Advanced Games Topics

Bruno Oliveira
Developer Relations, Android

Tom Wilson
Engineering, Android

Advanced Games Topics

...using Google Play game services.

Bruno Oliveira
Developer Relations, Android

Tom Wilson
Engineering, Android

Google I/O 13

```
// for this talk:
assert(you.know(BASICS));
```

```
10 PRINT “HELLO WORLD”
20 PRINT “WHAT IS YOUR NAME?”
30 INPUT$ ANS$
40 PRINT “HI” + ANS$
```

basics

basics

setup
sign-in
achievements

leaderboards
cloud save
multiplayer

real games

GamesClient

GamesClient

PlusClient

GamesClient

PlusClient

AppStateClient

Points: **9999999**

Level 1000

ZOMGWeRan OutOfTitles

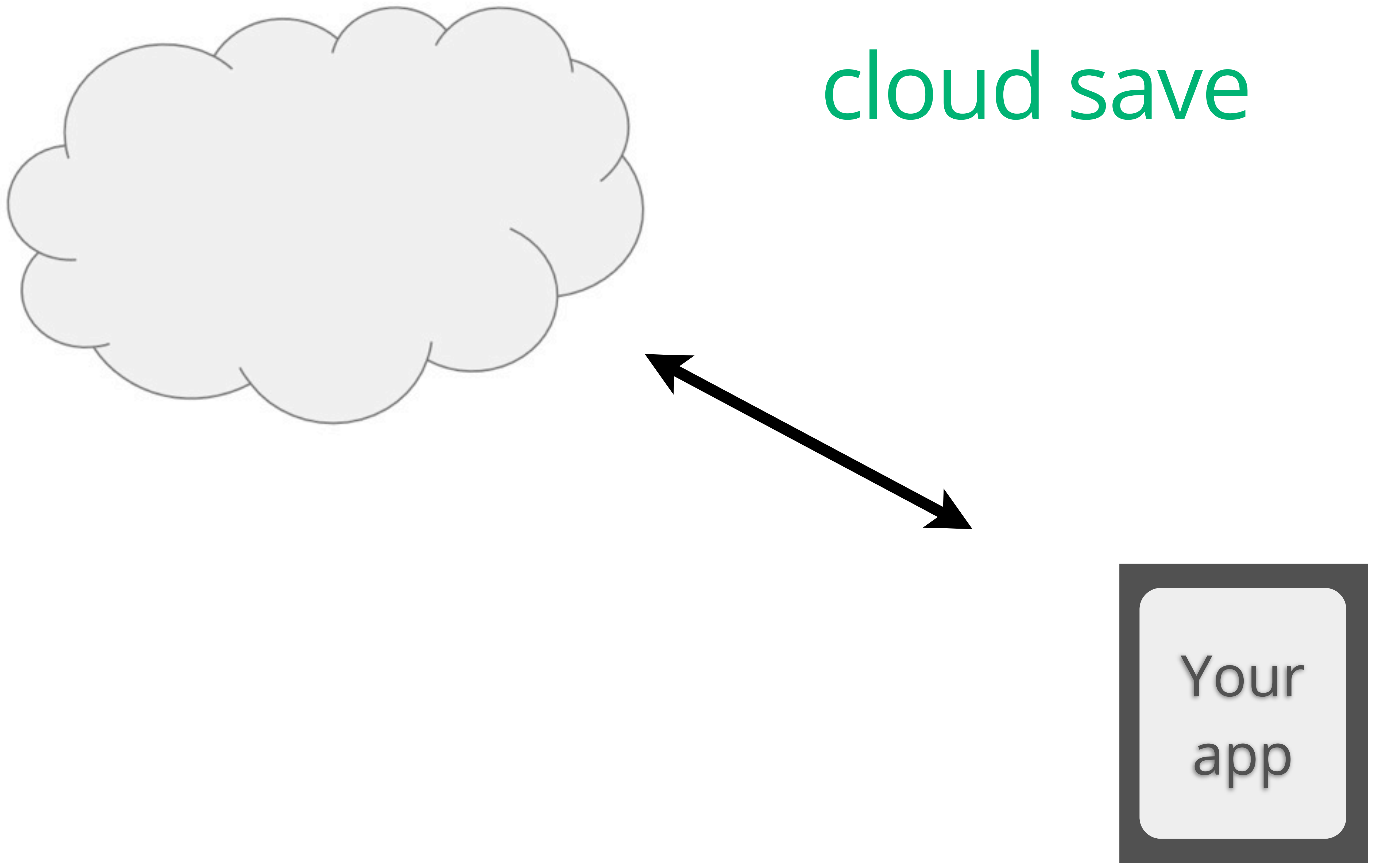
Oh, new phone?

Points: **0**

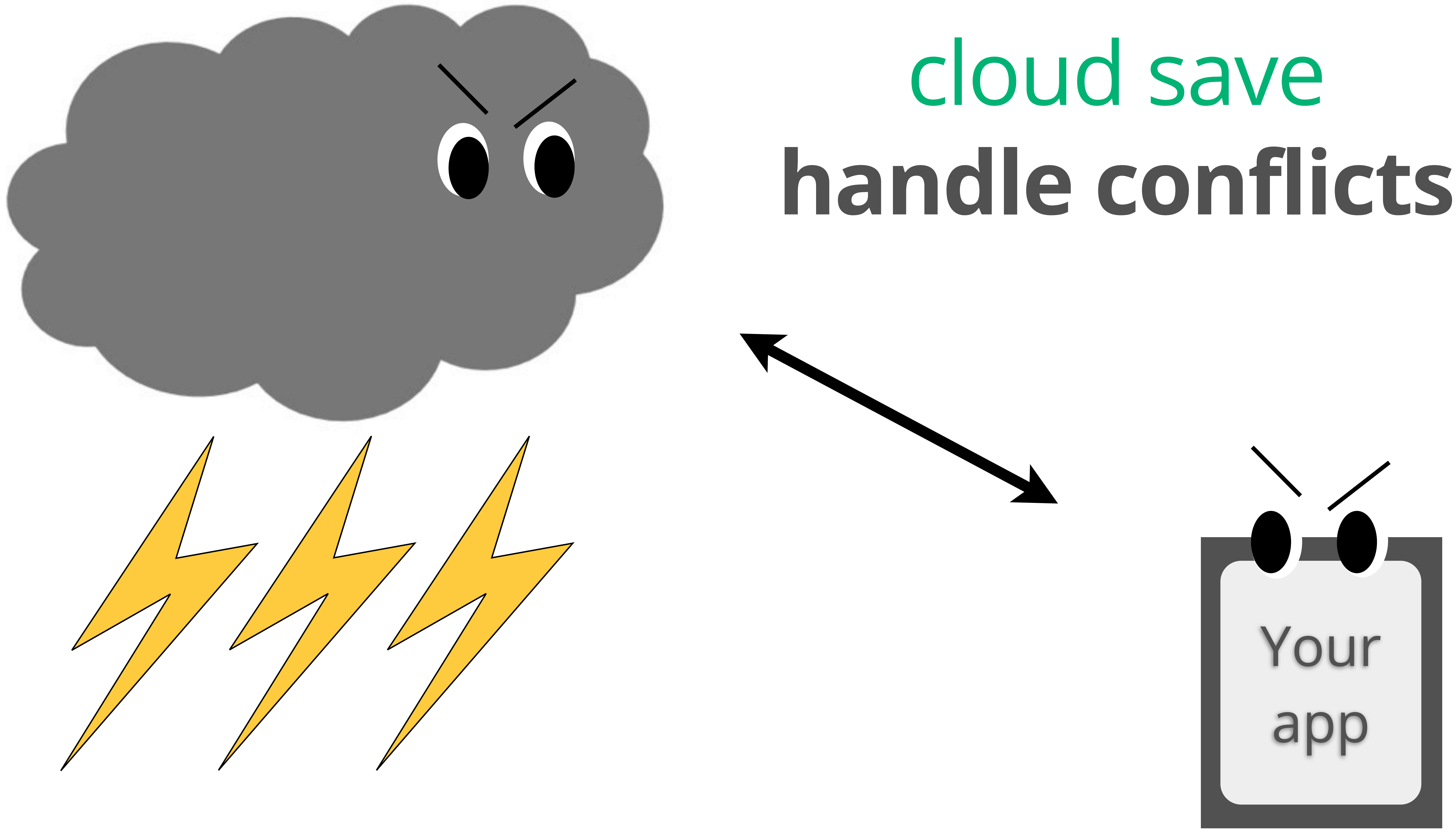
Level 1

Beginner

cloud save



cloud save
handle conflicts



Hi! My name is:

Native Code

Hi! My name is:

Native Code€âšÃ,Â建£

```
04-30 04:41:42.391: D/dalvikvm(1945): threadid=1: still suspended
04-30 04:41:42.391: A/libc(391): Fatal signal 11 (SIGSEGV) at 0x0004fcde (code=1)
04-30 04:41:42.391: I/DEBUG(58): *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***
04-30 04:41:42.391: I/DEBUG(58): Build fingerprint: 'Android/foo/bar/qux'
04-30 04:41:42.391: I/DEBUG(58): pid: 391, tid: 1381  >>> slide_deck <<<
04-30 04:41:42.391: I/DEBUG(58): signal 11 (SIGSEGV), code 1 (SEGV_MAPERR), fault
04-30 04:41:42.391: I/DEBUG(58):  r0 fb7381a3  r1 00000000  r2 993818fb  r3 00000000
04-30 04:41:42.391: I/DEBUG(58):  r4 00003000  r5 00000000  r6 00000039  r7 00000000
04-30 04:41:42.391: I/DEBUG(58):  r8 bce38183  r9 301930fd  10 9381bac3  fp 481bcaa3
04-30 04:41:42.391: I/DEBUG(58):  ip ffffff88  sp ab478290  lr 30193849  pc 39391939
04-30 04:41:42.391: I/DEBUG(58):  d0  3719319894aba383  d1  3198398cab398ab1
```

and lots more:

custom UIs
advanced automatching
3rd party engines
...

9 tips
for real games

information quanta

9 ~~tips~~
for real games

~~information quanta~~

howtos

9 ~~tips~~

for real games

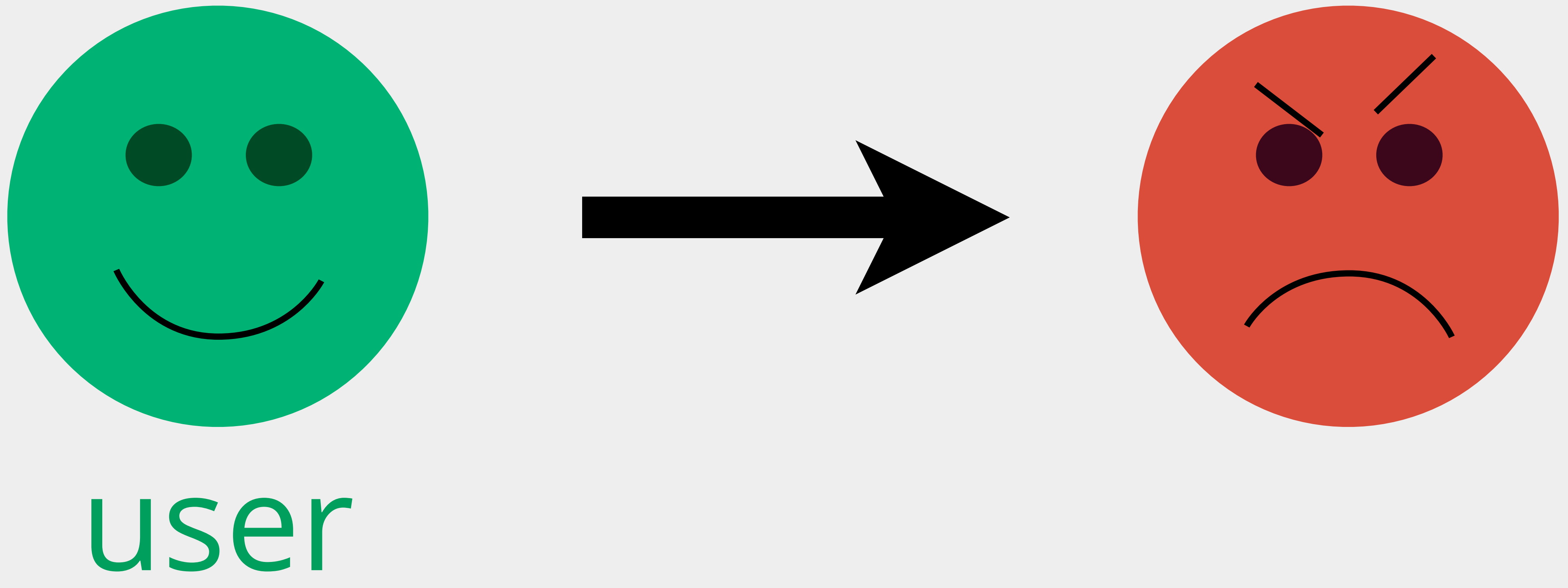
1

How to...

Not be annoying!

user

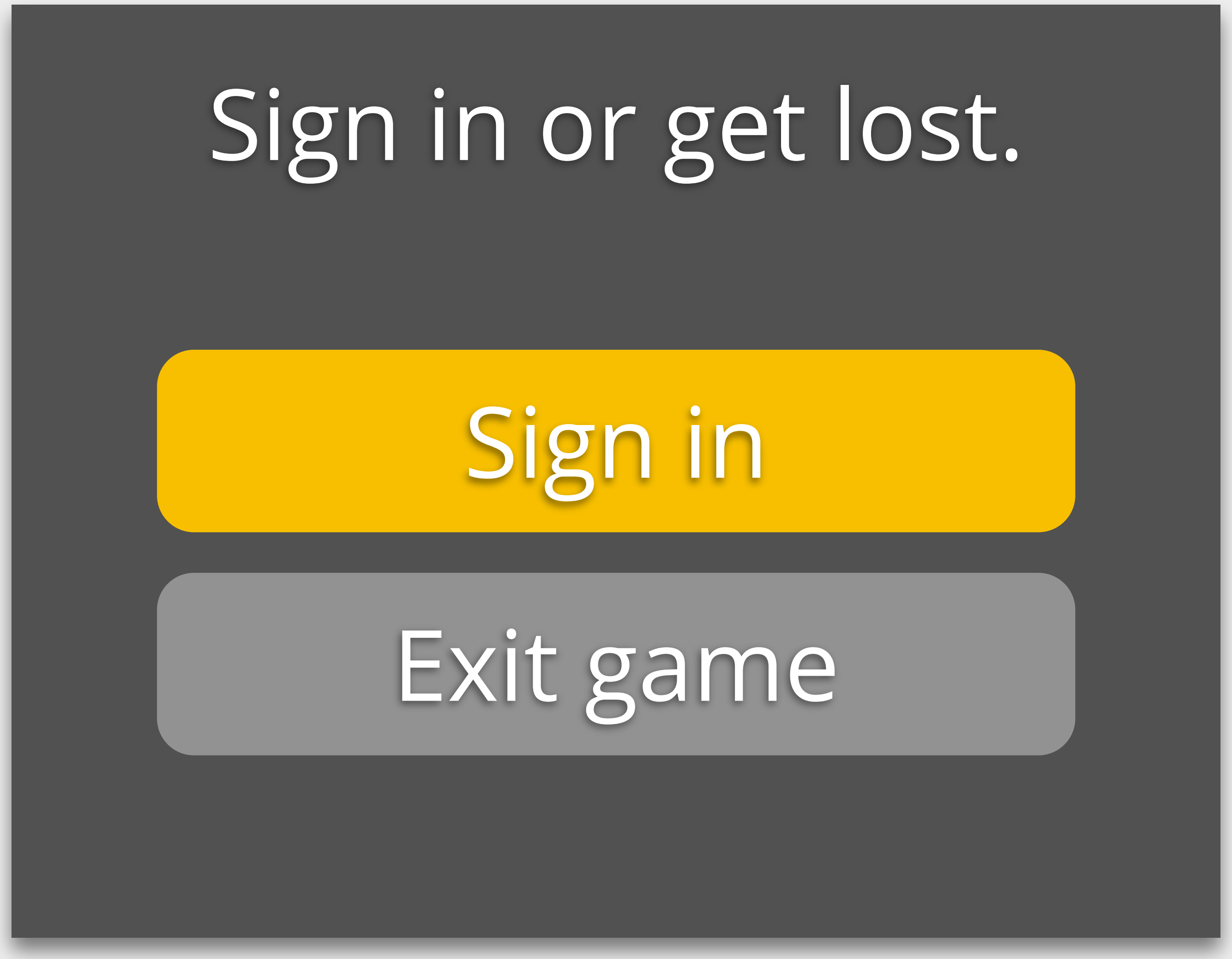
Achievement Unlocked!



...on the **first** screen!

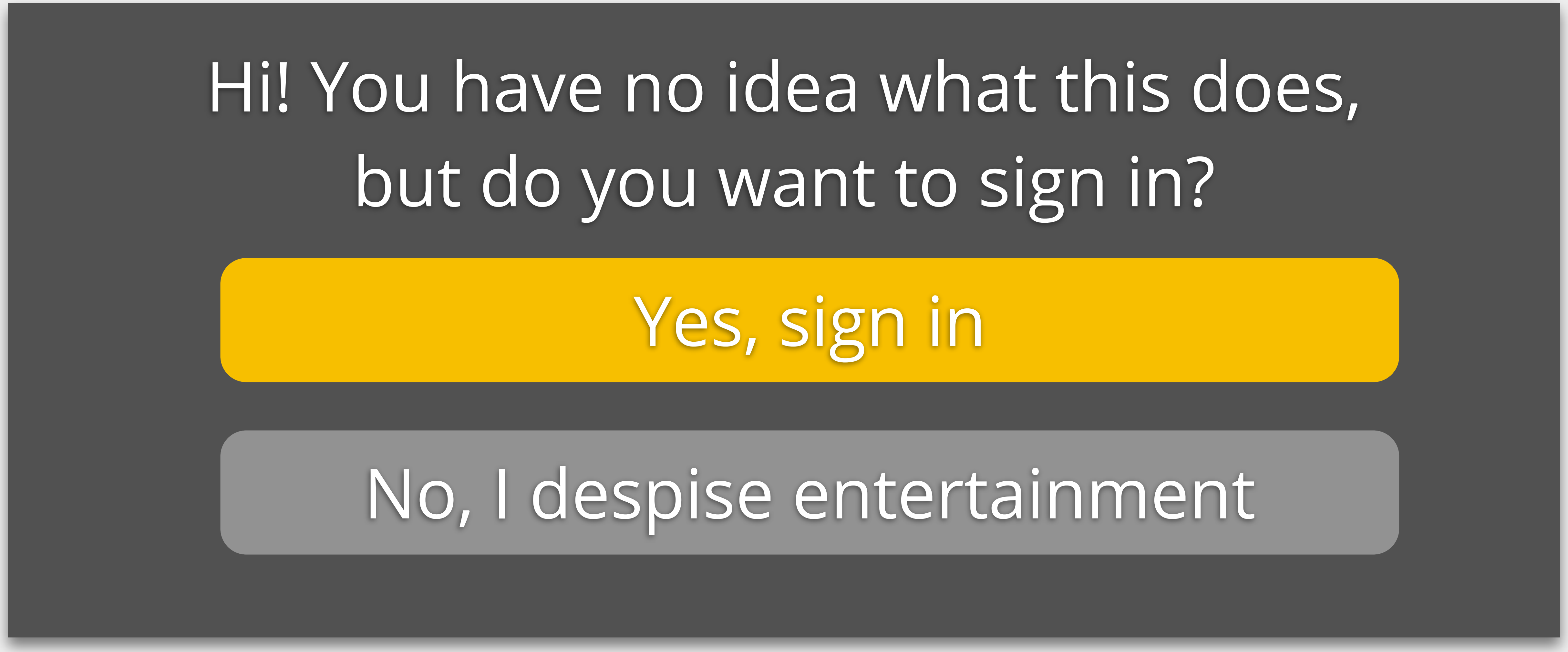
Annoying Game

Annoying Game



Slightly less (but still very) annoying Game

Slightly less (but still very) annoying Game


Hi! You have no idea what this does, but do you want to sign in?

Friendly Game

Single Player

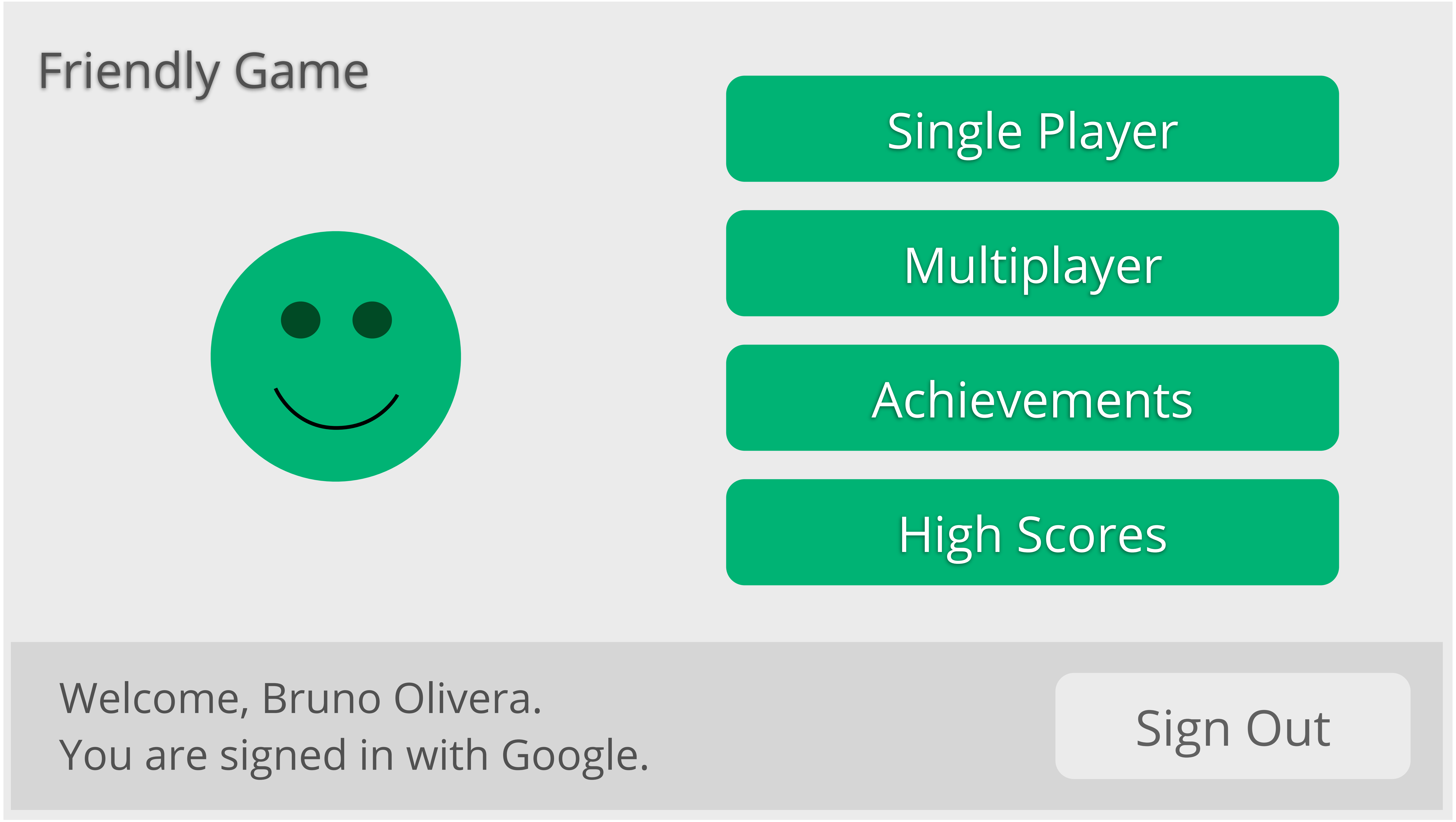
Multiplayer

Achievements

High Scores

Sign in

Sign in with Google to save your progress, unlock achievements and play with friends.



Welcome, Bruno Olivera.
You are signed in with Google.

Treat sign-in as optional

Java

```
if (mGamesClient.isConnected()) {
    // unlock achievement
    mGamesClient.unlockAchievement(...);
}
else {
    // do something else (or at least don’t crash!)
}
```

```
connect()
```

```
ConnectionResult.
startResolutionForResult(...)
```

```
connect()
```

no popup

```
ConnectionResult.
startResolutionForResult(...)
```

```
connect()
```

no popup

```
ConnectionResult.
startResolutionForResult(...)
```

may show popup

Well-behaved sign-in

Java

```java
ConnectionResult mResult = null;
boolean mUserRequestedSignIn = false;

public void onConnectionFailed(ConnectionResult result) {
```

Well-behaved sign-in

Java

```java
ConnectionResult mResult = null;
boolean mUserRequestedSignIn = false;

public void onConnectionFailed(ConnectionResult result) {
    if (mUserRequestedSignIn) {
        if (result.hasResolution()) {
            // may show a popup dialog
            result.startResolutionForResult(this, RC_RESOLVE);
        }
    }
```

Well-behaved sign-in

Java

```
ConnectionResult mResult = null;
boolean mUserRequestedSignIn = false;

public void onConnectionFailed(ConnectionResult result) {
    if (mUserRequestedSignIn) {
        if (result.hasResolution()) {
            // may show a popup dialog
            result.startResolutionForResult(this, RC_RESOLVE);
        }
    }
    else {
        mResult = result;
    }
```

Well-behaved sign-in

Java

```
public void onClick(View v) {
    if (v.getId() == R.id.sign_in_button) {







        }
    }
}
```

Well-behaved sign-in

Java

```java
public void onClick(View v) {
    if (v.getId() == R.id.sign_in_button) {
        if (mResult != null) {
            mResult.startResolutionForResult(this, RC_RESOLVE);
        }




        }
    }
}
```

Well-behaved sign-in

Java

```java
public void onClick(View v) {
    if (v.getId() == R.id.sign_in_button) {
        if (mResult != null) {
            mResult.startResolutionForResult(this, RC_RESOLVE);
        }
        else {
            mUserRequestedSignIn = true;
            mGamesClient.connect();
        }
    }
}
```

2

How to...

Manage multiple Google Play Services clients

If you have one Google Play Services client...

