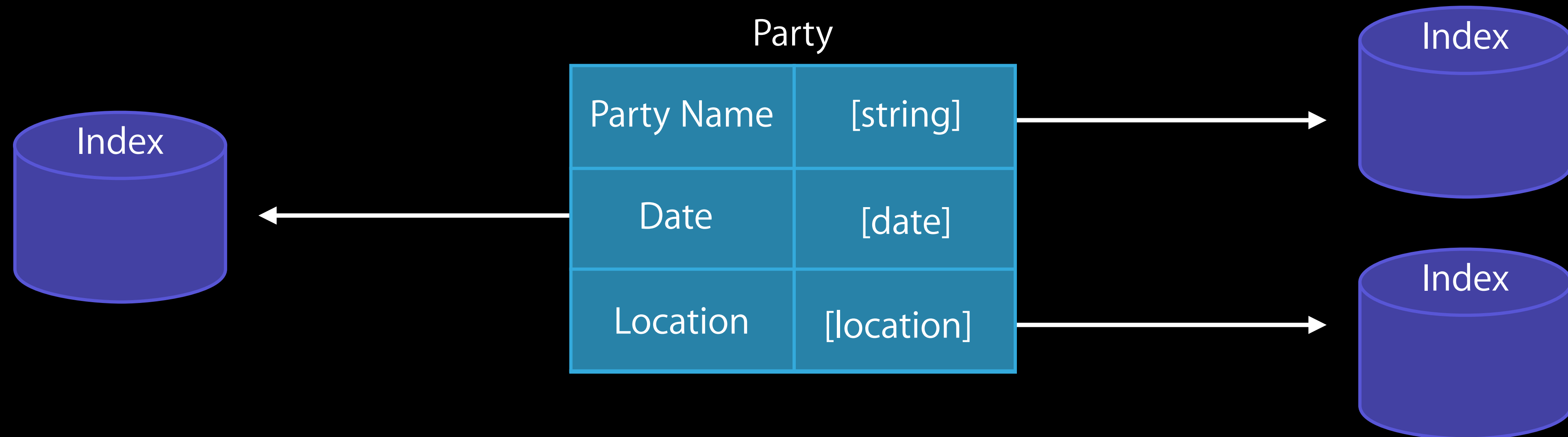


Party

Party Name="WWDC Bash"
Date=June 5th, 2014
Location=Yerba Buena Gardens

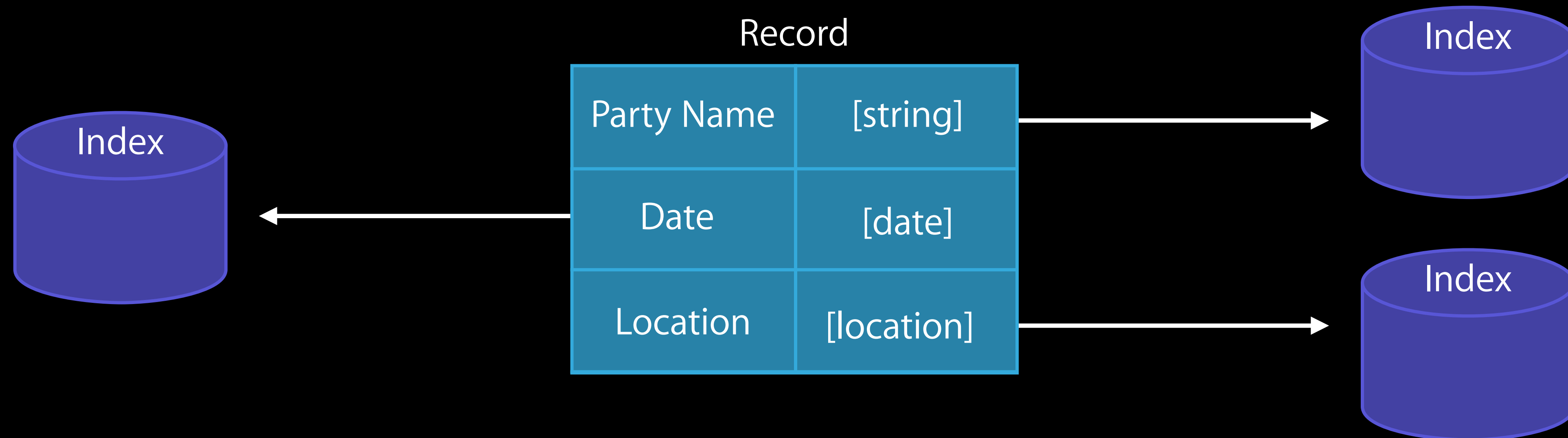
Records in Development

Schema and indices



Records in Development

Schema and indices

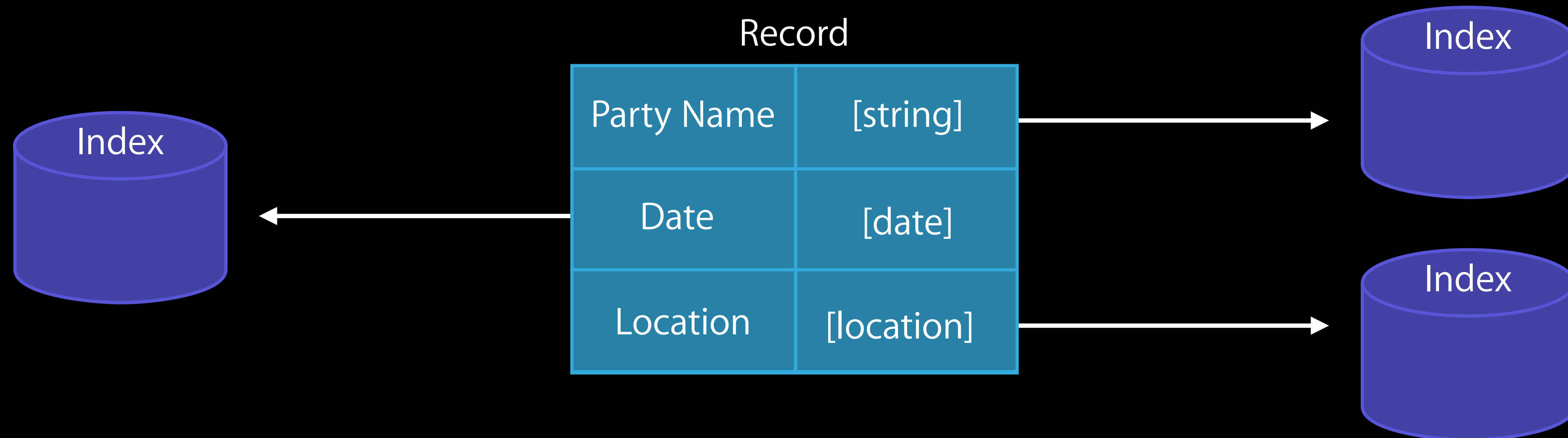


Party

Party Name="WWDC Bash"
Date=June 5th, 2014
Location=Yerba Buena Gardens
Background="Blue"