`onCreate()`	instantiate client
`onStart()`	connect
`onConnectionFailed()`	resolve connection problem
`onConnected()`	ready to use
`onStop()`	disconnect

Create the clients

Java

```
public void onCreate() {
    mGamesClient = createGamesClient();
    mPlusClient = createPlusClient();
    mAppStateClient = createAppStateClient();






}
```

Create the clients

Java

```java
public void onCreate() {
    mGamesClient = createGamesClient();
    mPlusClient = createPlusClient();
    mAppStateClient = createAppStateClient();

    // Add the clients to a tracking array.
    mClients.add(mGamesClient);
    mClients.add(mPlusClient);
    mClients.add(mAppStateClient);
}
```

Connect the first client

Java

```java
public void onStart() {
    super.onStart();

    // You can just connect your clients in order.
    // Connecting an already connected client is safe.
    mClients.get(0).connect();
}
```

Connect the first client

Java

```java
public void onConnectionFailed(ConnectionResult result) {
    // Standard error handling here
    result.startResolutionForResult(this, RC_RESOLVE_FAILURE);
}
```

Connect the first client

Java

```
public void onConnectionFailed(ConnectionResult result) {
    // Standard error handling here
    result.startResolutionForResult(this, RC_RESOLVE_FAILURE);
}

public void onActivityResult(int request, int result,
        Intent intent) {
    if (result == RESULT_OK) {
        mClients.get(0).connect();
    }
}
```

Rinse and repeat

Java

```
public void onConnected(Bundle connectionHint) {
    for (int i = 0; i < mClients.size(); i++) {
        GooglePlayServicesClient client = mClients.get(i);
        if (!client.isConnected()) {
            client.connect();
            return;
        }
    }

    // All clients are connected! Move on.
}
```

Disconnect all clients

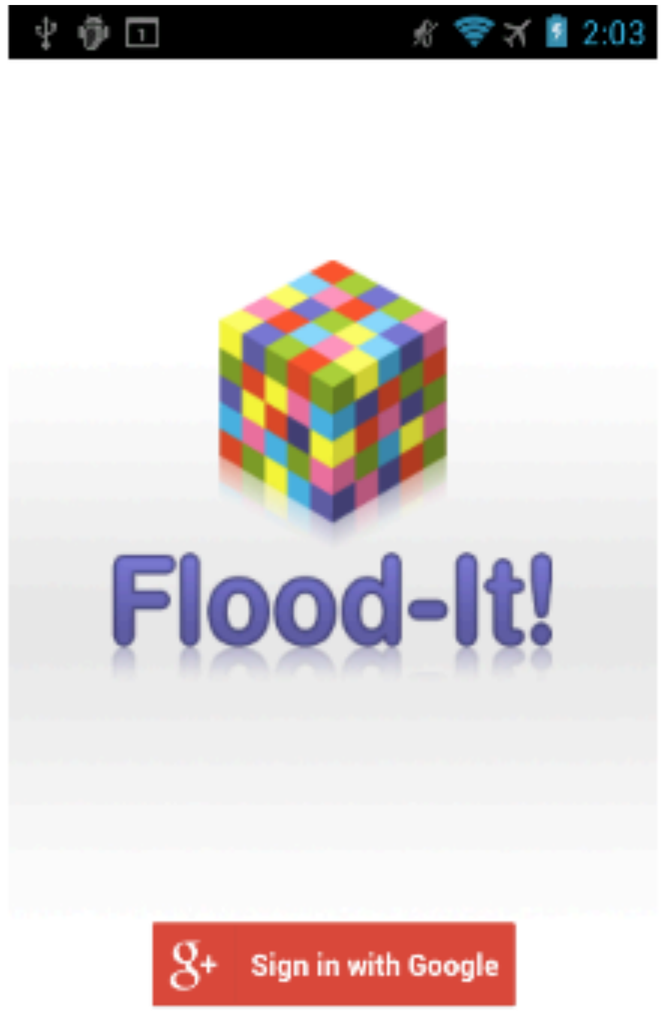
Java

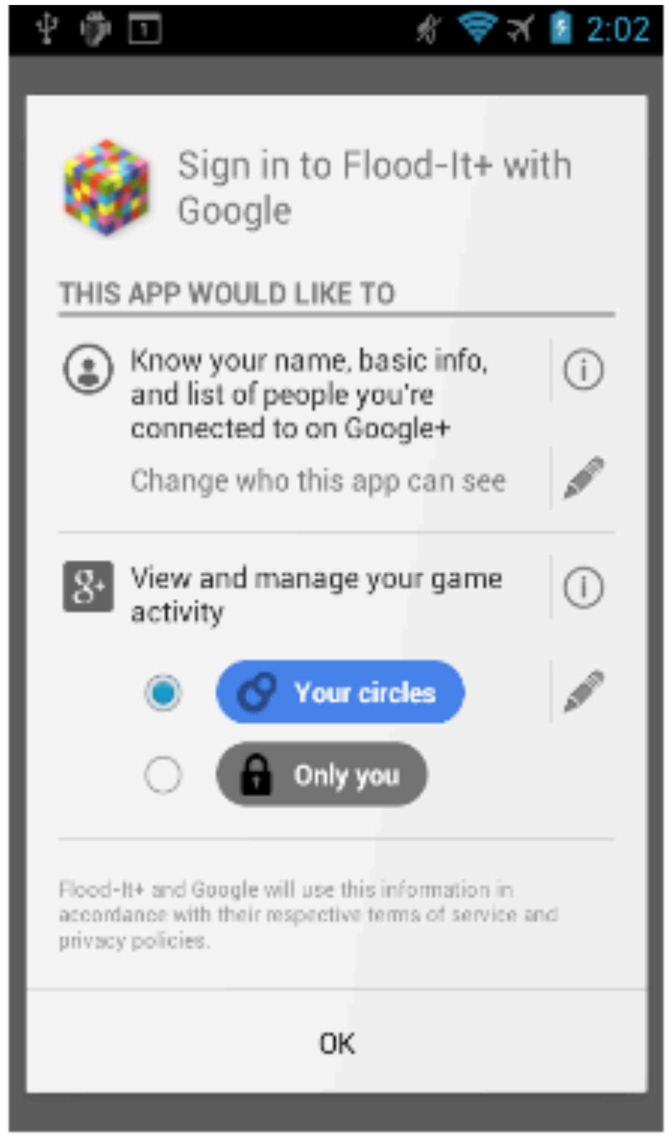
```java
public void onStop() {
    super.onStop();

    int count = mClients.size();
    for (int i = 0; i < count; i++) {
        mClients.get(i).disconnect();
    }
}
```

Scopes!

Scopes!





2:02

Sign in to Flood-It+ with Google

THIS APP WOULD LIKE TO

Know your name, basic info, and list of people you're connected to on Google+

Change who this app can see

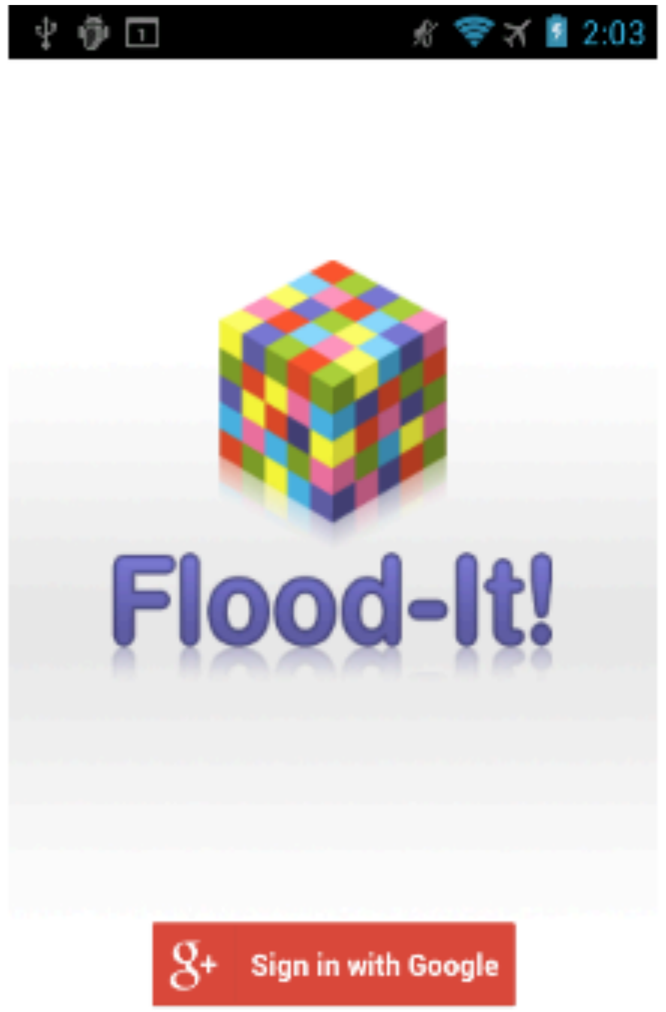
View and manage your game activity

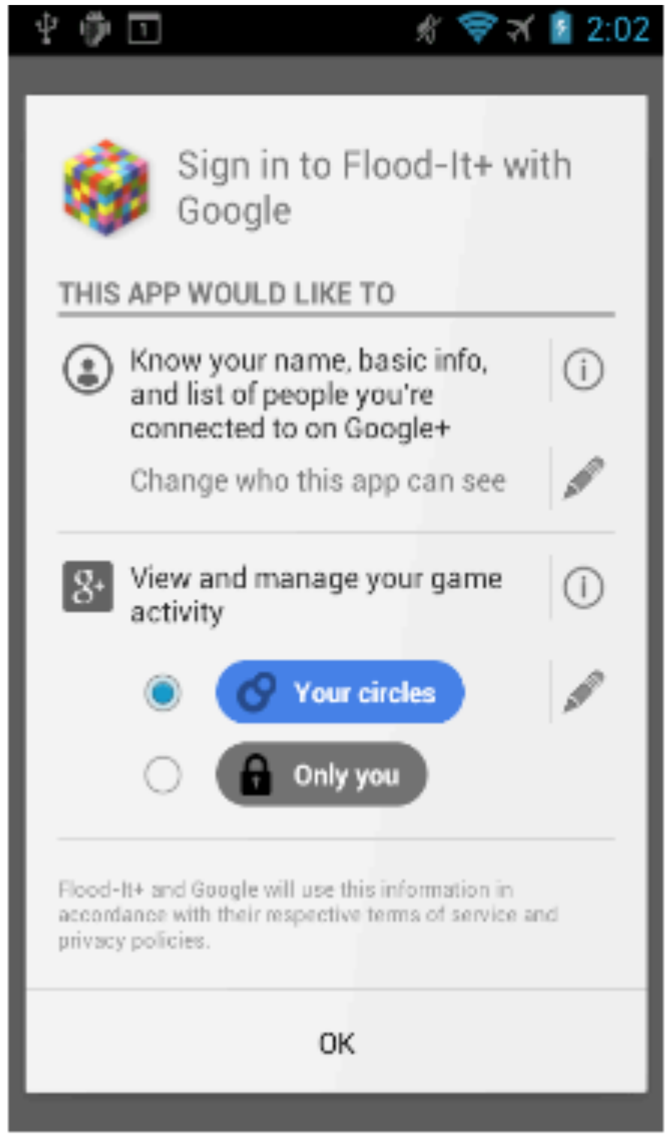
[✓ Your circles] Only you

Flood-It+ and Google will use this information in accordance with their respective terms of service and privacy policies.

OK

Scopes!

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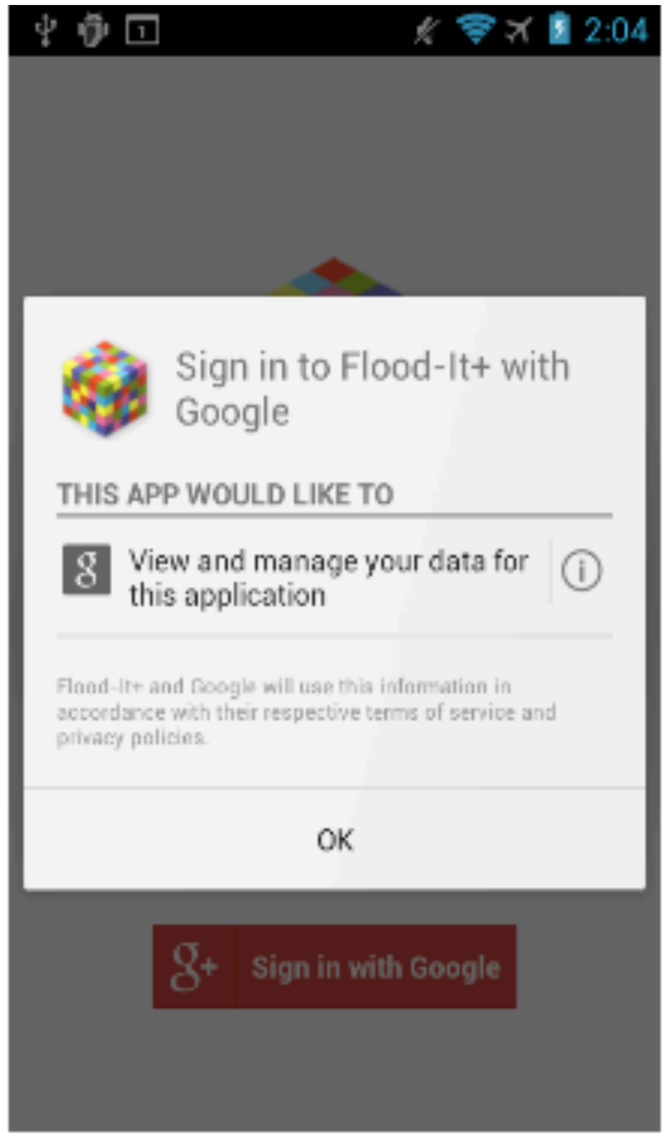
2:04

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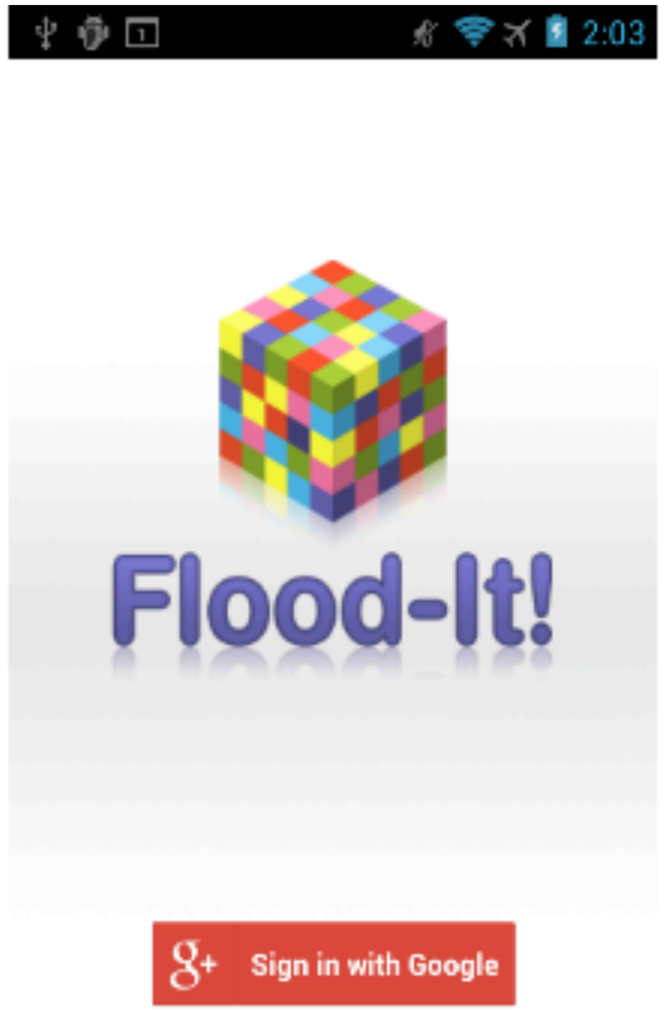
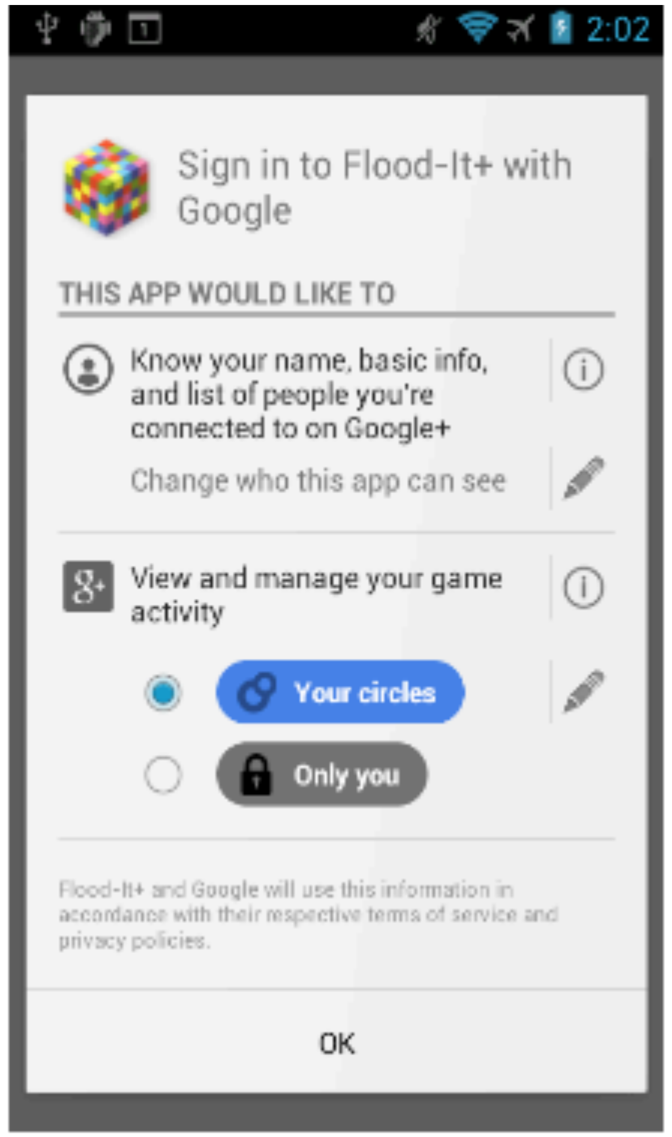
OK

Sign in with Google

Scopes!

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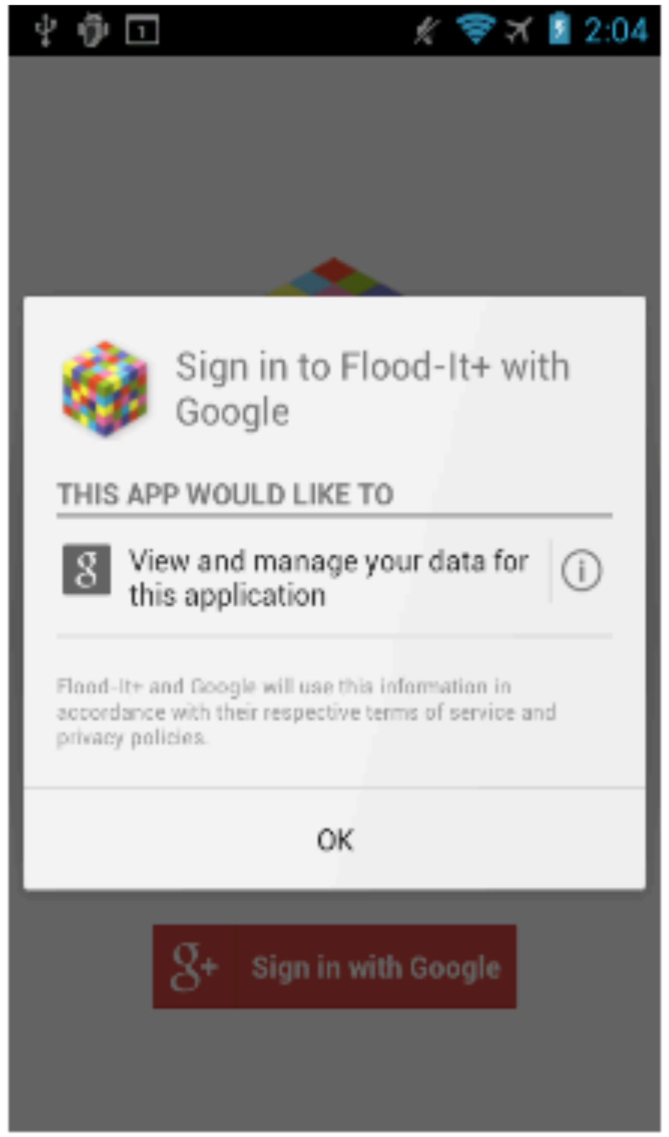
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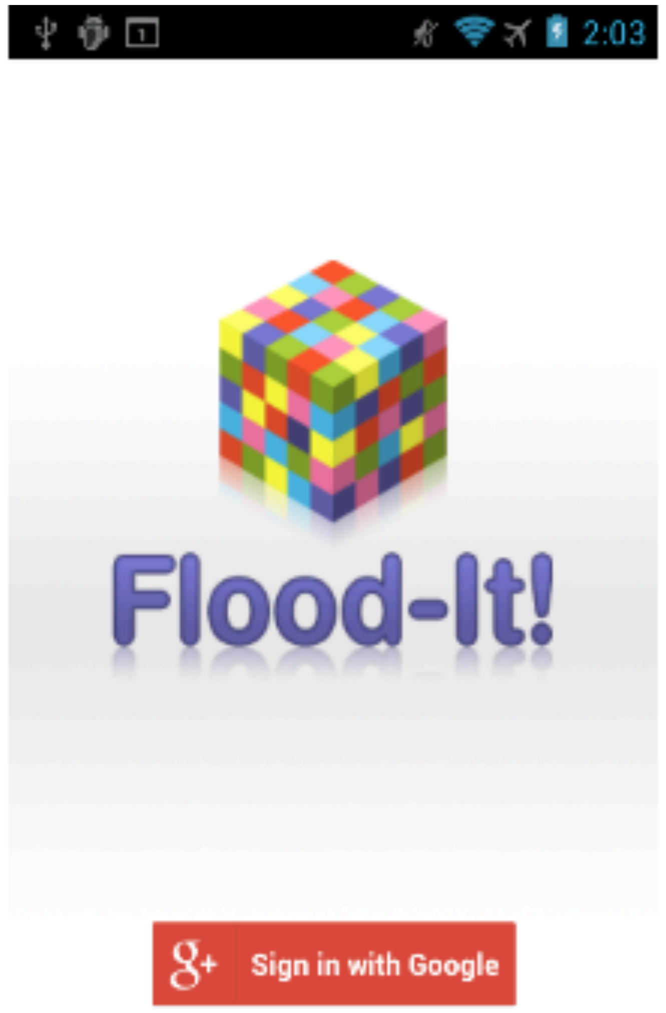
OK

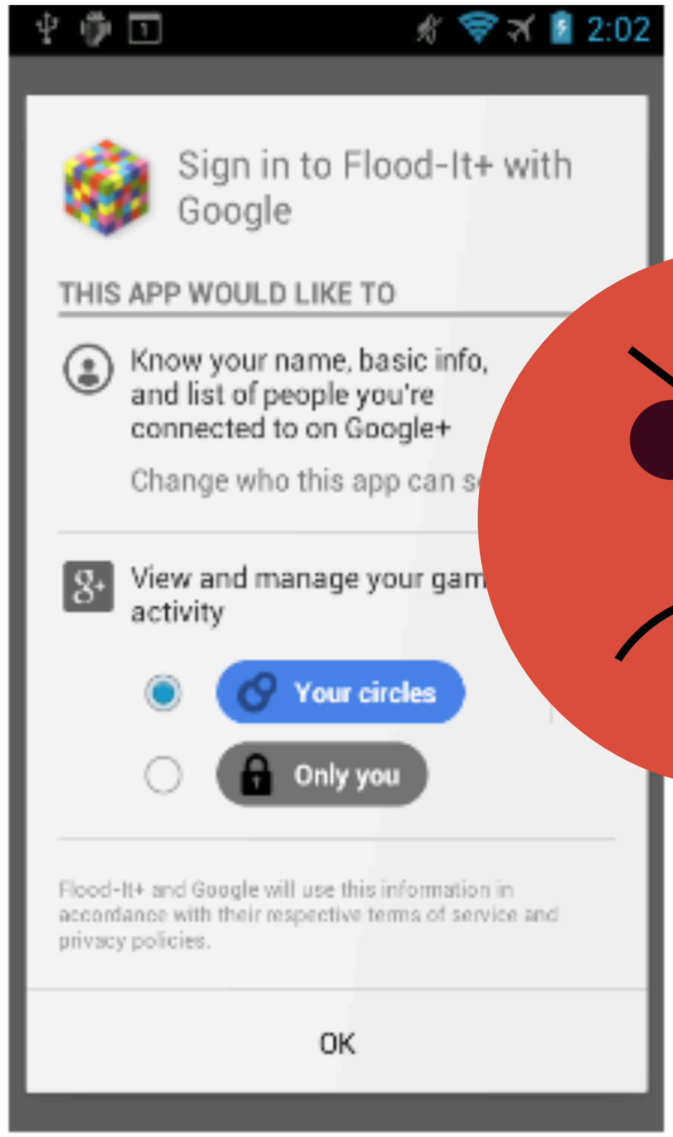
Sign in with Google

Scopes!


2:03

Flood-It!

Sign in with Google


2:02

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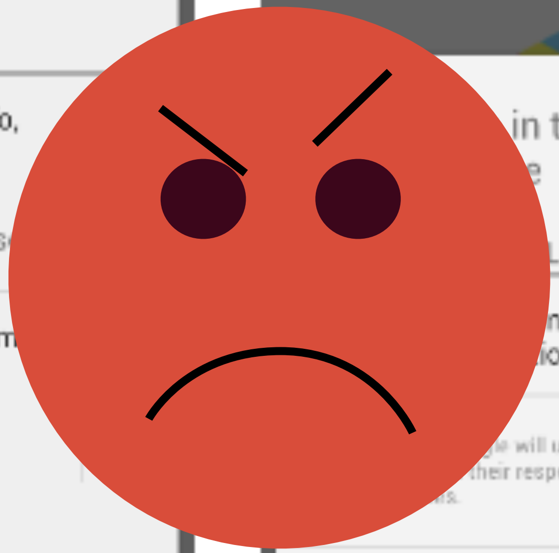

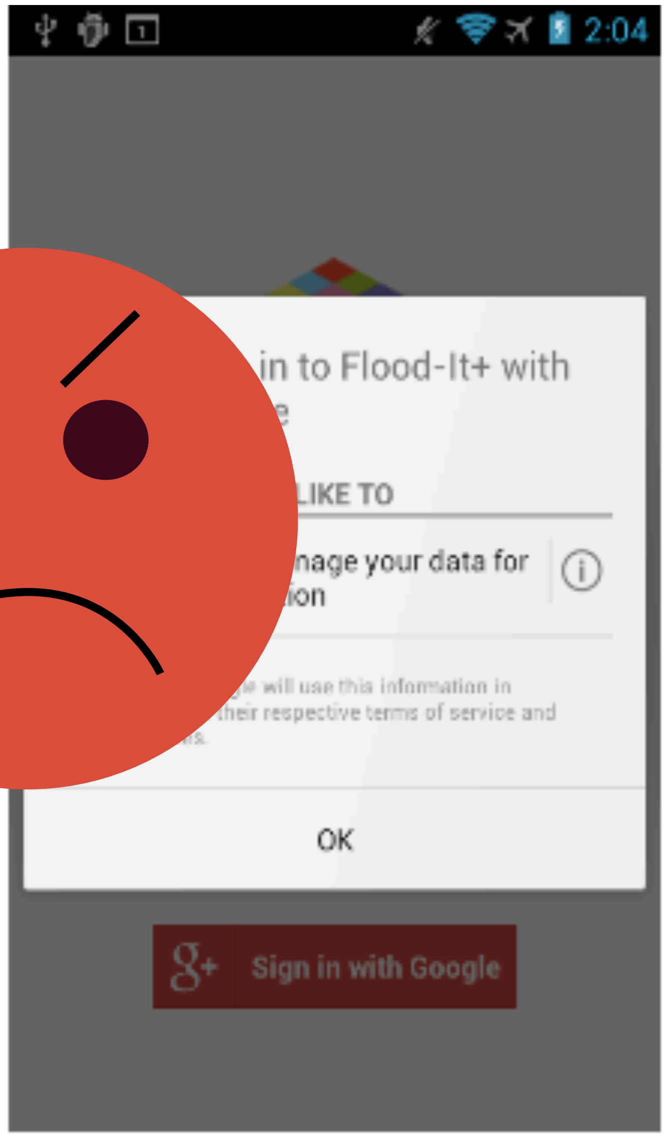
2:04

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LIKE TO

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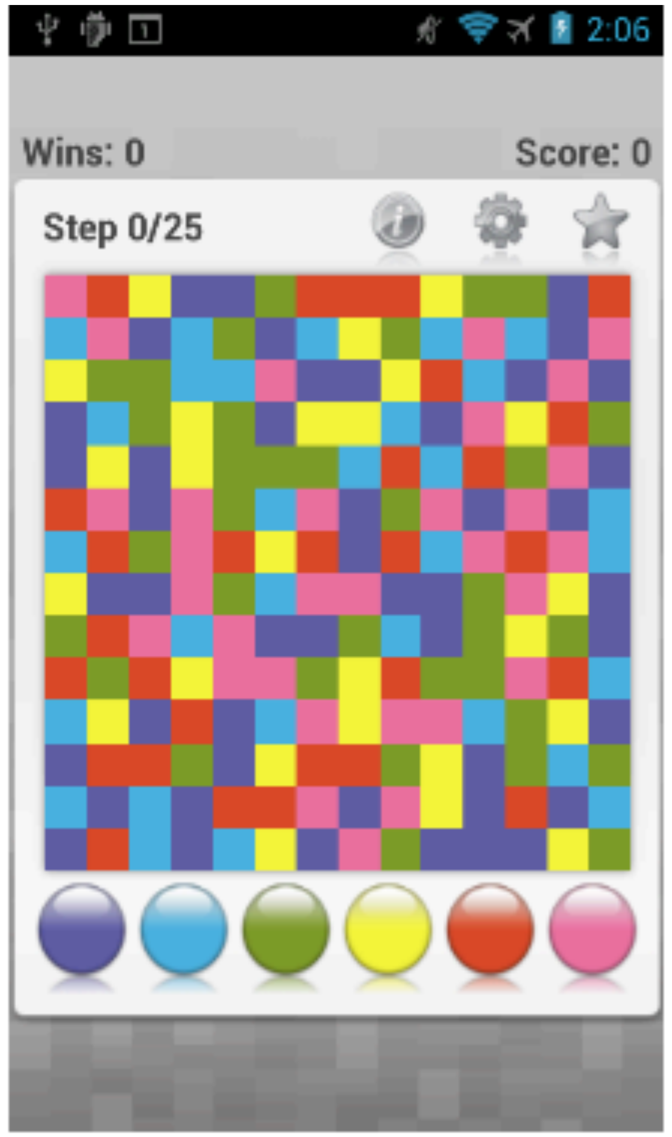
will use this information in their respective terms of service and

OK

Sign in with Google


2:06

Wins: 0

Score: 0

Step 0/25

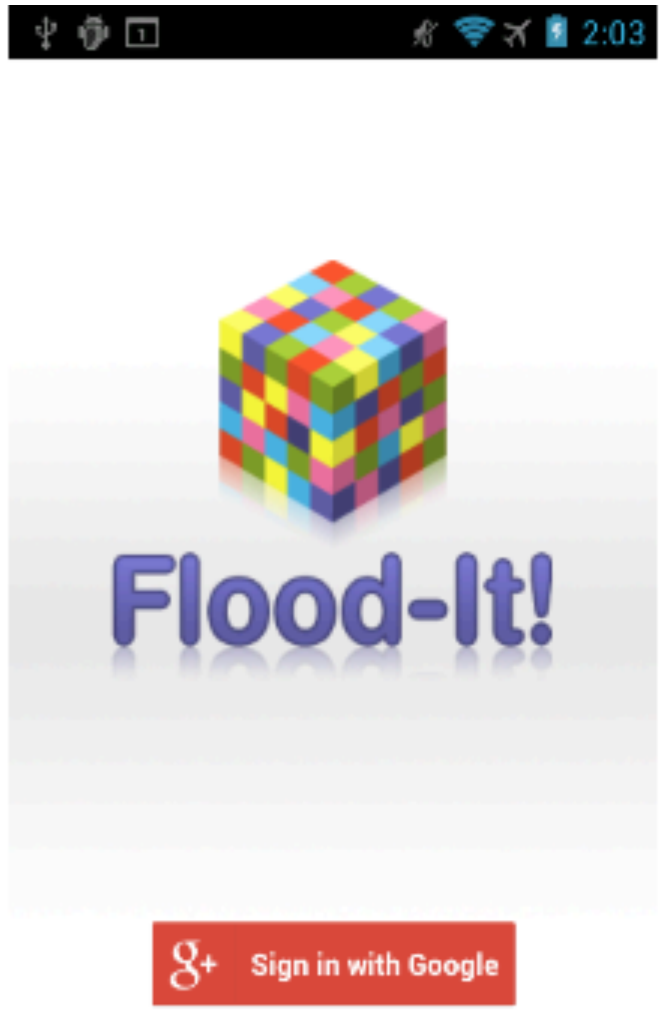
Scopes!

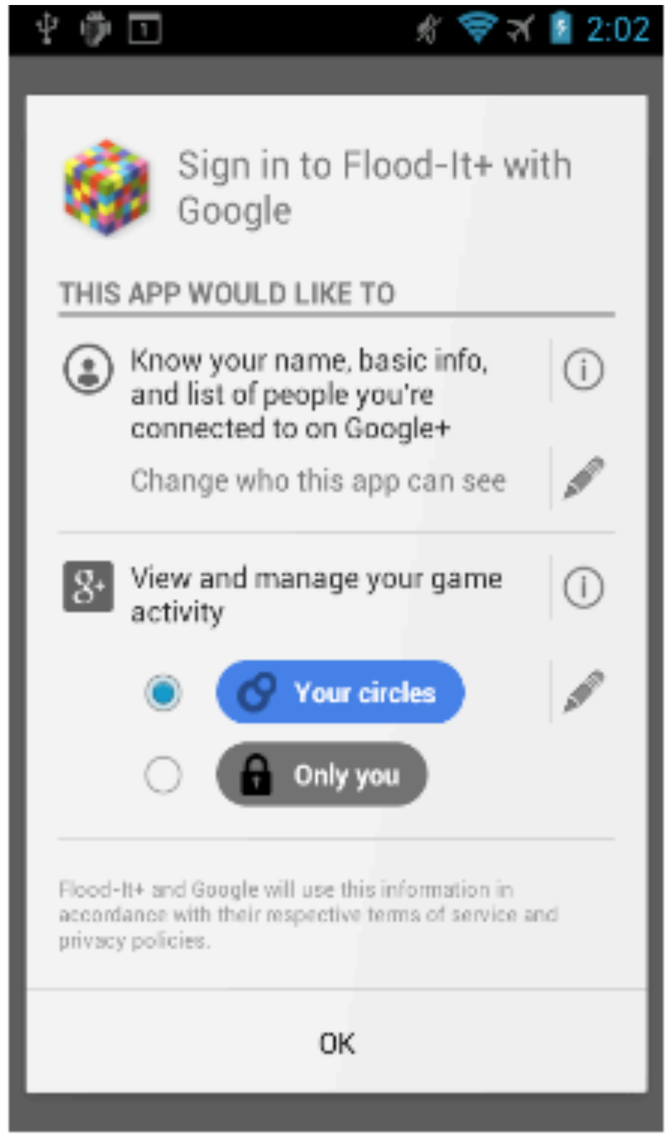
Java

```java
public GamesClient createGamesClient() {
    String games = Scopes.GAMES;
    String appState = Scopes.APP_STATE;
    String plusProfile = Scopes.PLUS_PROFILE;

    // Create your client with all the scopes
    return new GamesClient.Builder(this, this, this)
            .setScopes(games, appState, plusProfile)
            .create();
}
```

Scopes!

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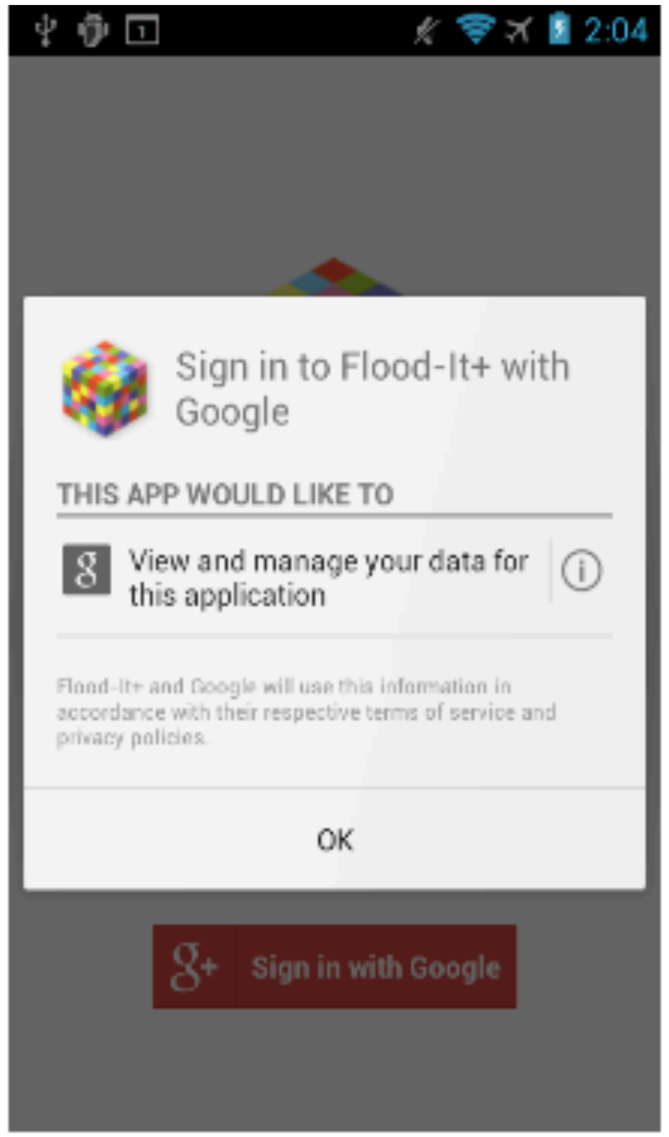
OK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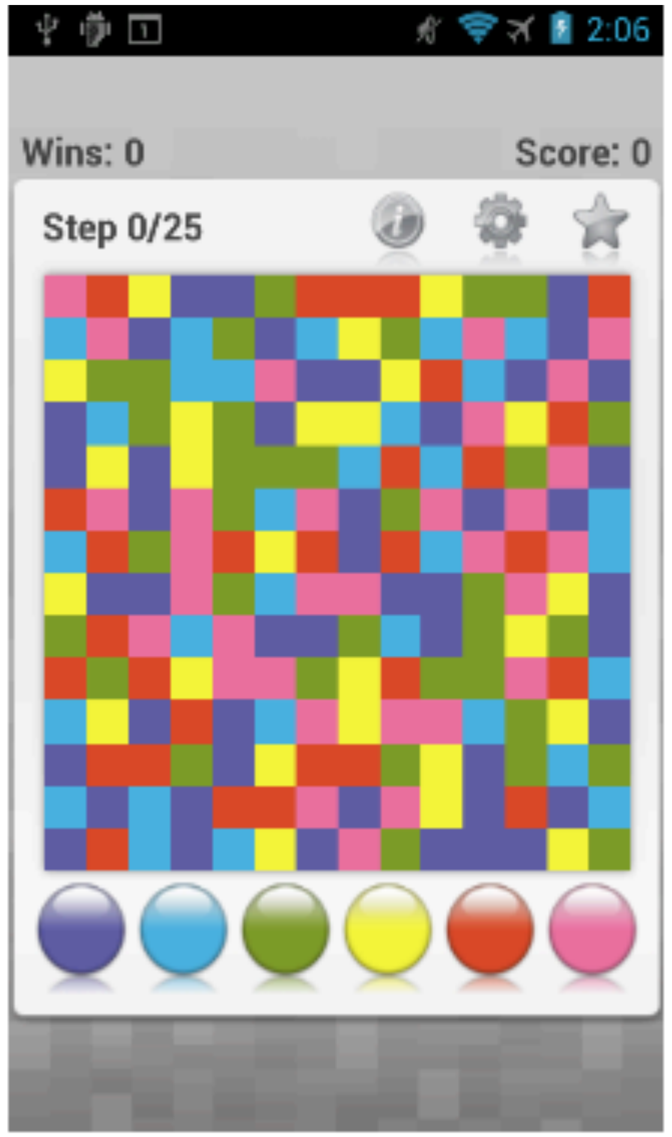
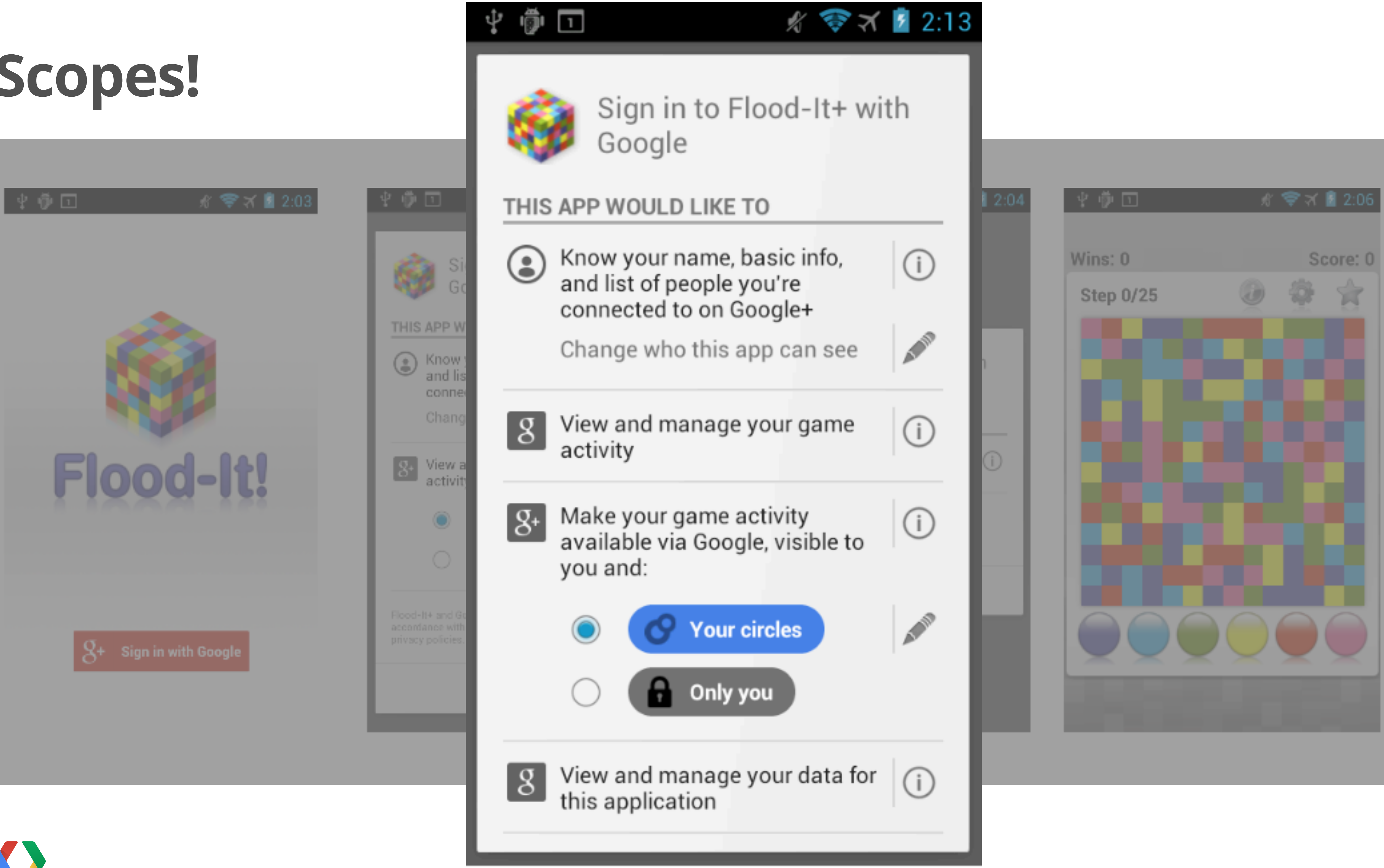


Scopes!



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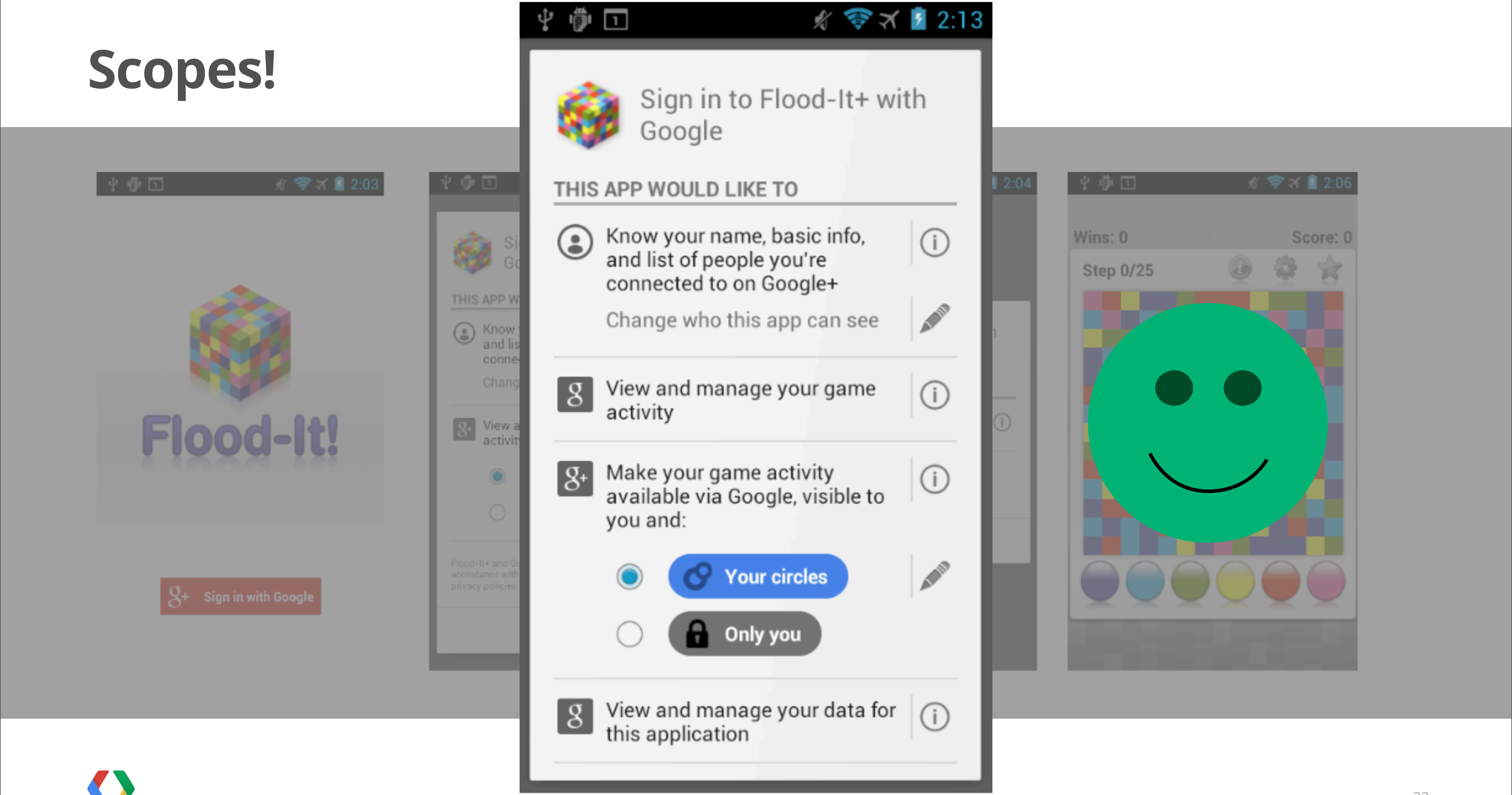
Make your game activity available via Google, visible to you and:

[✓ Your circles] Only you

View and manage your data for this application

Scopes!



2:13

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[✓ Your circles]

Only you

View and manage your data for this application

Monday, May 20,

Example?

See our samples!

Example?

GameHelper

See our samples!

Example?

See our samples!

GameHelper

BaseGameActivity

3

How to...
Call the Games API from Native Code

1. Install NDK
2. Use NativeActivity
3. Receive happiness

C/C++!

Wait a minute.
I need to access my
Java classes.

```
JNIEnv *env;

...

(*env)->FindClass(env,
"com/example/foo/MyClass");
```

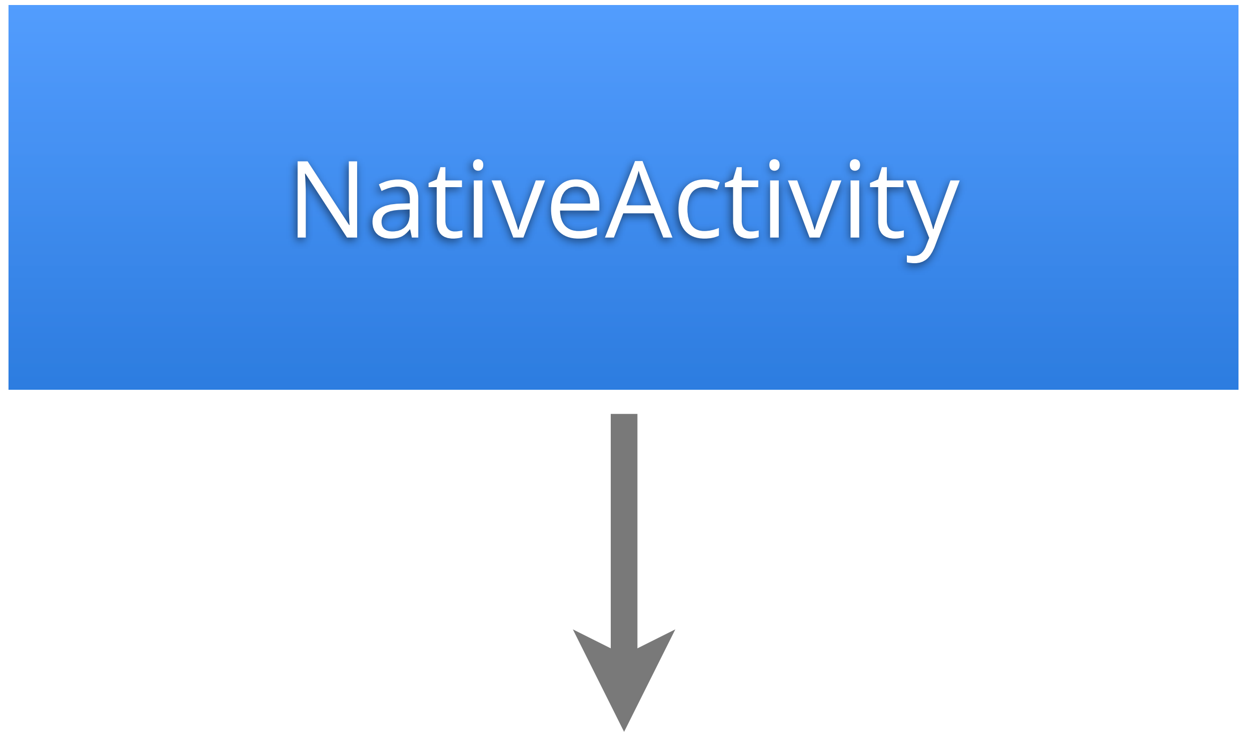
ClassNotFoundException

```
JNIEnv *env;

...

(*env)->FindClass(env,
"com/example/foo/MyClass");
```

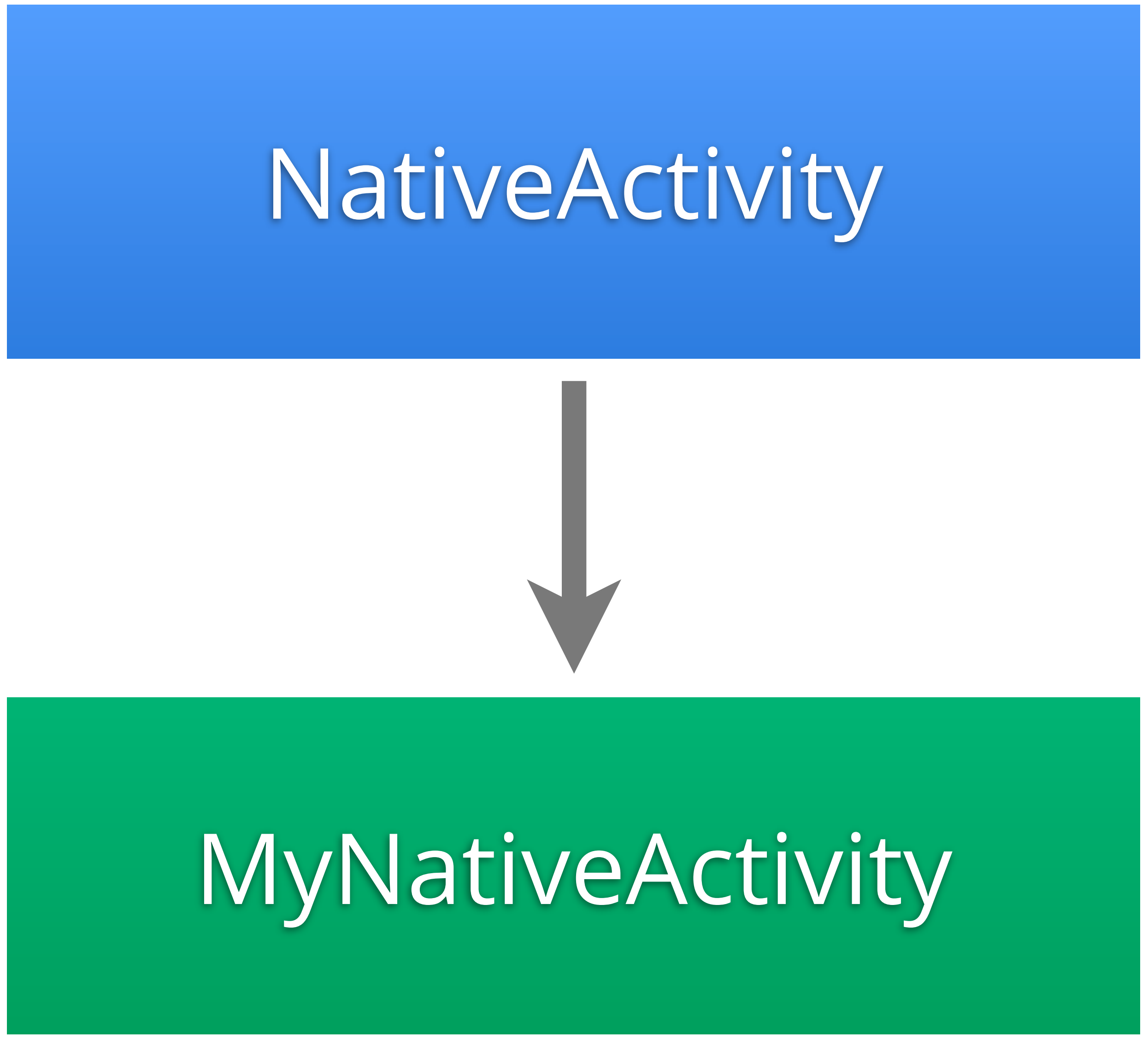
Huh? MyClass??

```
JNIEnv *env;

...

(*env)->FindClass(env,
"com/example/foo/MyClass");
```

Derive from NativeActivity



Derive from NativeActivity



Load your shared library

Java

```java
public class MyNativeActivity extends NativeActivity {
```

Load your shared library

Java

```java
public class MyNativeActivity extends NativeActivity {

    static {
        System.load("mylib.so");
    }
```

Add convenience methods

Java

```java
public class MyNativeActivity extends NativeActivity {

   // convenience method to be called from native code
   protected void postHighScore(int score) {
       // call games API from here
       mGamesClient.submitScore(...);
   }
```

Call from C/C++

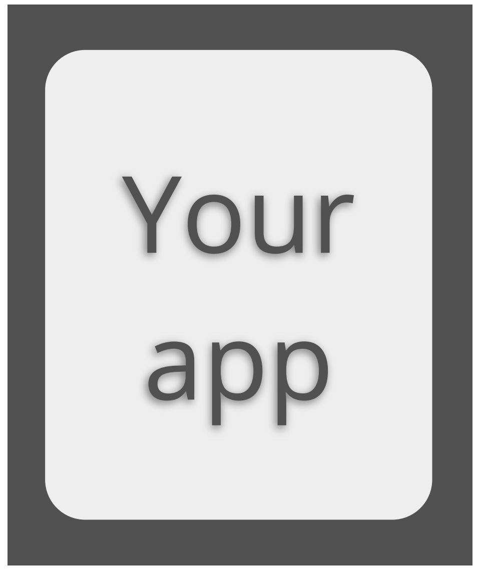
C++

```
jobject obj = ...;
jclass cls =
   (*env)->GetObjectClass(env, obj);
jmethodID mid =
   (*env)->GetMethodID(env, obj, "postHighScore", "(I)V");

// call the convenience method
(*env)->CallVoidMethod(env, cls, mid);
```

ther”We’ree sure are no race
conditio in thisns program”

What about threading?