Records in Development

Schema and indices

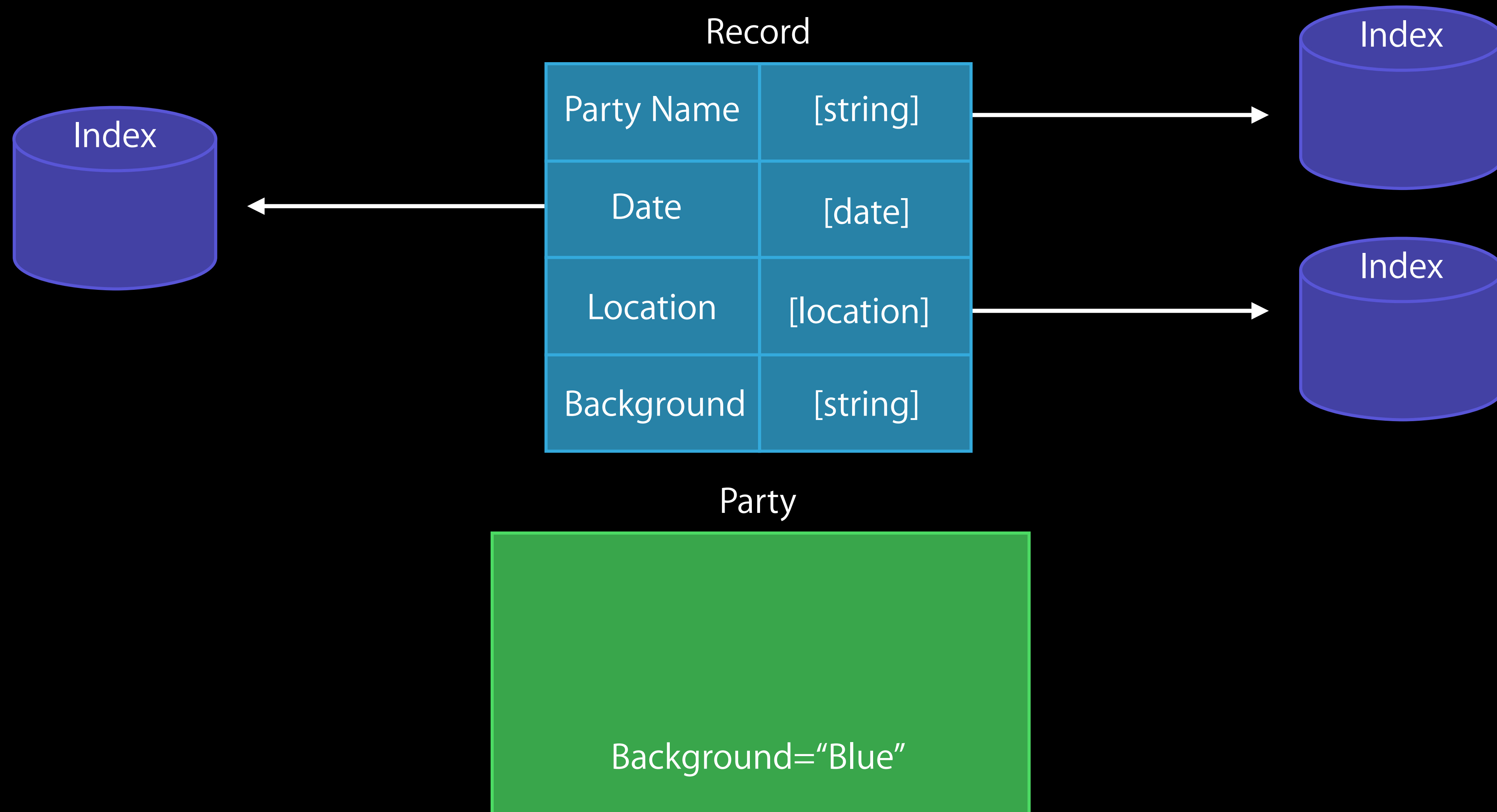


Party

Background="Blue"