Native code often runs outside the main thread.


Your
app

```
“Can’t create handler inside
thread that has not called
Looper.prepare()”
```

```
“Can't create handler inside
thread that has not called
Looper.prepare()”
```

↓

“I really like you.

```
“Can't create handler inside
thread that has not called
Looper.prepare()”
```

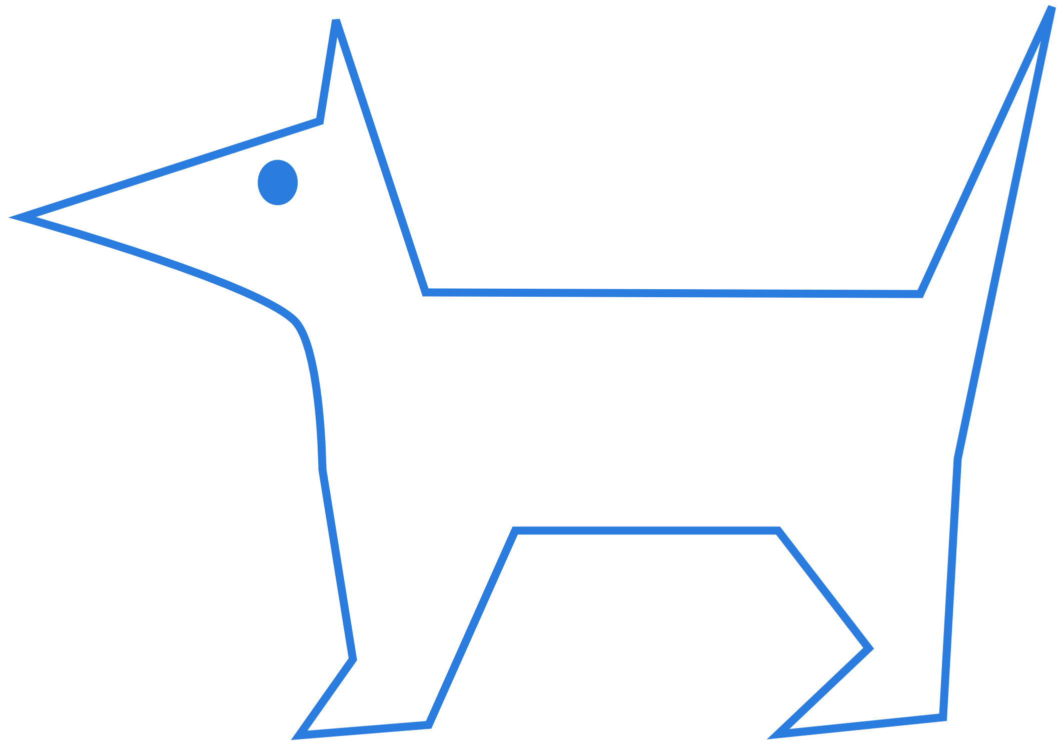
↓

“I really like you.
But you're on the ***wrong thread****.”*

off-thread developer’s best friend

off-thread developer's best friend

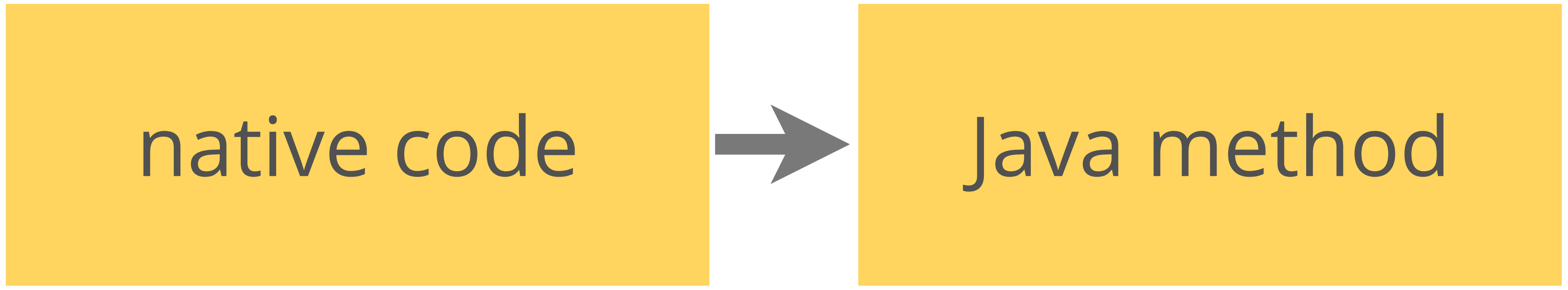
`runOnUiThread`



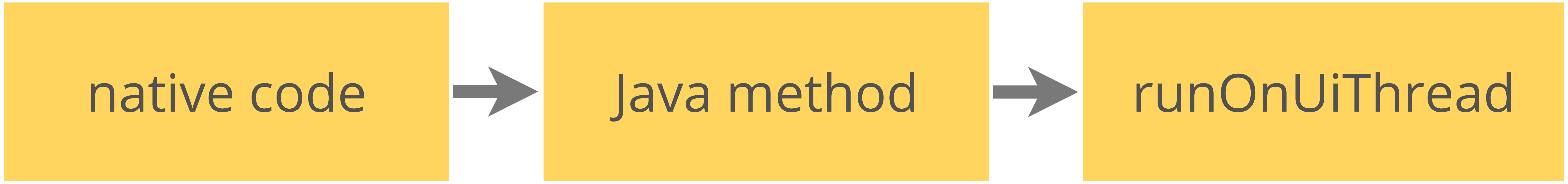
`runOnUiThread` is your friend

native code

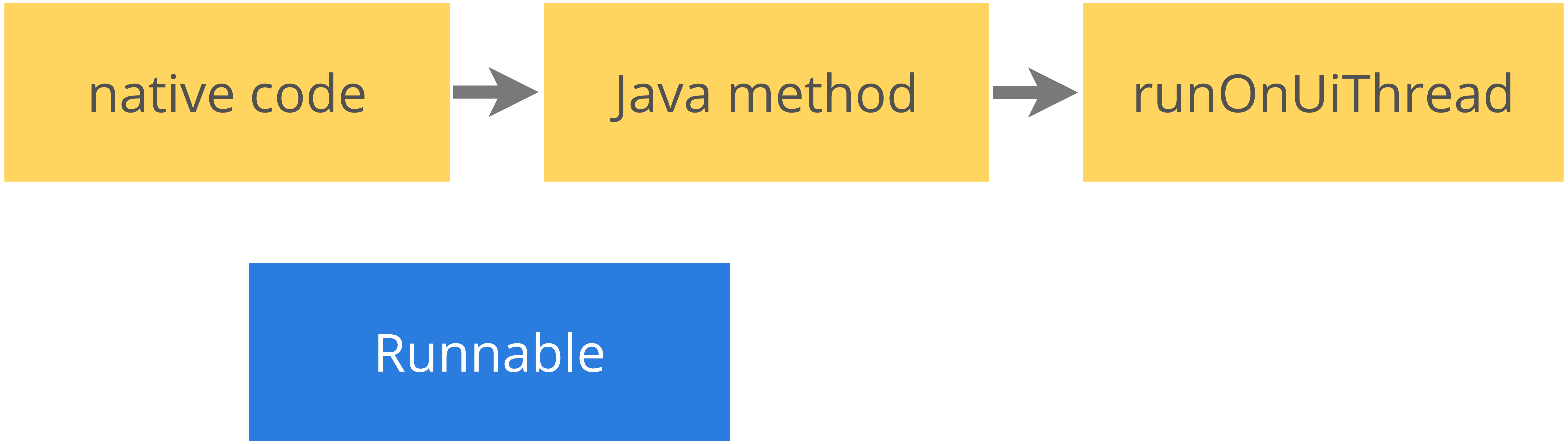
`runOnUiThread` is your friend



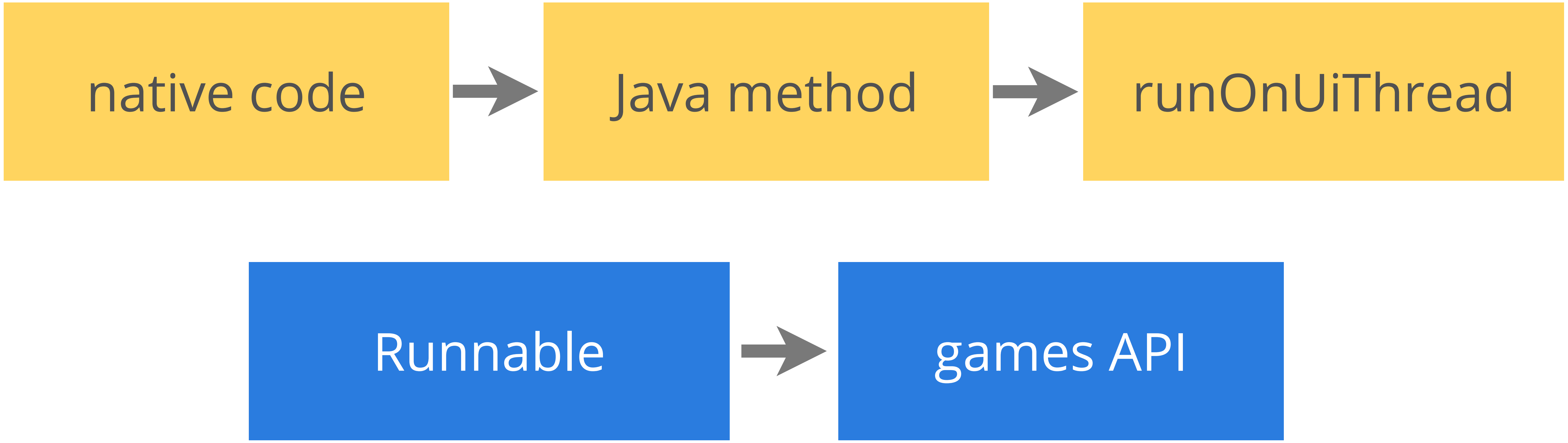
runOnUiThread is your friend



`runOnUiThread` is your friend



`runOnUiThread`
is your friend

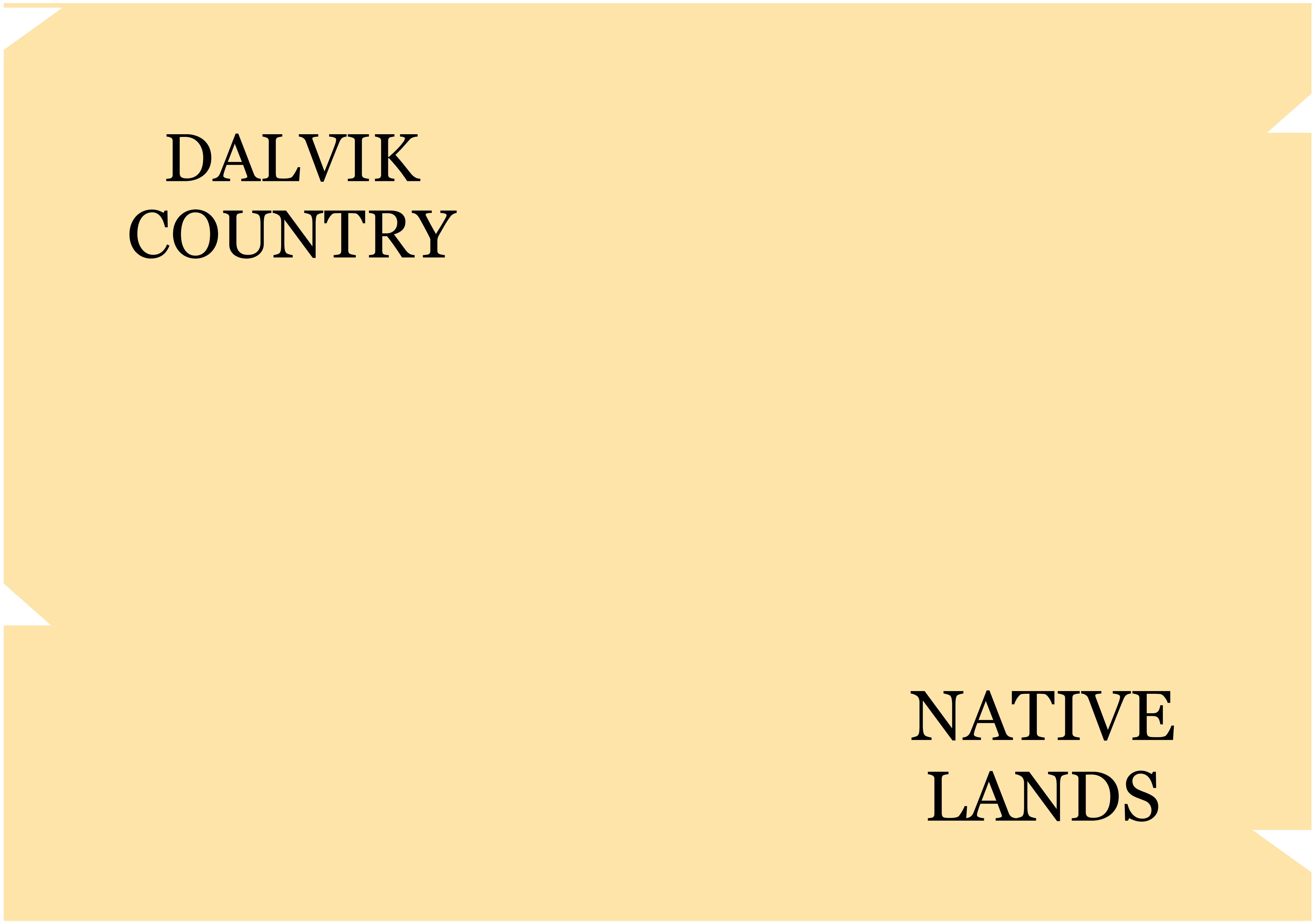


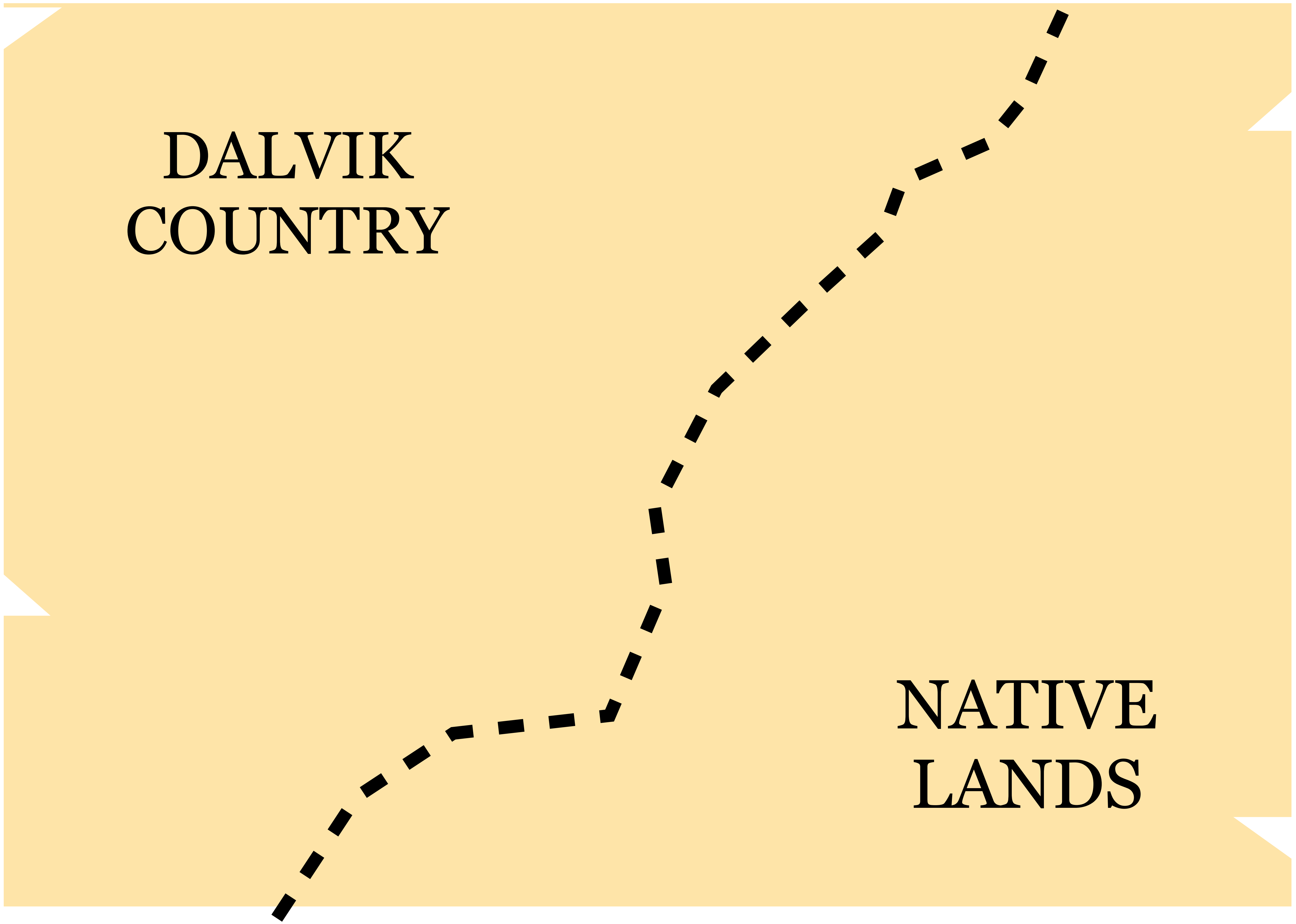
Invoke Games API calls from the UI thread

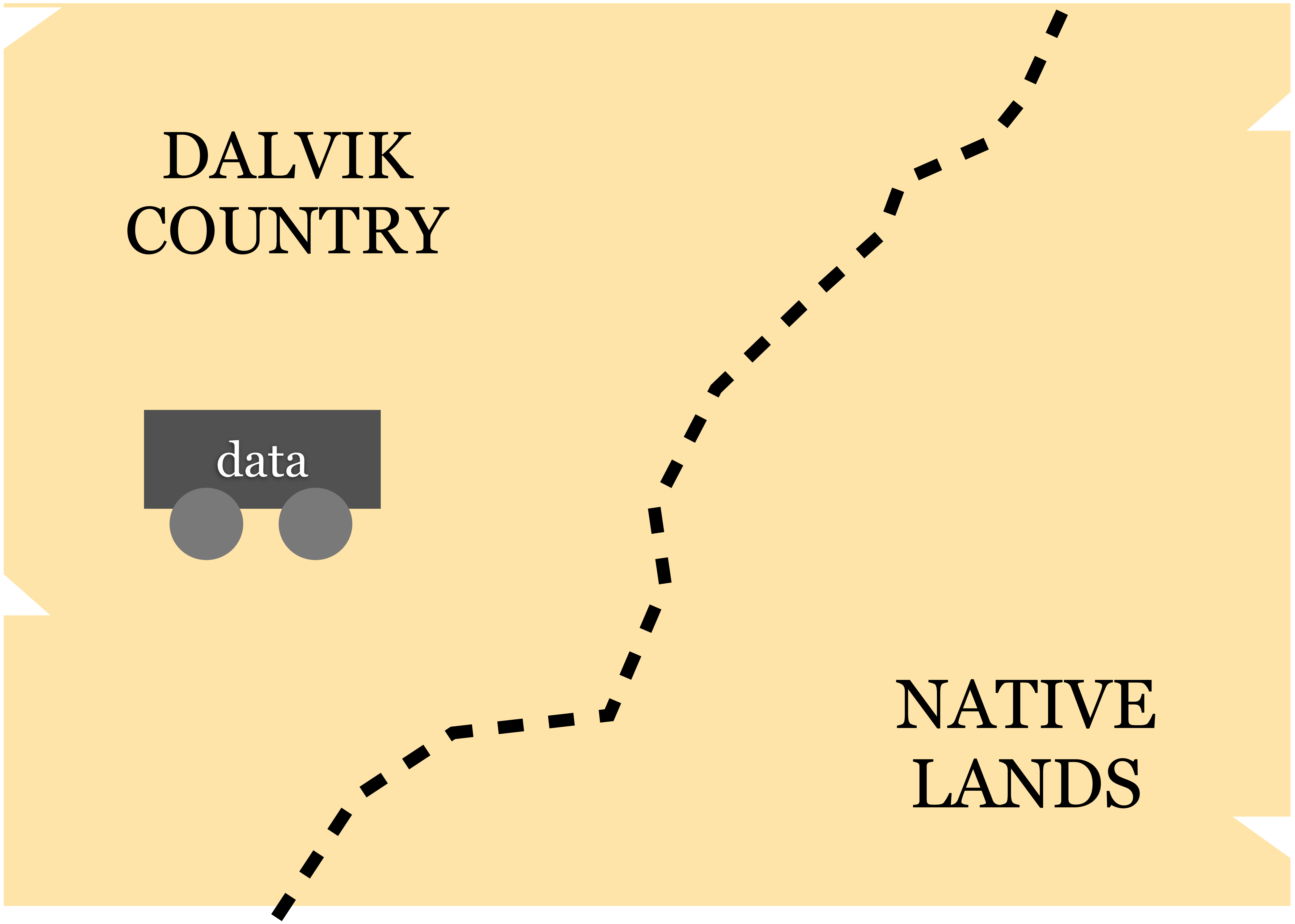
Java

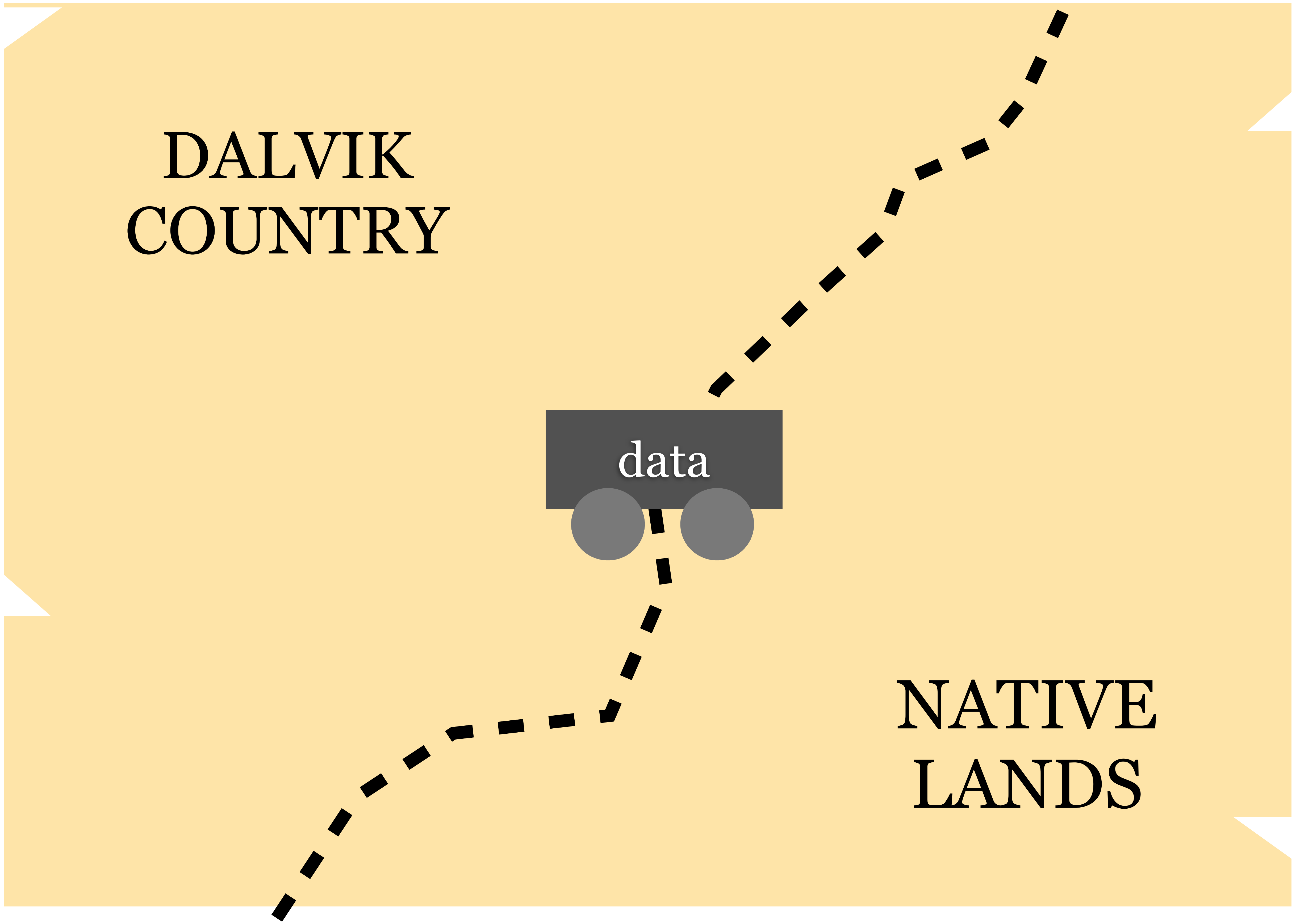
```
public void showAchievements() {
    runOnUiThread(new Runnable() {
        Intent i = mGamesClient.
                  getAchievementsIntent(...);
        startActivityForResult(i, RC_UNUSED);
    });
}
```