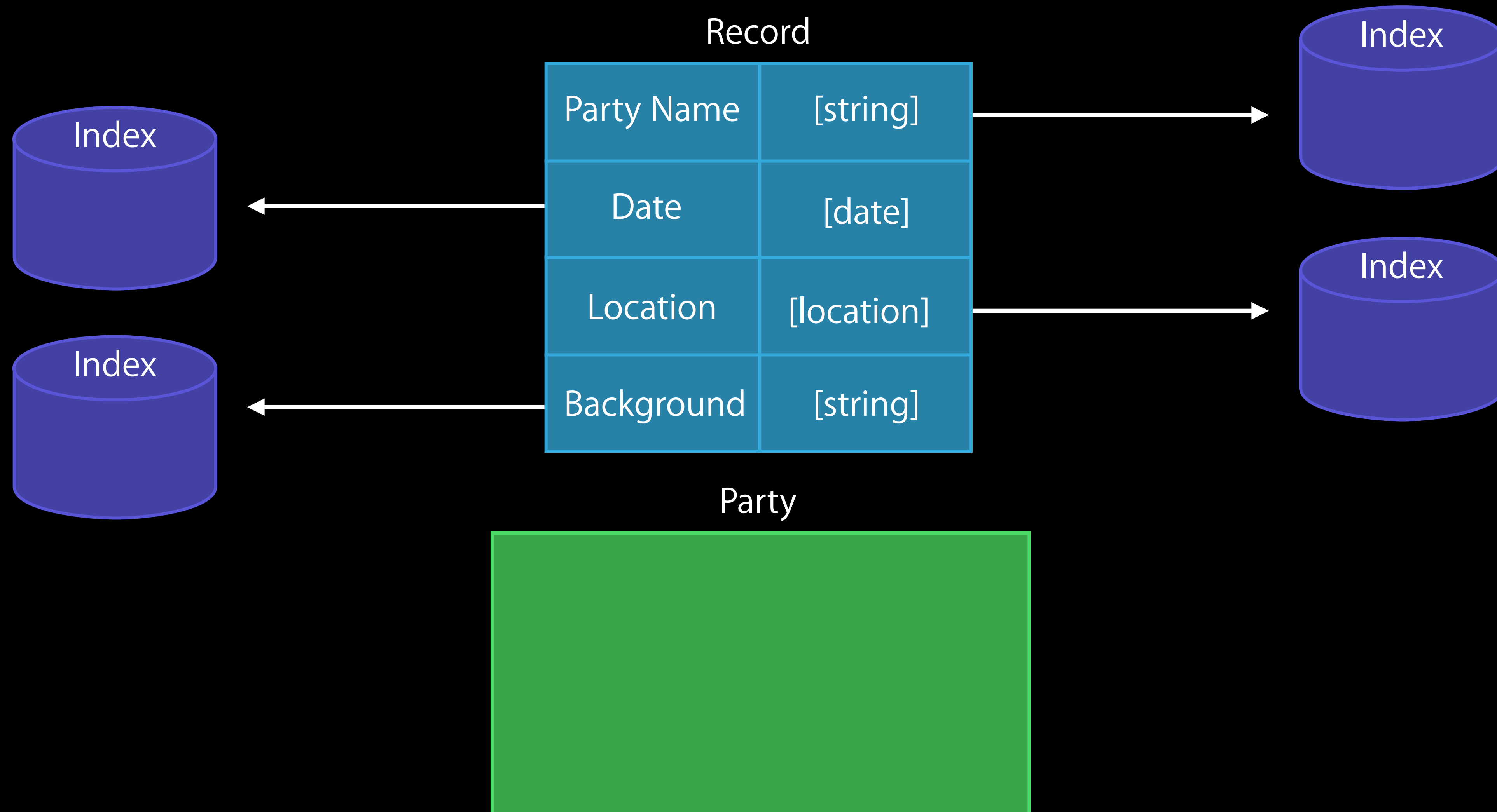
Records in Development

Schema and indices



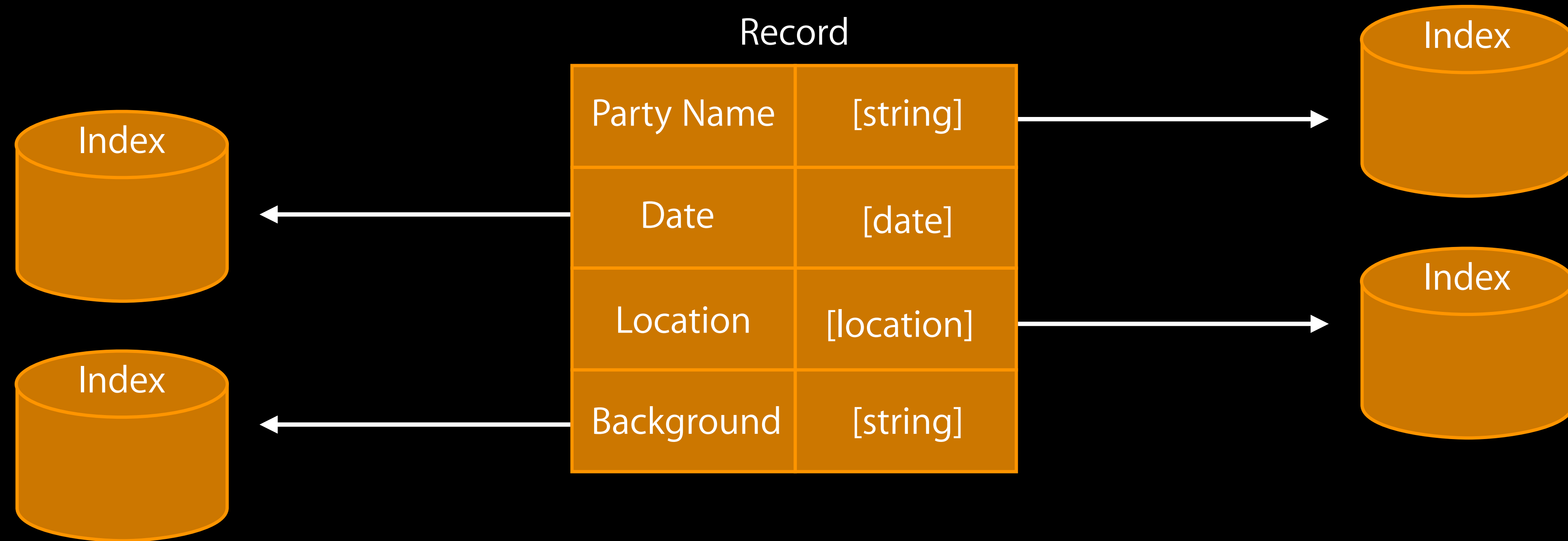
Records in Development

Schema and indices



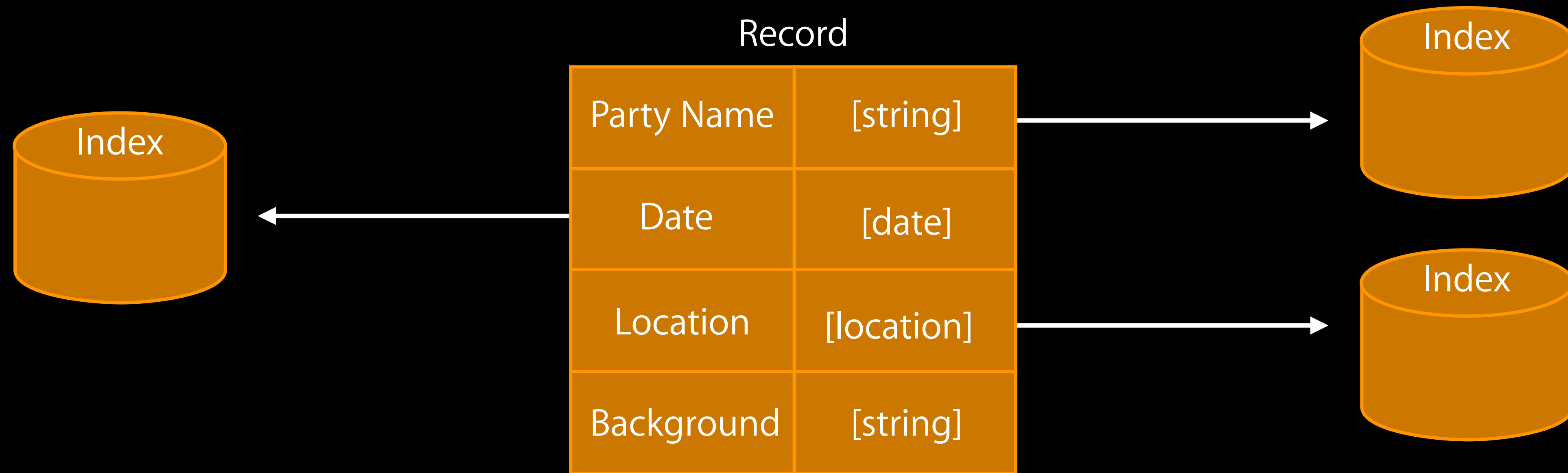
Records in Development

Schema and indices



Records in Development

Schema and indices



CloudKit Tips and Tricks

More other

Errors

Everybody loves error handling

Errors

Everybody loves error handling

Handle your errors

Errors

Everybody loves error handling

Handle your errors

- No magic

Errors

Everybody loves error handling

Handle your errors

- No magic

Operations can have partial errors

Errors

Everybody loves error handling

Handle your errors

- No magic

Operations can have partial errors

Atomic update errors

Errors

Everybody loves error handling

Handle your errors

- No magic

Operations can have partial errors

Atomic update errors

Retry server busy errors

Errors

Everybody loves error handling

Handle your errors

- No magic

Operations can have partial errors

Atomic update errors