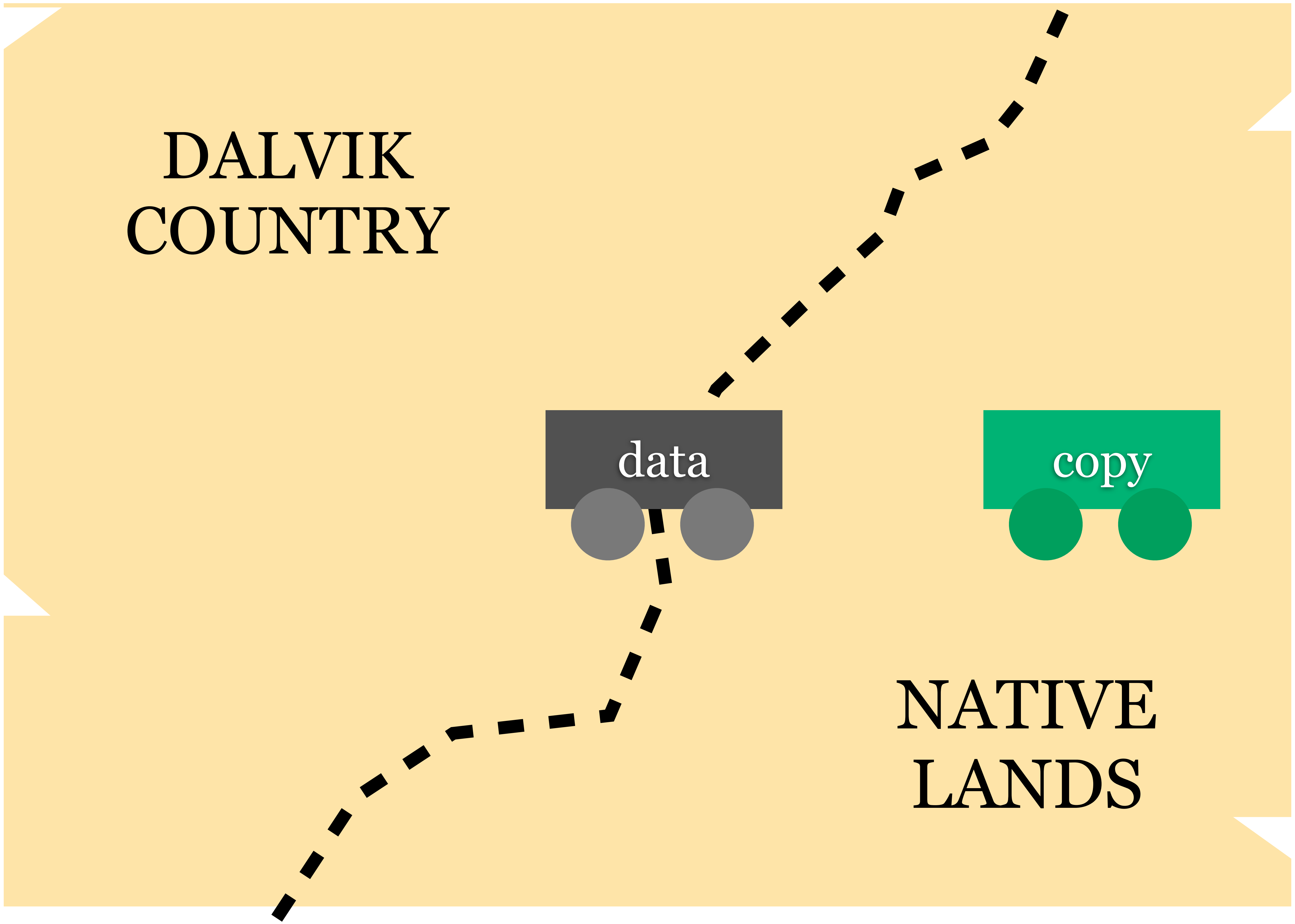
Careful around the border.

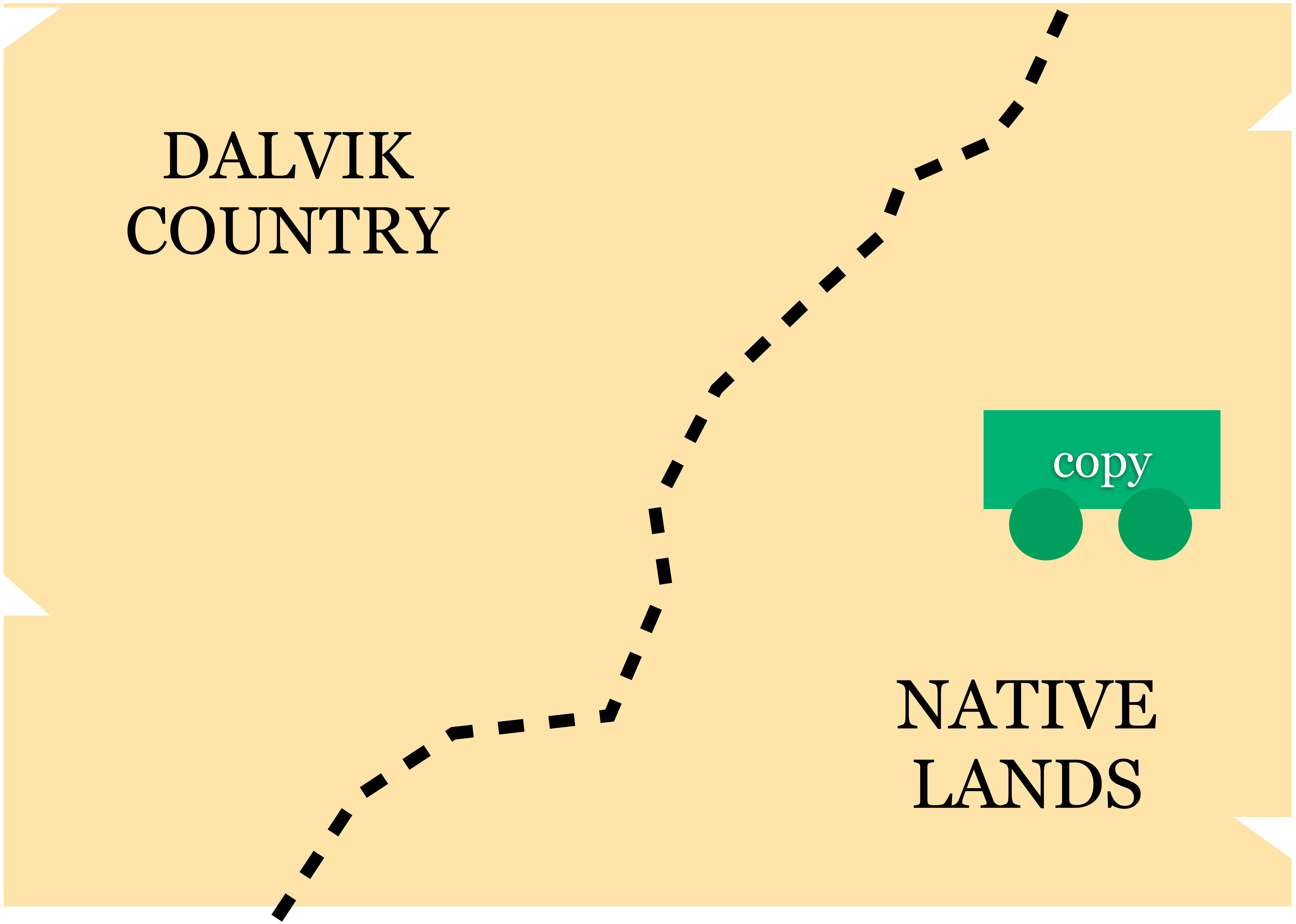

DALVIK COUNTRY
NATIVE LANDS


DALVIK
COUNTRY
NATIVE
LANDS


DALVIK
COUNTRY
data
NATIVE
LANDS


DALVIK COUNTRY
data
NATIVE LANDS


DALVIK COUNTRY
data
copy
NATIVE LANDS


DALVIK
COUNTRY
copy
NATIVE
LANDS

Travel Tips

Travel Tip

#1

Travel light

Travel light

```
jbyteArray jbuf = ...; // 128K managed buffer
jbyte *buf = (jbyte*)
   (*env)->GetByteArrayElements(
            env, jbuf, NULL);
int enemyId = *((int*)buf + 42);
(*env)->ReleaseByteArrayElements(env,
            jbuf, buf, 0);
```

Travel Tip

#1

Travel light

```
jbyteArray jbuf = ...; // 128K managed buffer

int enemyId;

(*env)->GetByteArrayRegion(env,
    jbuf, 42, sizeof(int), (jbyte*)&enemyId);
```

Travel Tip

#2

Pack the right buffers

	Dalvik	Native
managed byte[]		
allocateDirect		

Travel Tip

#2

Pack the right buffers

	Dalvik	Native
managed byte[]	fast	slow
allocateDirect		

Travel Tip

#2

Pack the right buffers

	Dalvik	Native
managed byte[]	fast	slow
allocateDirect	slow	fast

Travel Tip

#3

Don’t engage in race conditions

Travel Tip

#3

Don’t engage in race conditions

buffers

Travel Tip #3

Don’t engage in race conditions

buffers

GamesClient: No concurrent calls!

Travel Tip

#4

Don’t keep stuff that’s not yours

Travel Tip

#4

Don’t keep stuff that’s not yours

local/global references

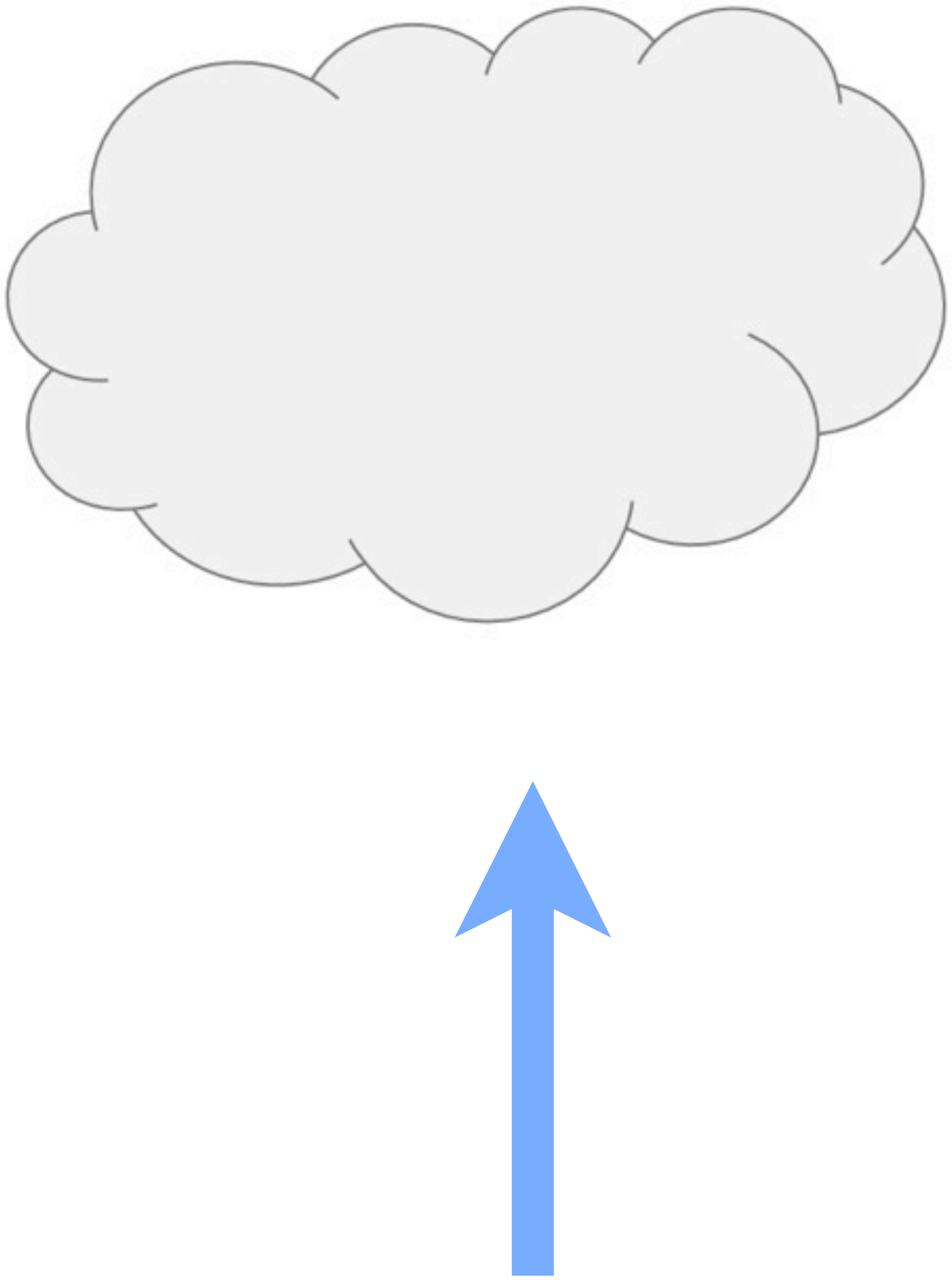
Travel Tip

#4

Don’t keep stuff that’s not yours

local/global references

NewGlobalRef

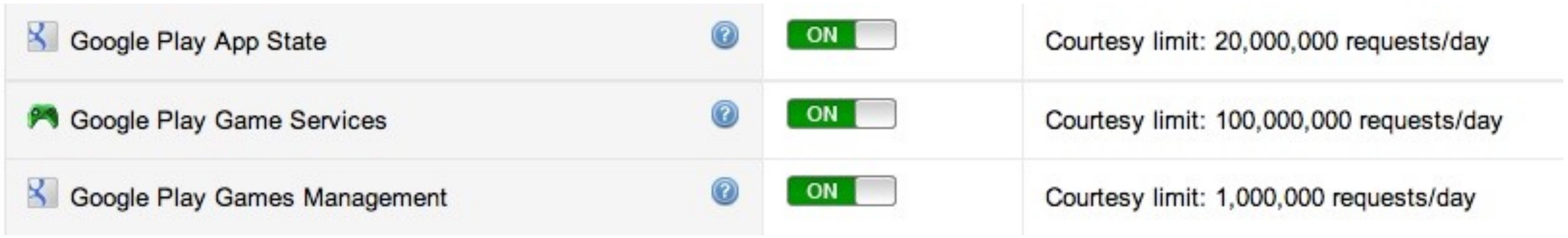


4

How to...

Handle Cloud Save Conflicts

https://code.google.com/apis/console



Google Play App State	ON	Courtesy limit: 20,000,000 requests/day
Google Play Game Services	ON	Courtesy limit: 100,000,000 requests/day
Google Play Games Management	ON	Courtesy limit: 1,000,000 requests/day

Cloud Save APIs

Java

```java
public void loadState(OnStateLoadedListener listener,
        int stateKey);
```

Cloud Save APIs

Java

```java
public void loadState(OnStateLoadedListener listener,
        int stateKey);

public void updateState(int stateKey, byte[] data);
```

Cloud Save APIs

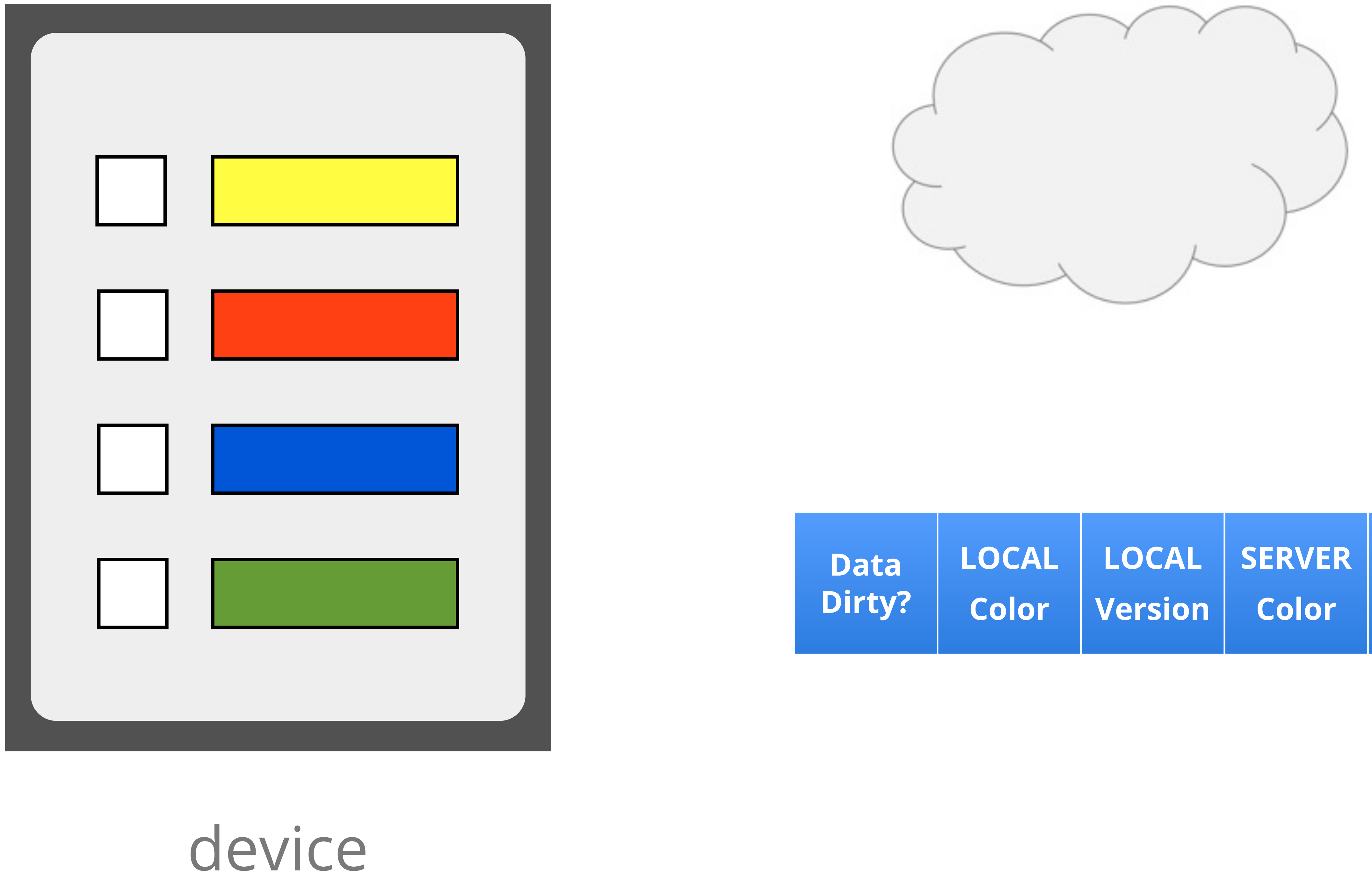
Java

```java
public void loadState(OnStateLoadedListener listener,
        int stateKey);

public void updateState(int stateKey, byte[] data);

public void resolveState(OnStateLoadedListener listener,
        int stateKey, String resolvedVersion,
        byte[] data);
```

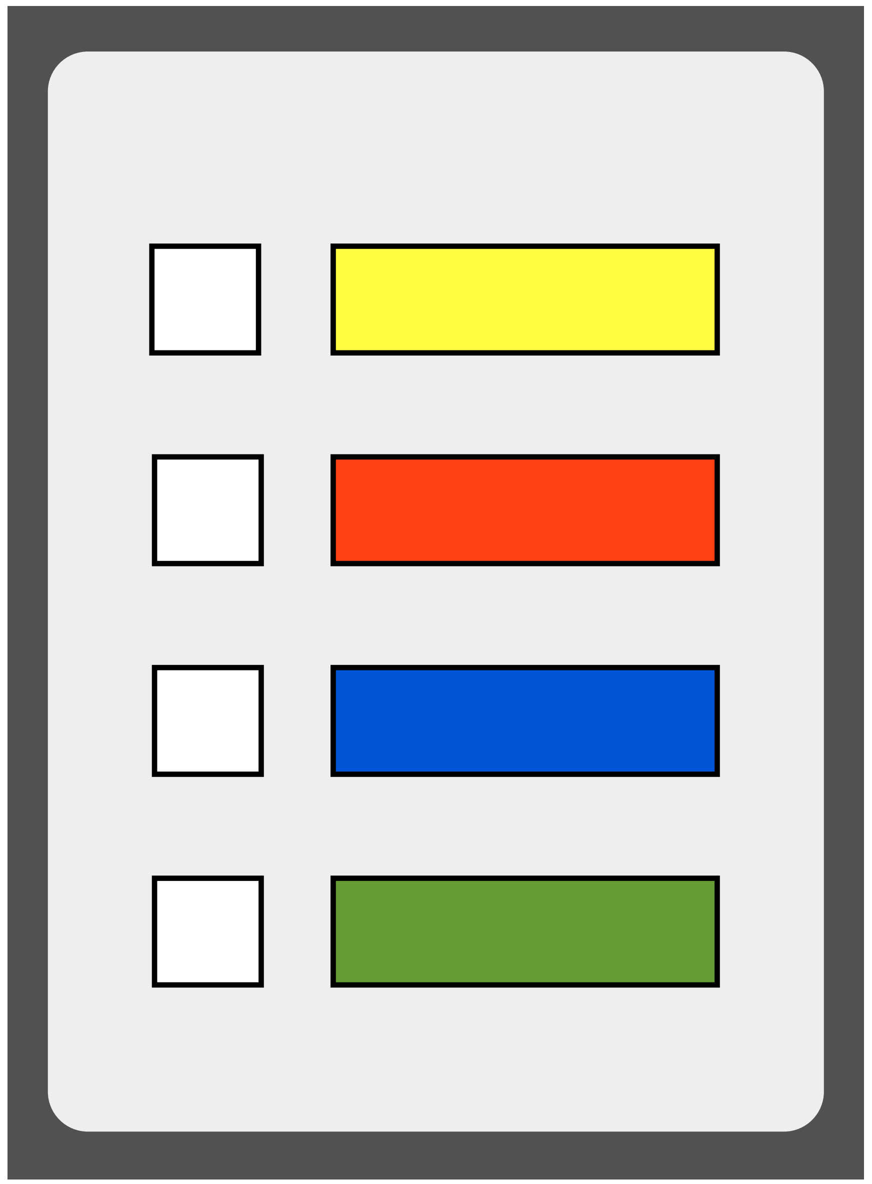
Cloud Save APIs

Java

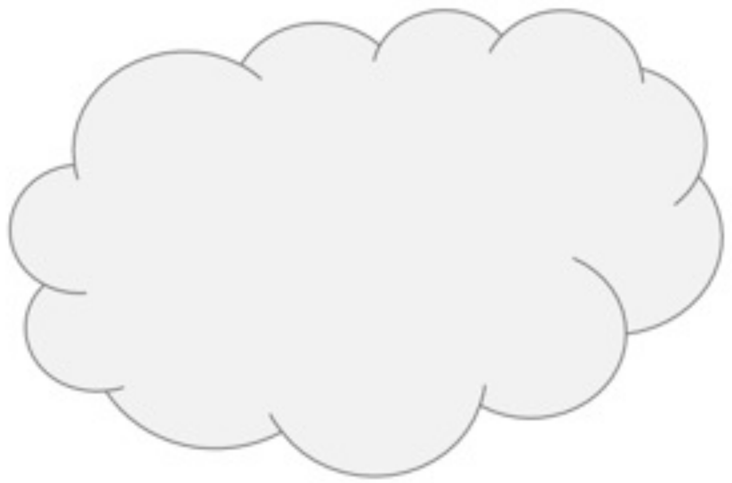
```
interface OnStateLoadedListener {
    void onStateLoaded(int statusCode, int stateKey,
            byte[] localData);


    void onStateConflict(int stateKey,
            String resolvedVersion, byte[] localData,
            byte[] serverData);
}
```



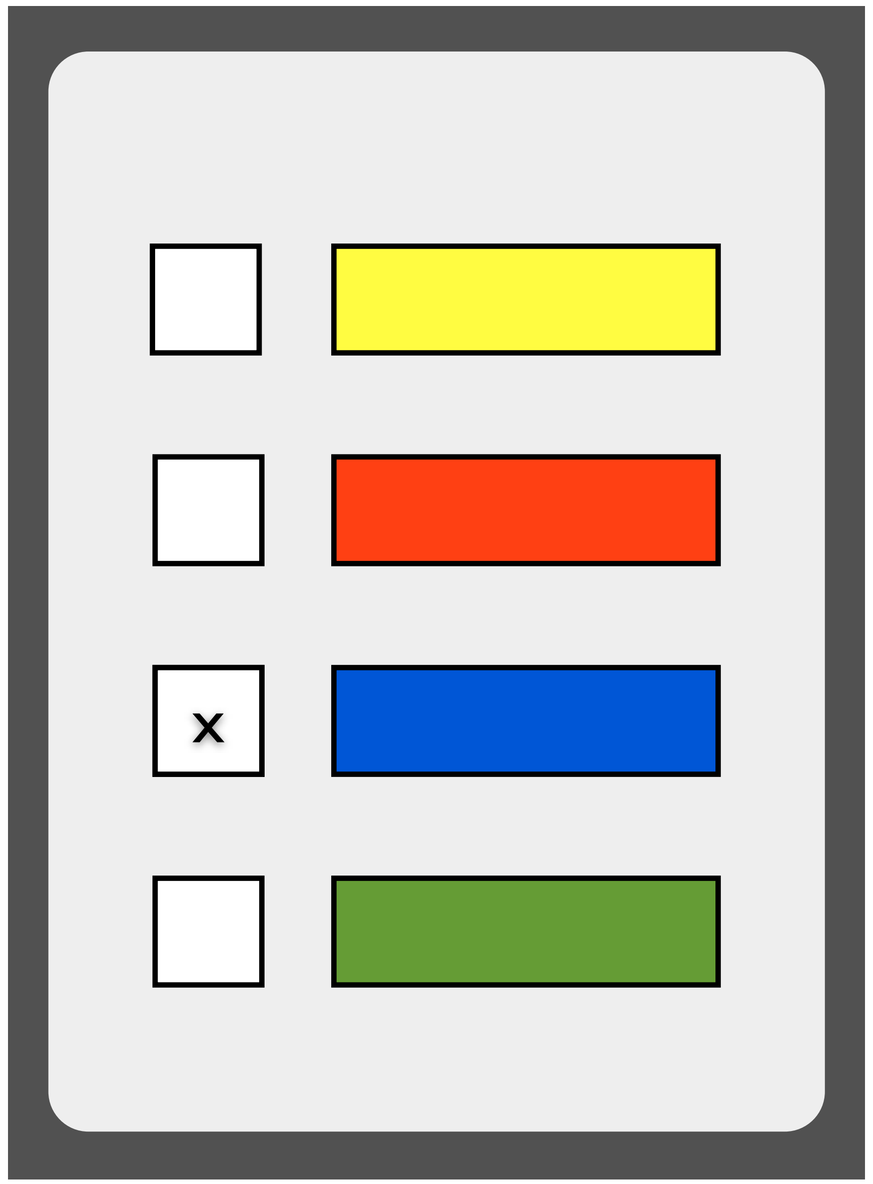
Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version



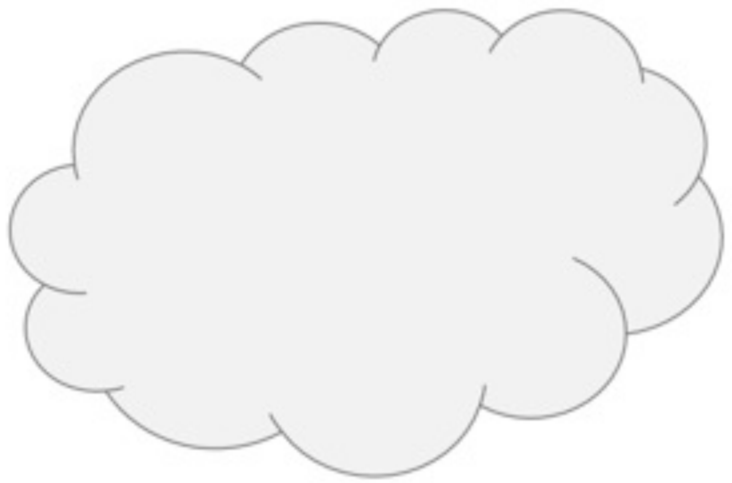
device



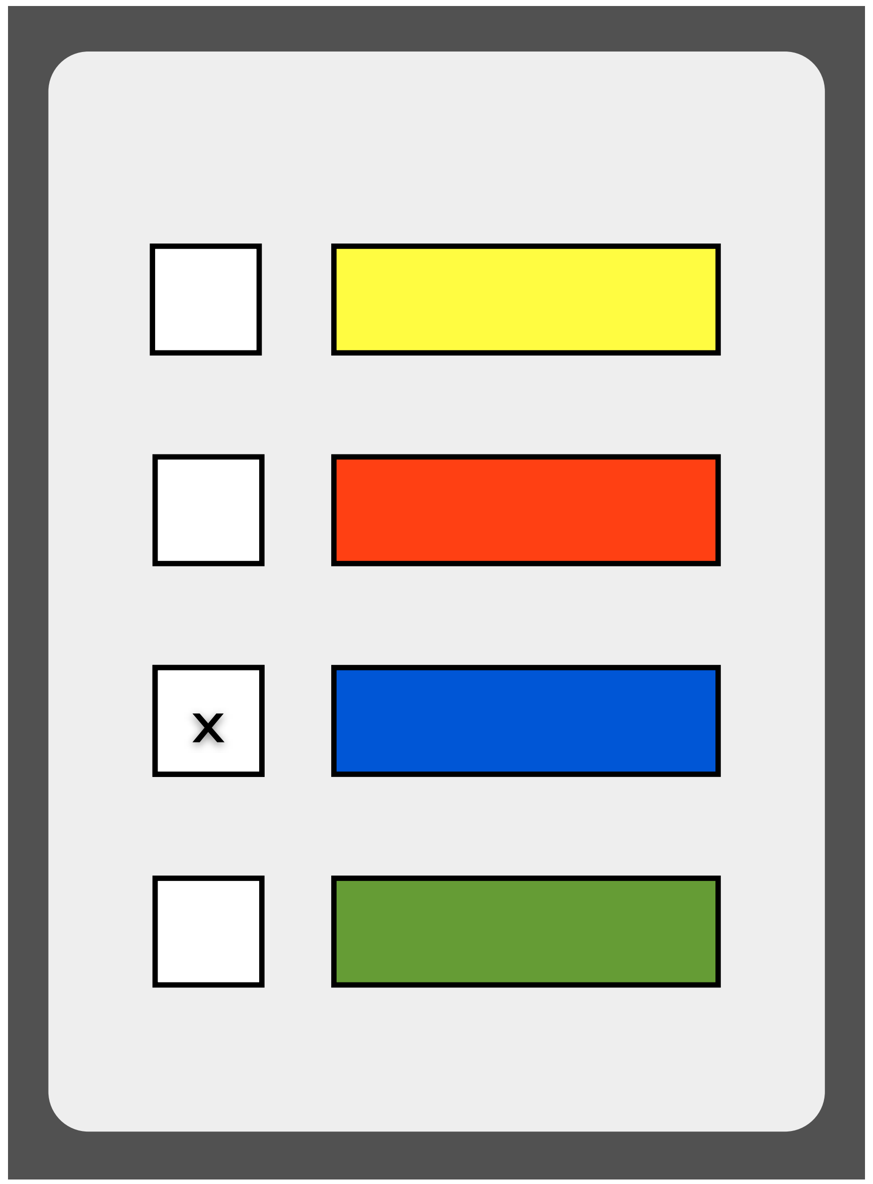
Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version



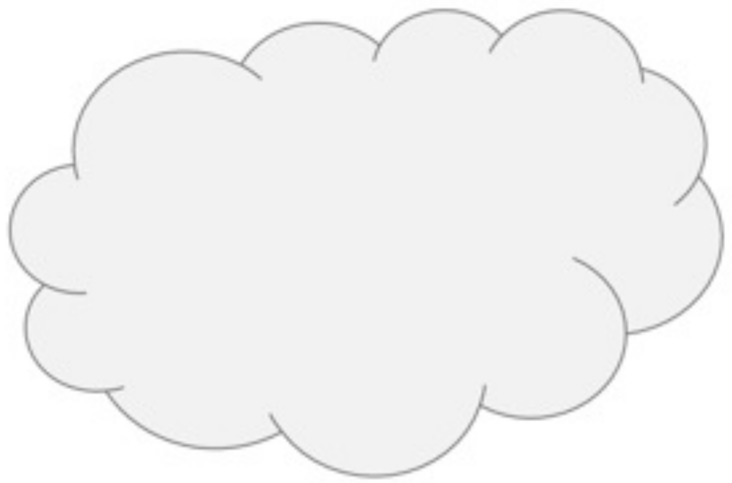
device



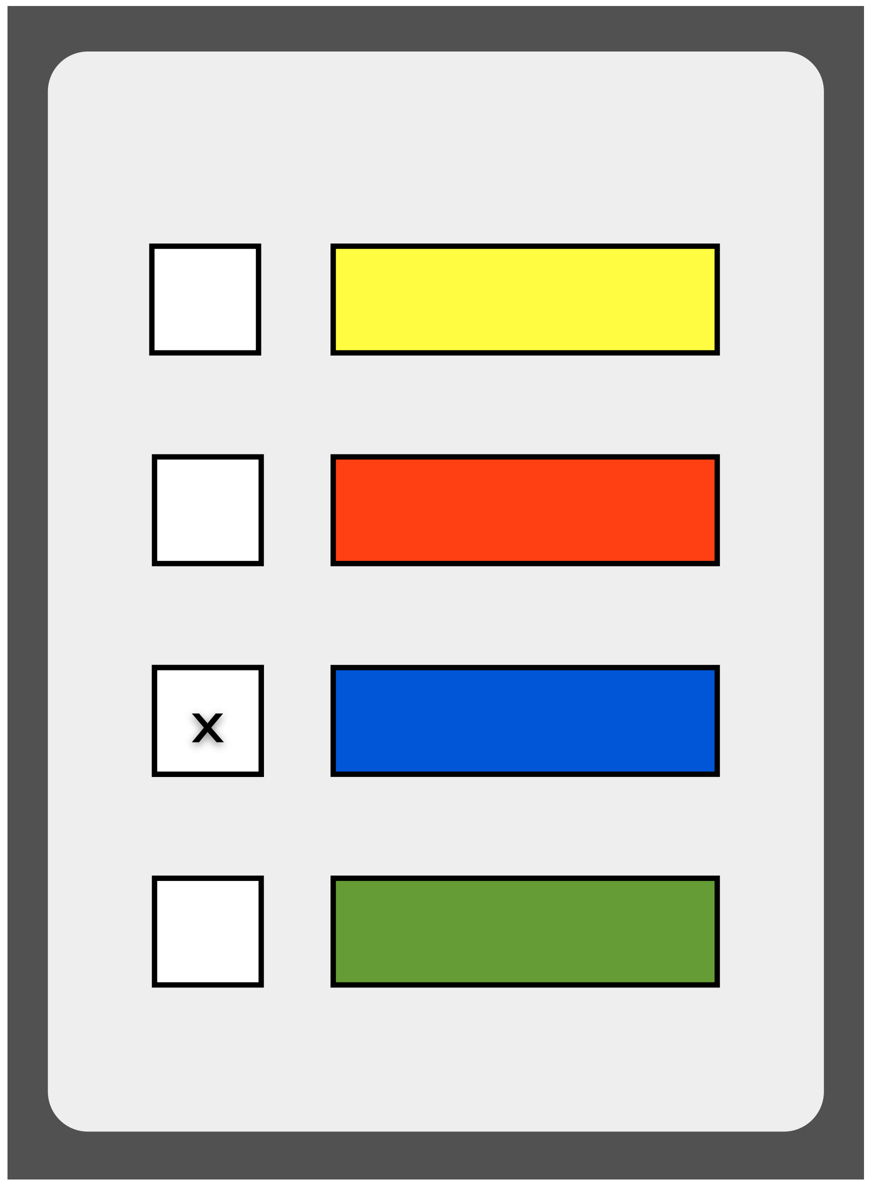
Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version



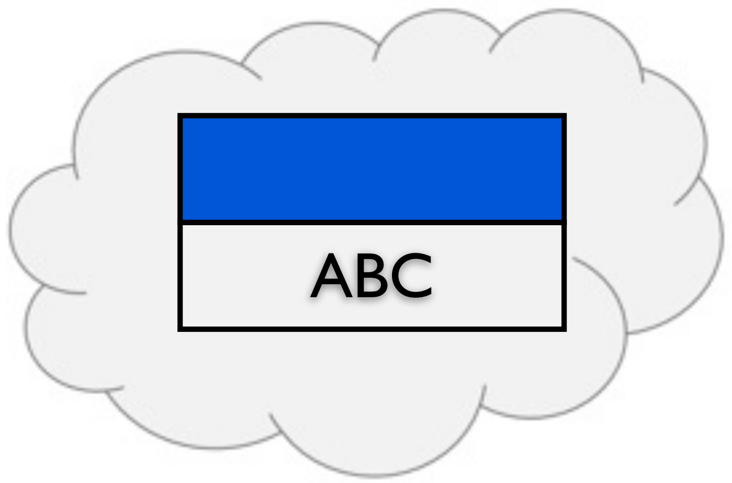
device



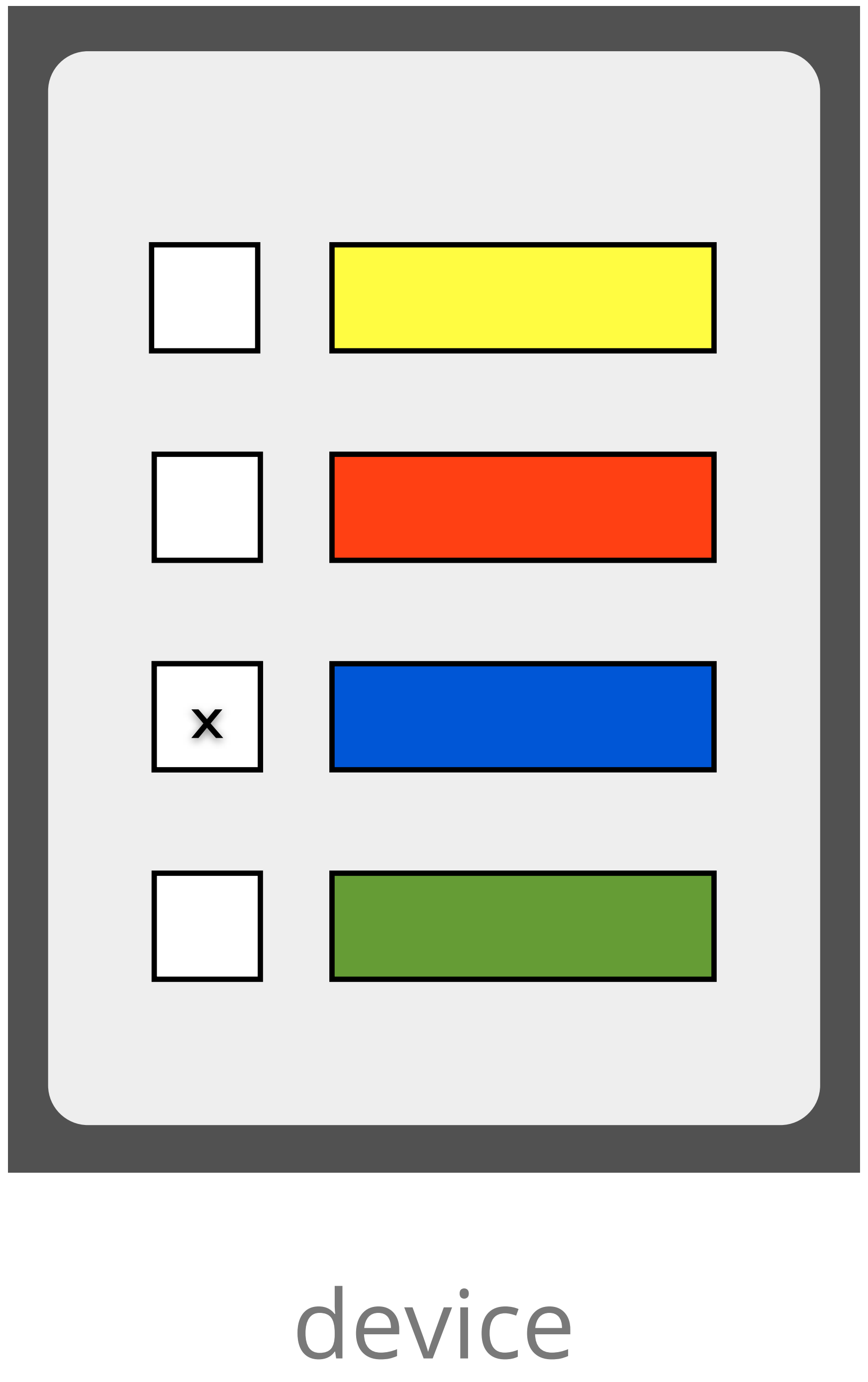
Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
Y	🟦	N/A		

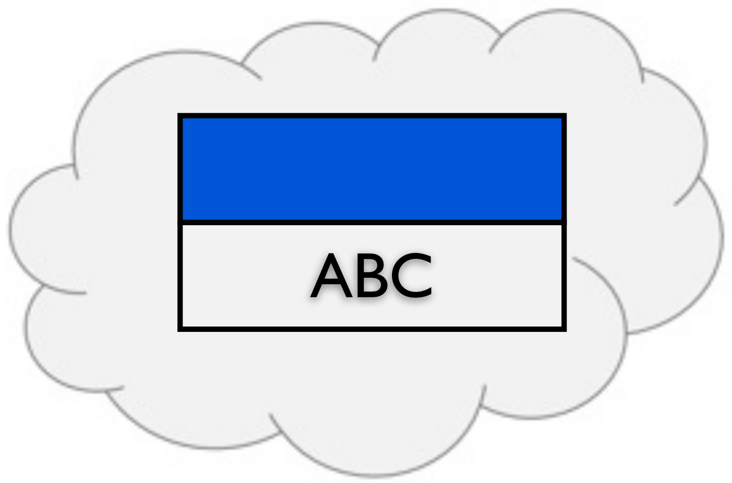


device

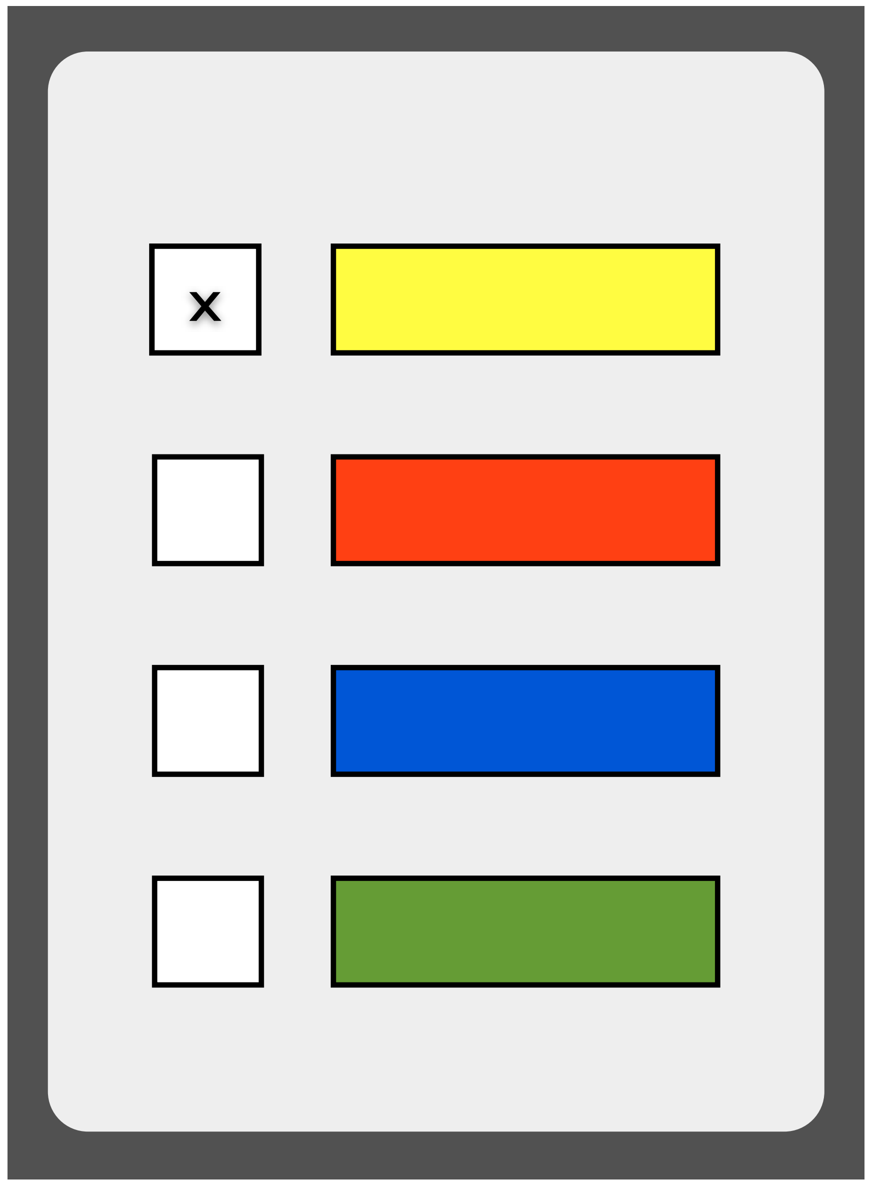


Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
Y	🟦	N/A		

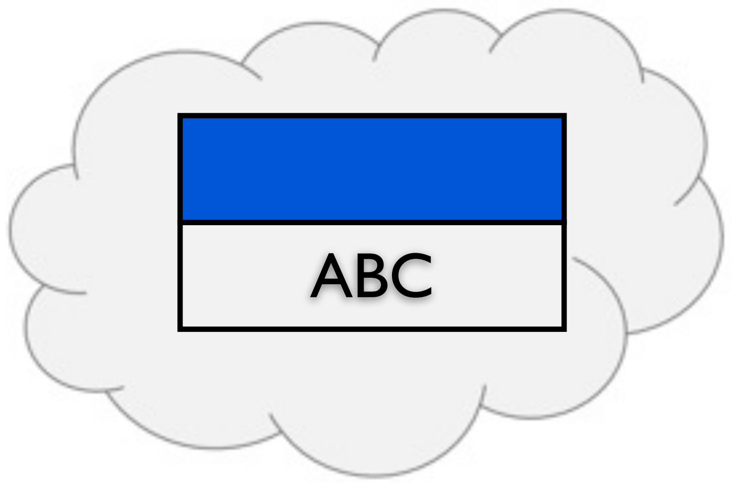




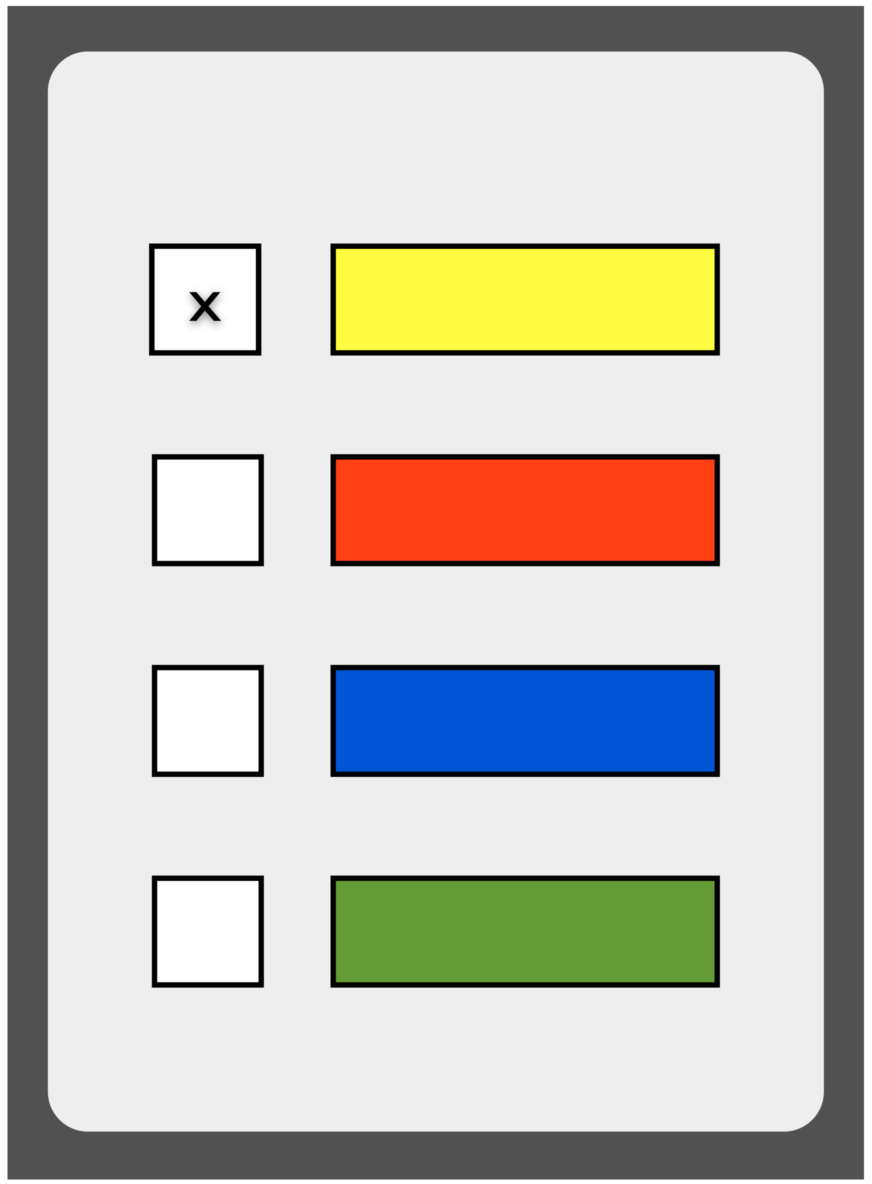
Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
N	🟦	ABC		