Retry server busy errors

- Use `CKErrorRetryAfterKey`

Accounting

Where is my data stored?

Accounting

Where is my data stored?

Public data is counted against the app

Accounting

Where is my data stored?

Public data is counted against the app

Private data is counted against the user's account

Accounting

Where is my data stored?

Public data is counted against the app

Private data is counted against the user's account

- Be nice to your users

Limits

Public database

Limits

Public database

We want customers to have a great experience

Limits

Public database

We want customers to have a great experience

Limits prevent abuse, not legitimate use

Limits

Public database

We want customers to have a great experience

Limits prevent abuse, not legitimate use

Scales with number of users

Limits

Public database

We want customers to have a great experience

Limits prevent abuse, not legitimate use

Scales with number of users

For an app with 10 million users

- 1 Petabyte asset storage
- 10 Terabyte database storage
- 5 Terabyte/day asset transfer
- 50 Gigabyte/day database transfer

Efficiency

CloudKit doesn't cache records

Efficiency

CloudKit doesn't cache records

Only changed properties are transmitted

Efficiency

CloudKit doesn't cache records

Only changed properties are transmitted

Assets are transferred efficiently

Summary

Summary

We use CloudKit

Summary

We use CloudKit

We want you to use CloudKit

Summary

We use CloudKit

We want you to use CloudKit

We're excited to see what you're going to make!

More Information

Dave DeLong

App Frameworks Evangelist

delong@apple.com

Documentation

Cloud Kit Framework Reference

<http://developer.apple.com>

Apple Developer Forums

<http://devforums.apple.com>

Related Sessions

-
- | | | |
|---|-----------------|------------------|
| ● Introducing CloudKit | Mission | Tuesday 3:15PM |
| ● What's New in Core Data | Pacific Heights | Thursday 9:00AM |
| ● Building a Document-based App | Marina | Thursday 11:30AM |
-

Labs

-
- CloudKit Lab

Frameworks Lab A Friday 11:30AM

 WWDC14