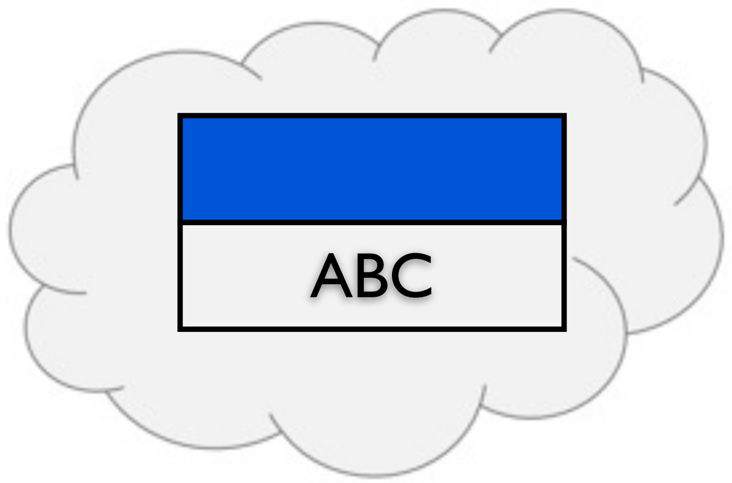
device



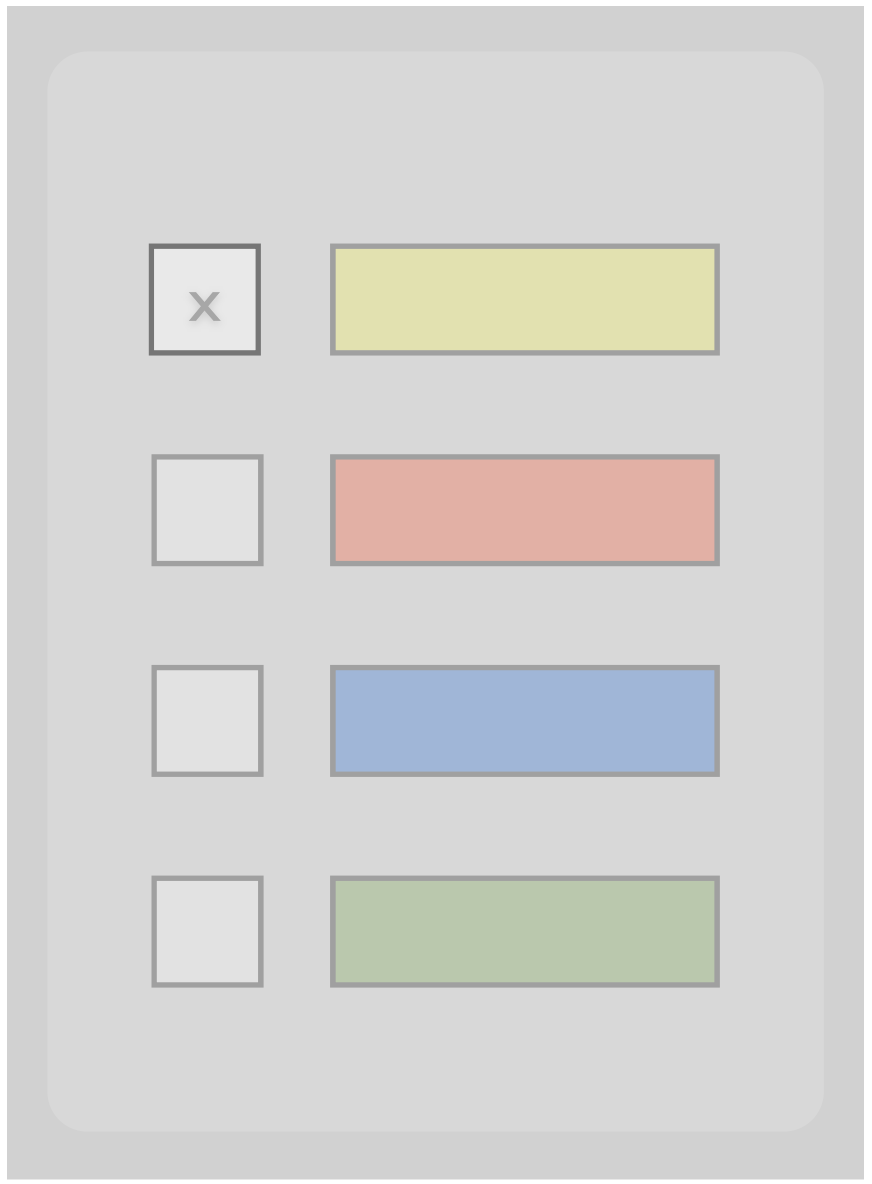
Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
N	🟦	ABC		



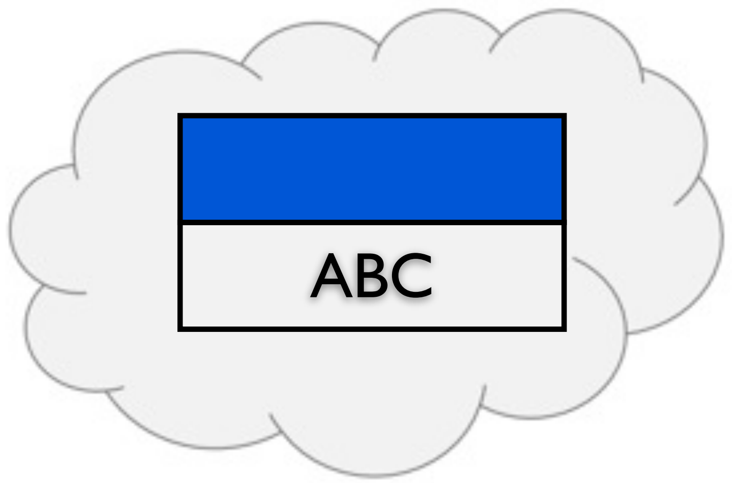
device



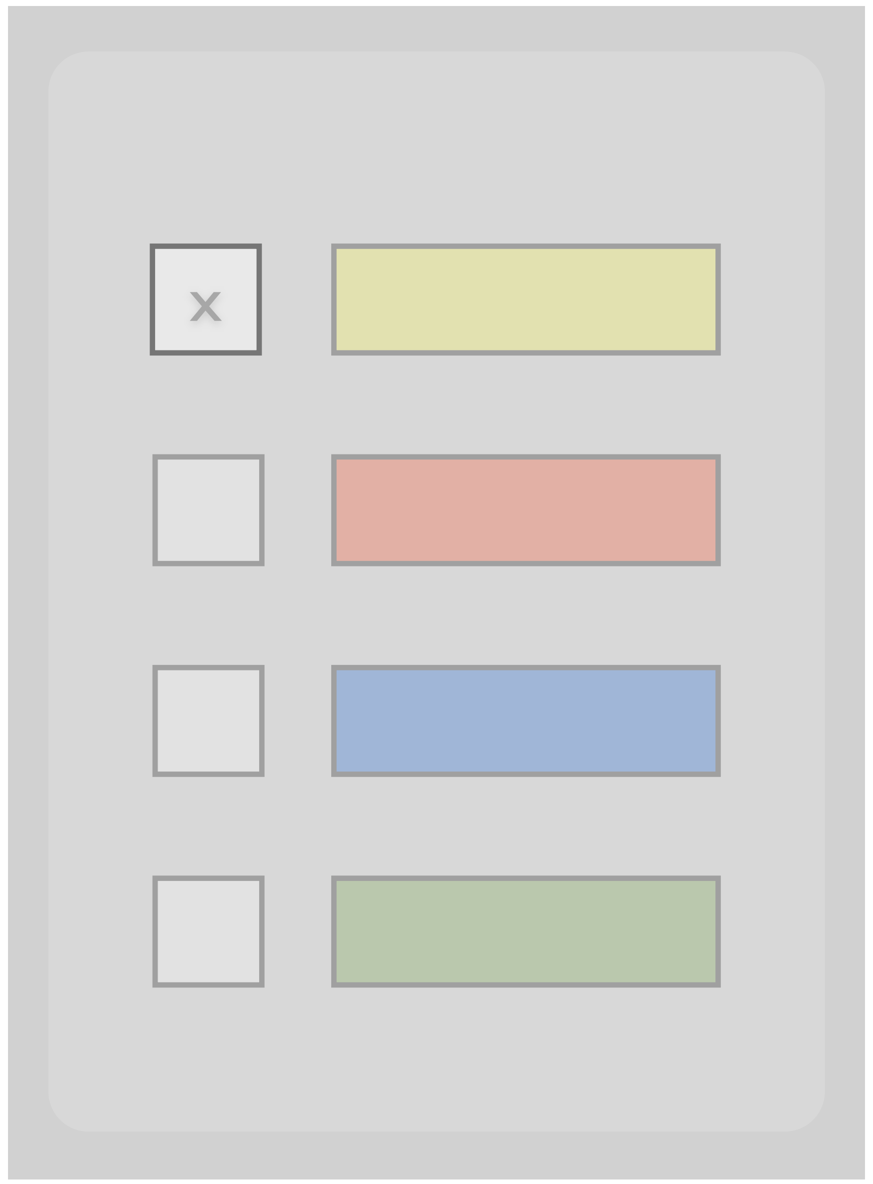
Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
Y	🟨	ABC		



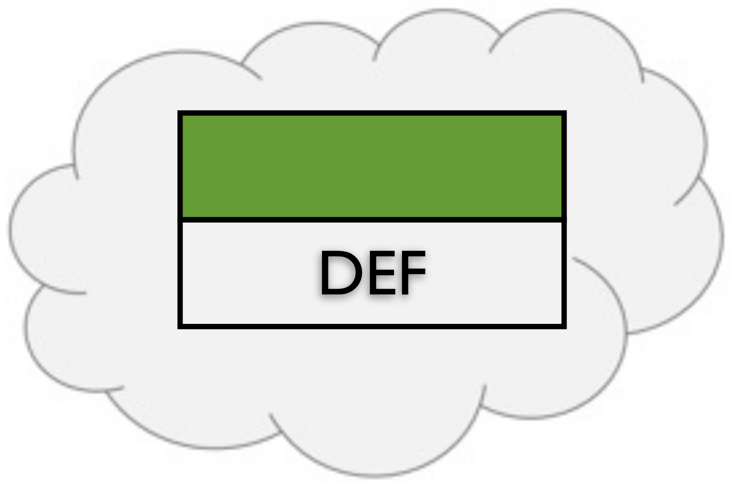
device



Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
Y	🟨	ABC		

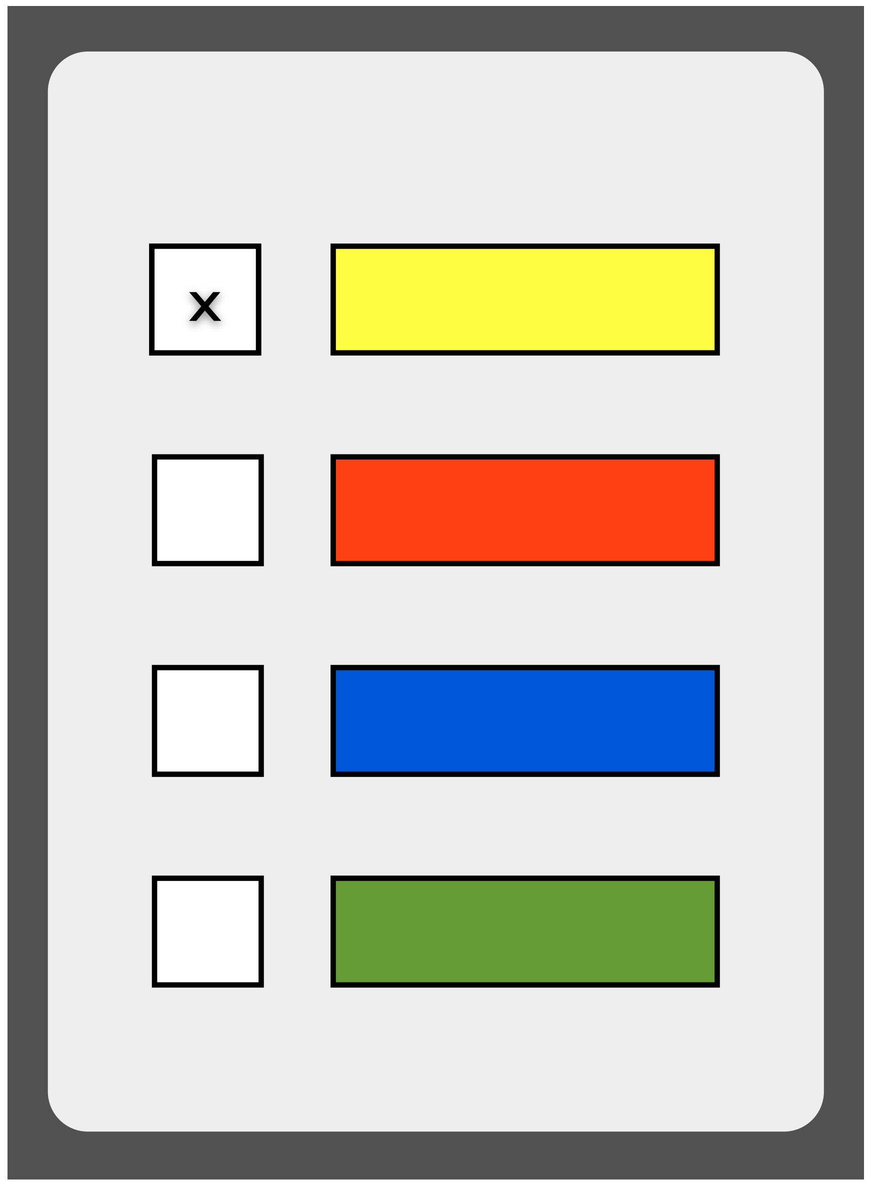


device

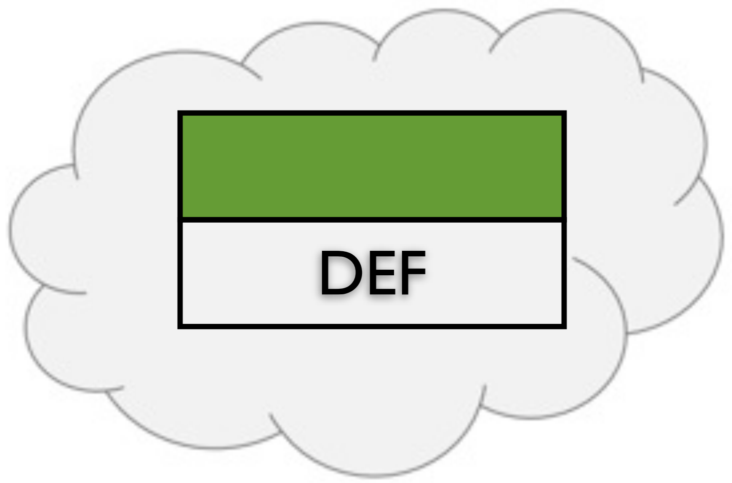


Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
Y	🟨	ABC		

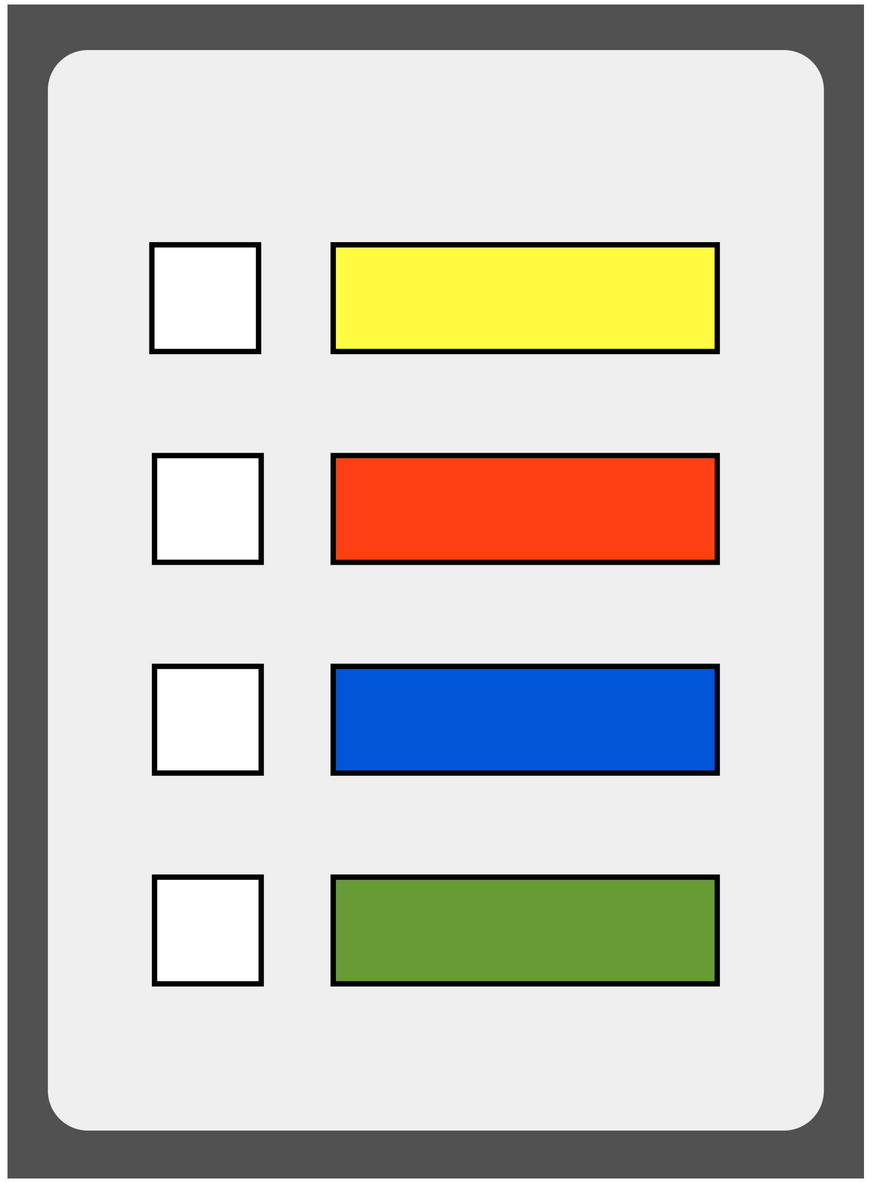
Monday, May 20,



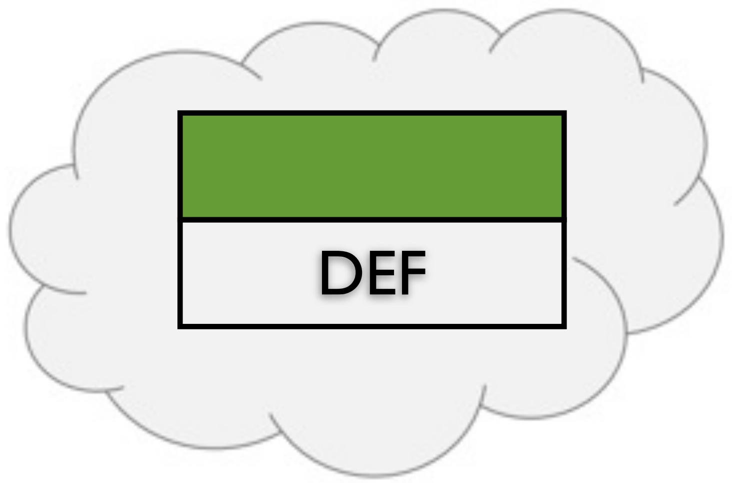
device



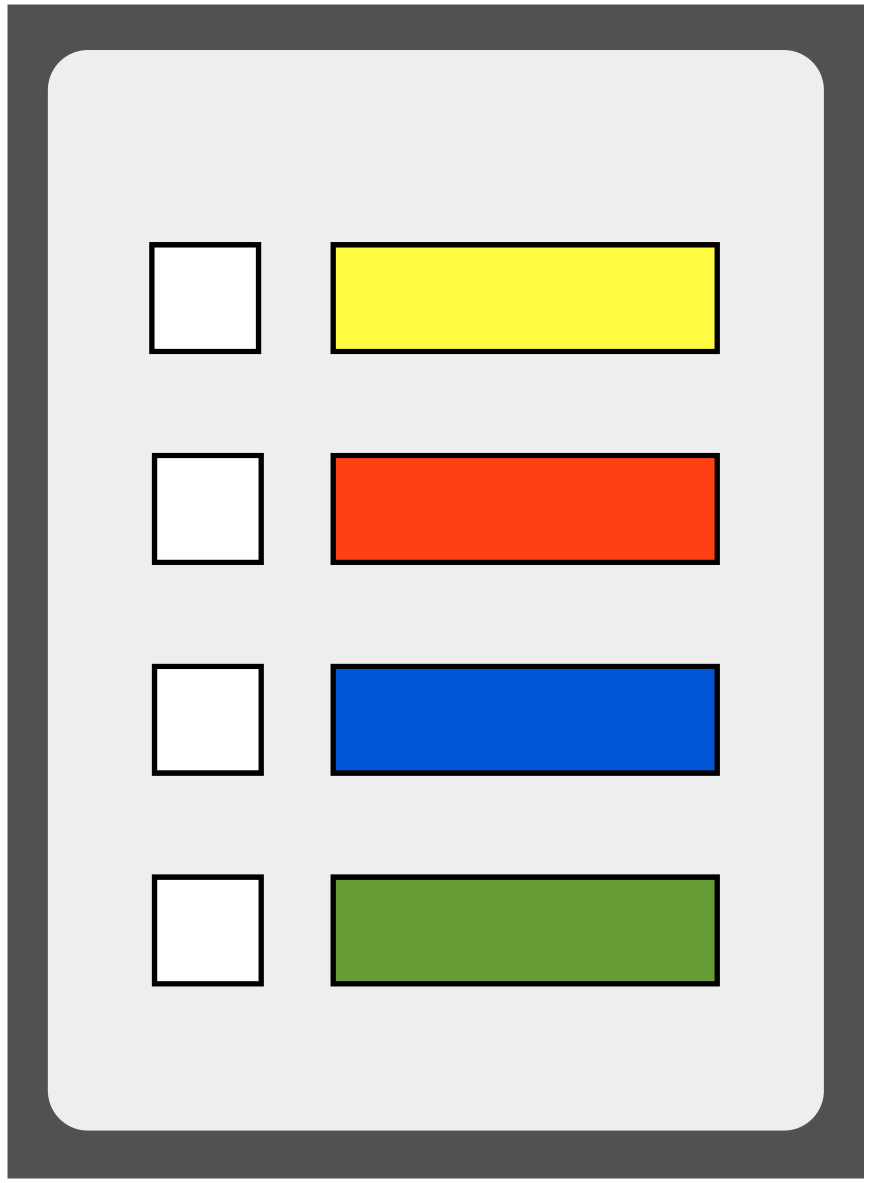
Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
Y	🟨	ABC		

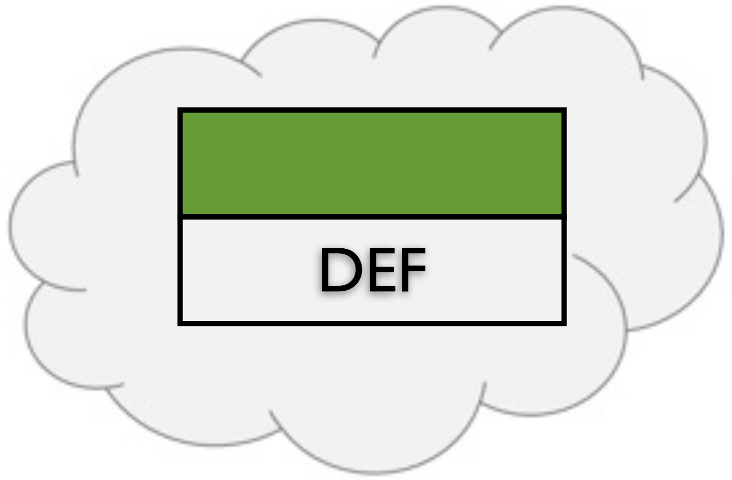


device



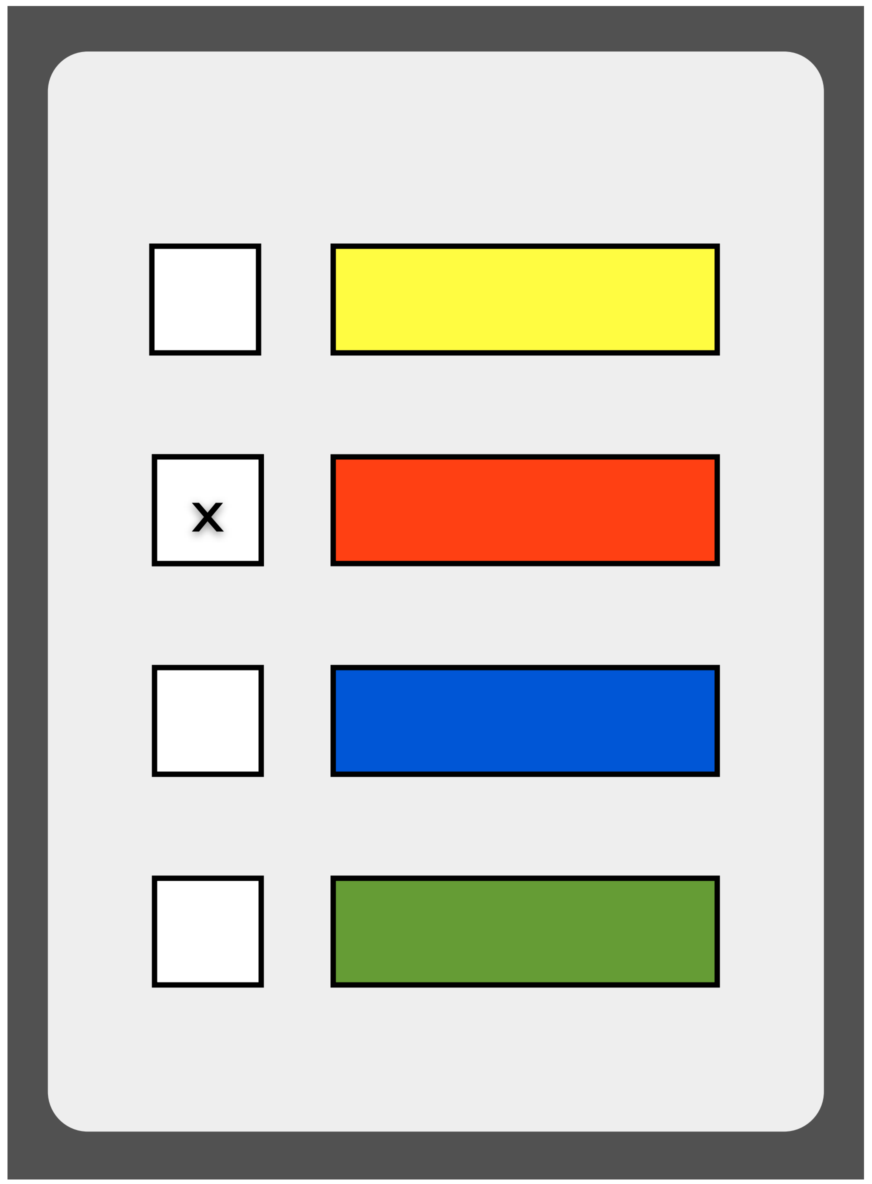
Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
Y	🟨	ABC		



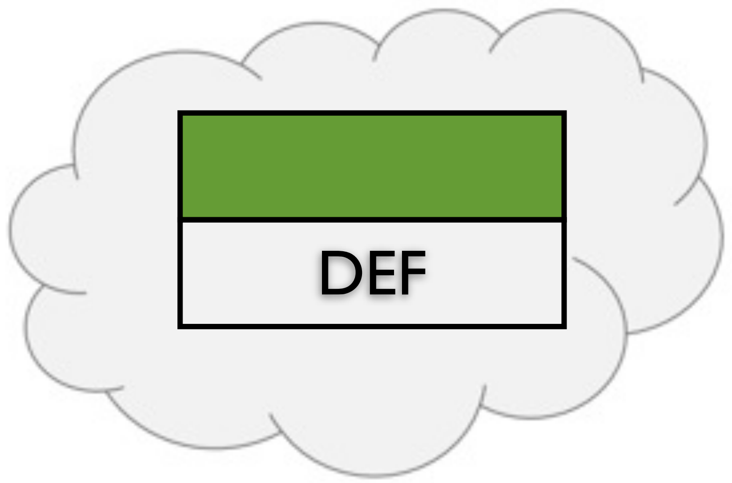


Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
Y	🟨	ABC	🟩	DEF

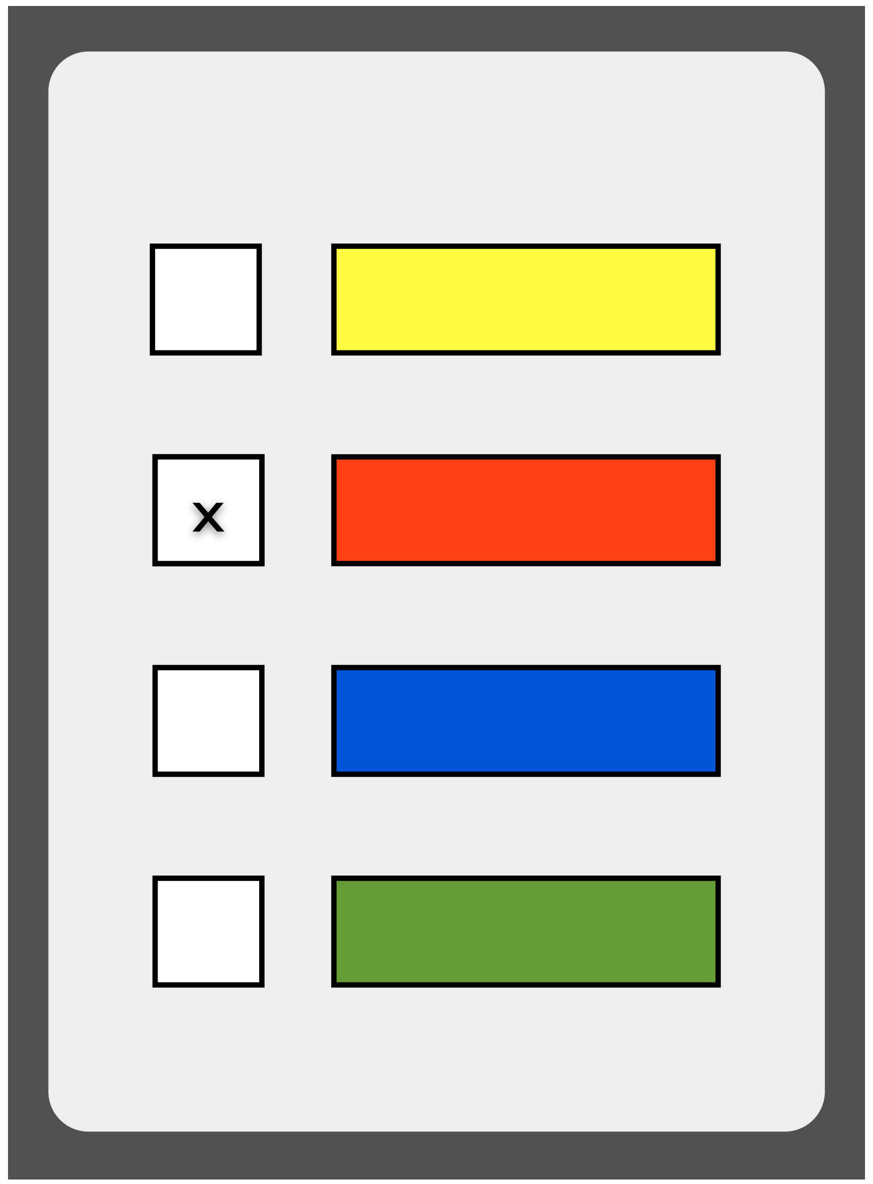
```
onStateConflict(0, “DEF”, “YELLOW”, “GREEN”)
```



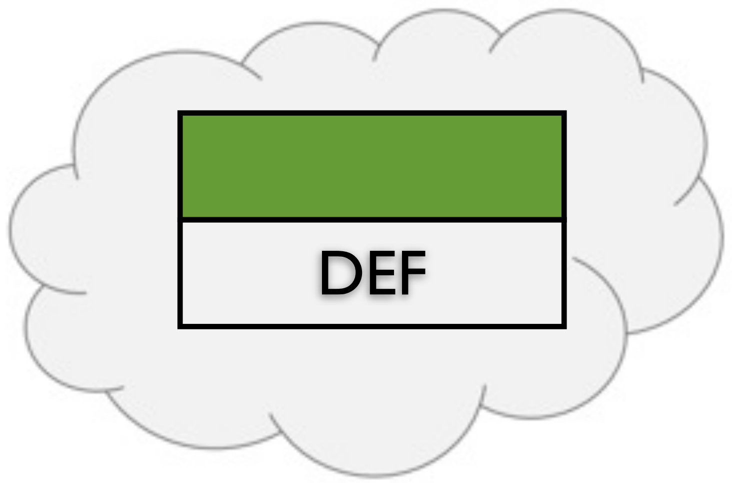
device



Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
Y	🟨	ABC	🟩	DEF

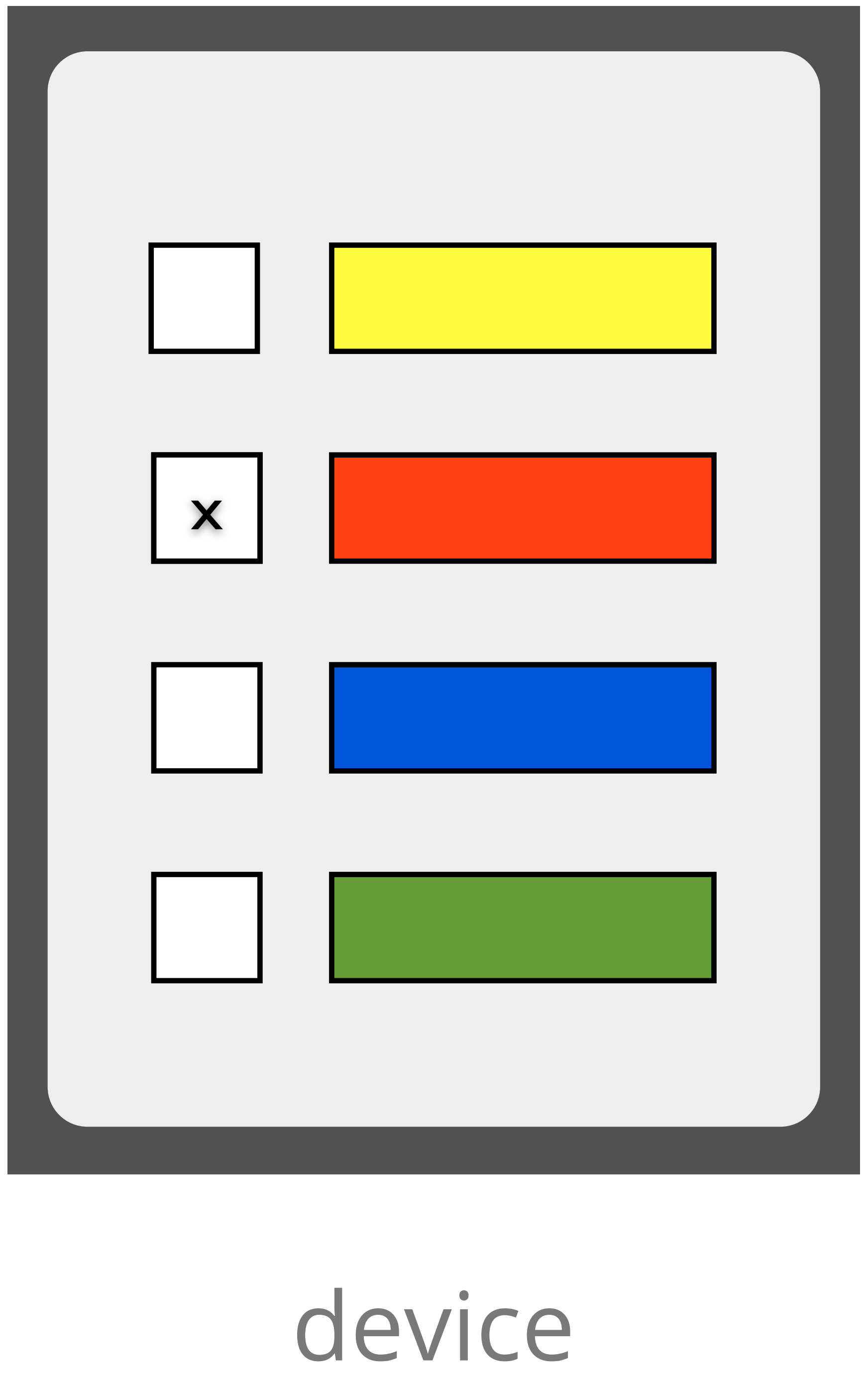


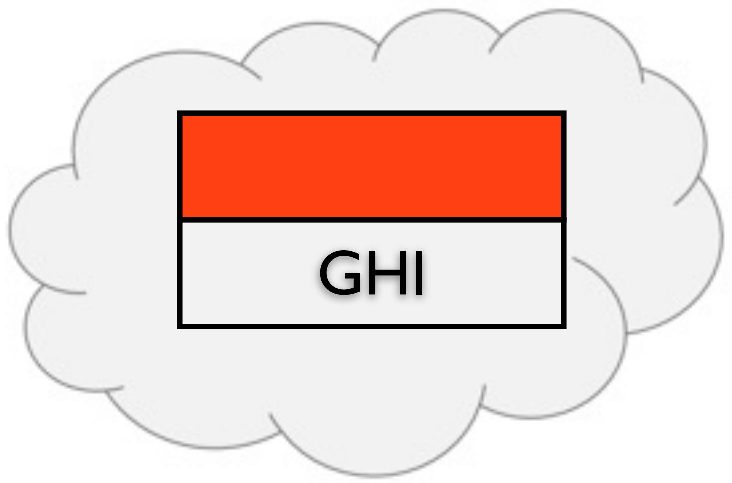
device



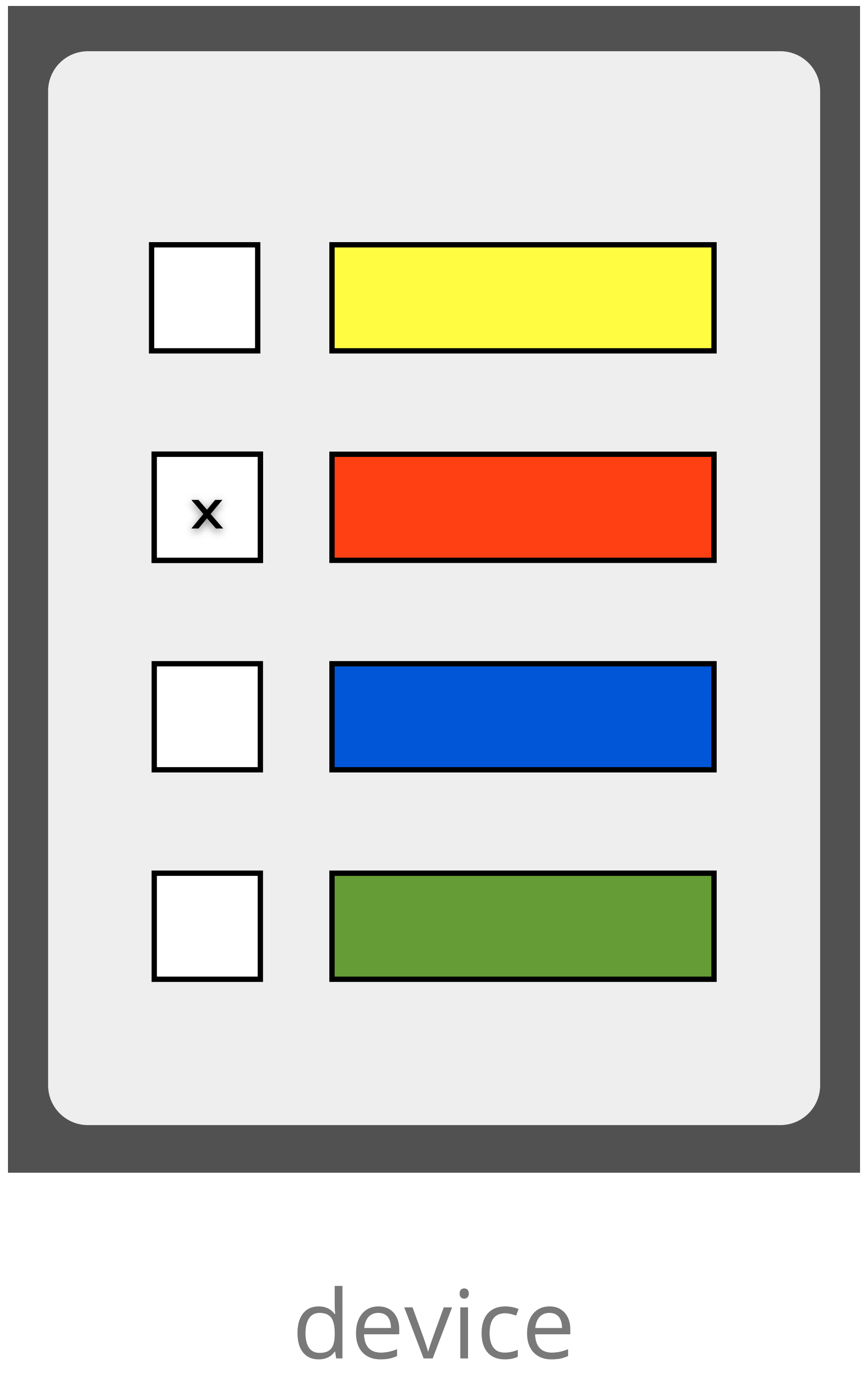
Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
Y	🟥	DEF	🟩	DEF

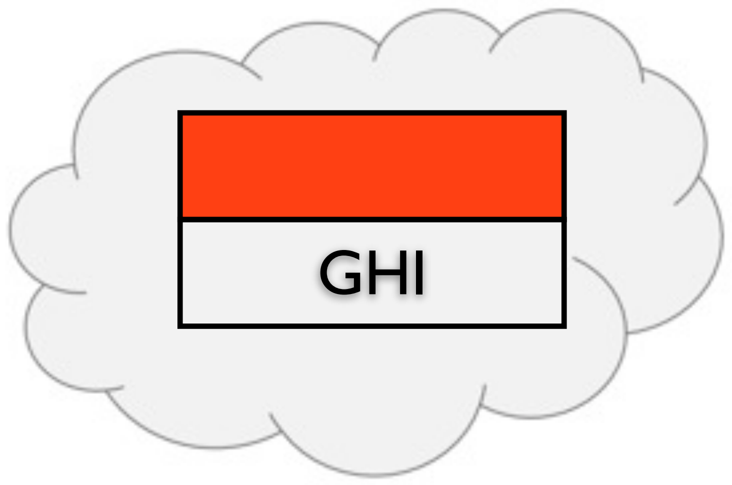
```
resolveState(this, 0, “DEF”, “RED”)
```





Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
Y	🟥	DEF	🟩	DEF



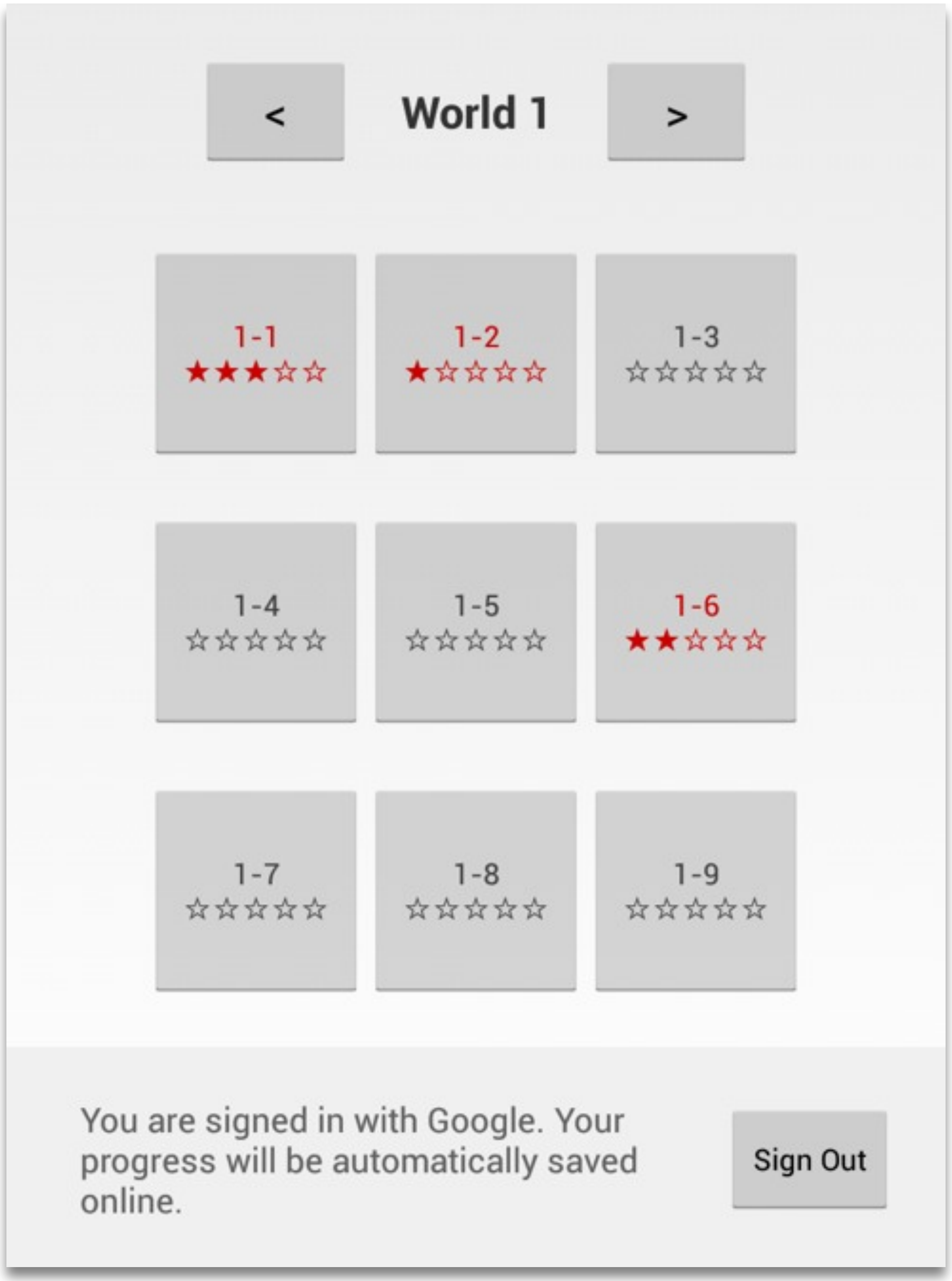


Data Dirty?	LOCAL Color	LOCAL Version	SERVER Color	SERVER Version
N	🟥	GHI		

How to know which data is best?

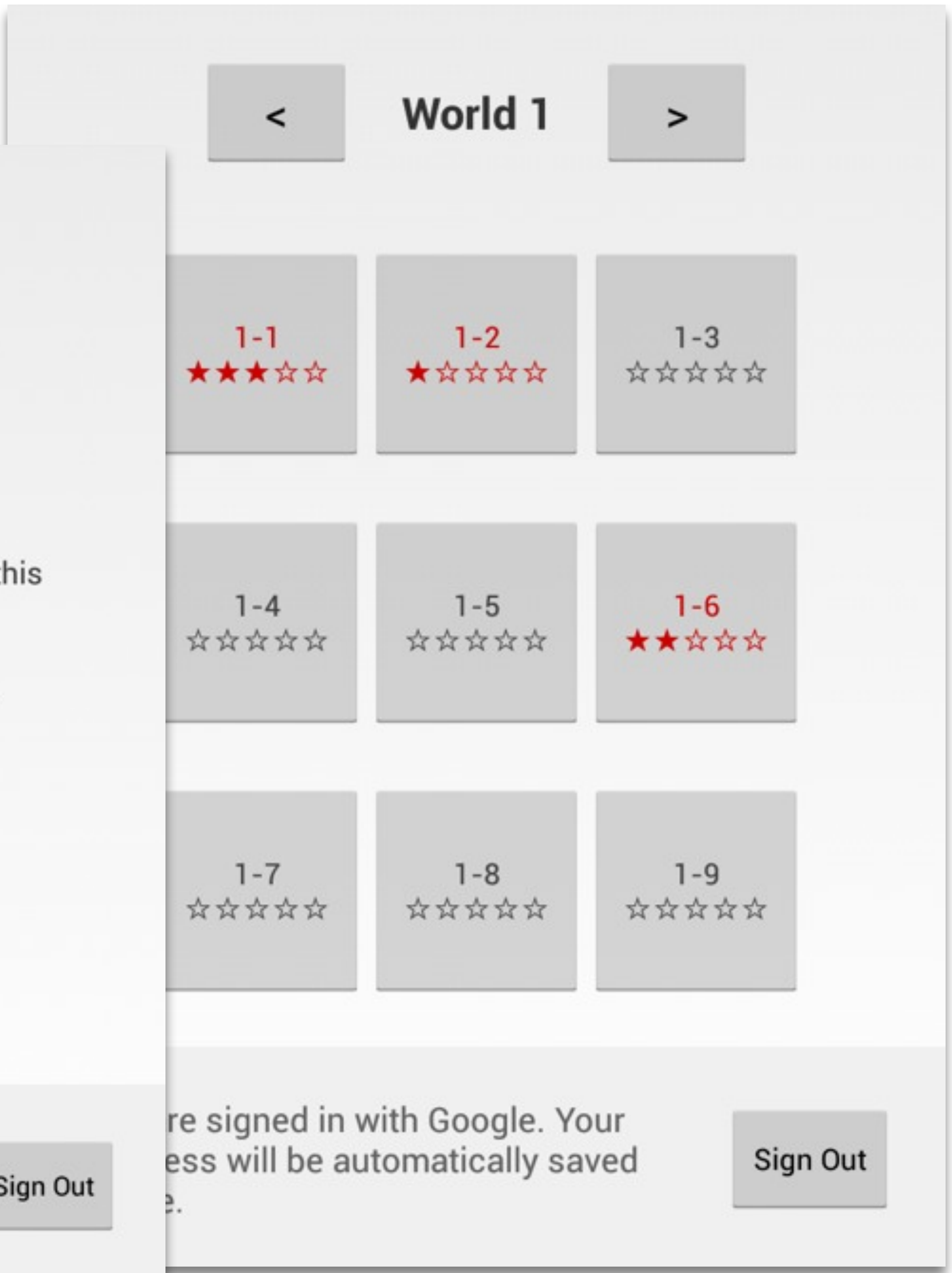
CollectAllTheStars

CollectAllTheStars



You are signed in with Google. Your progress will be automatically saved online.

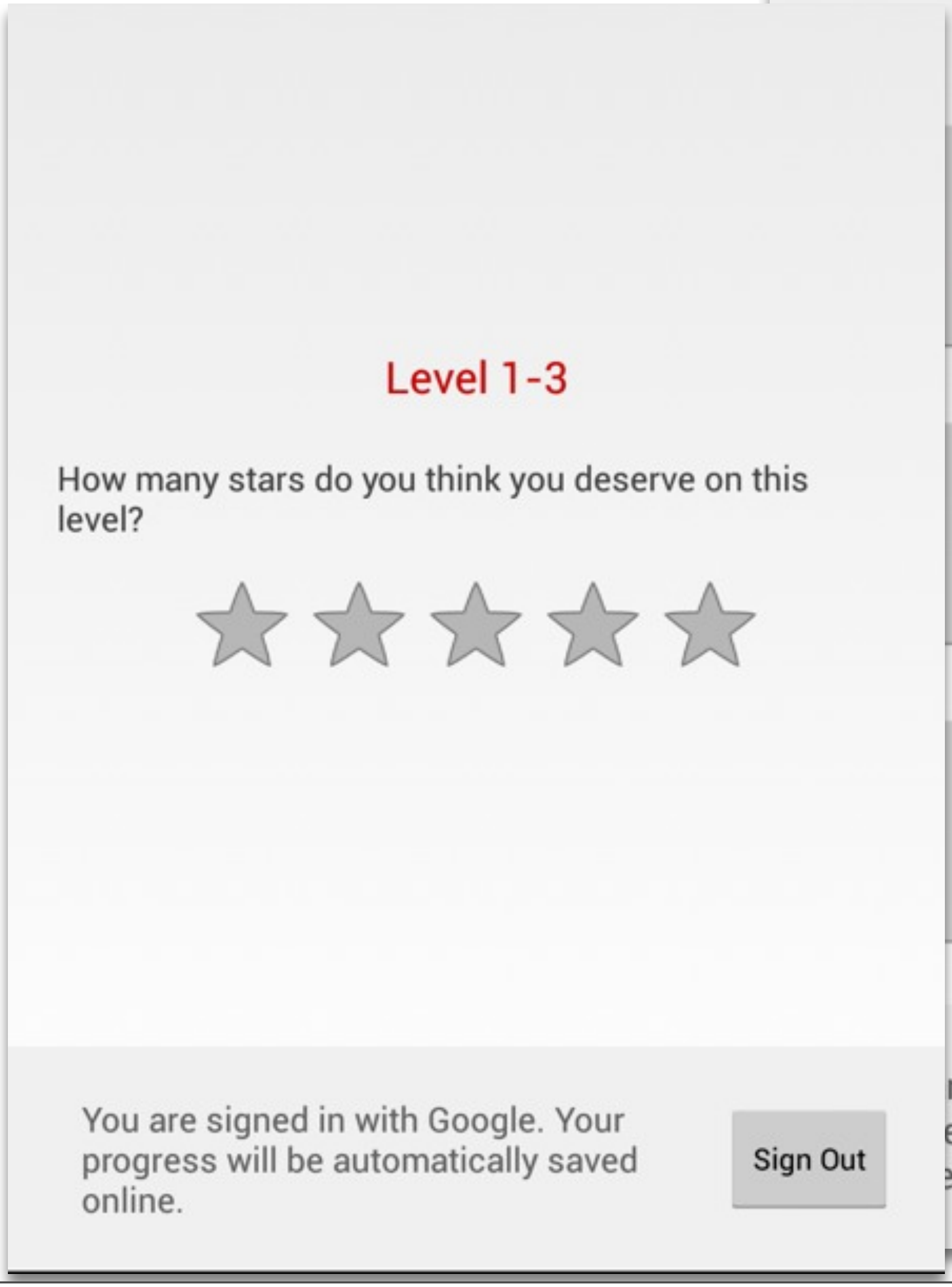
CollectAllTheStars


< World 1 >

1-1 ★★★☆☆	1-2 ★☆☆☆☆	1-3 ☆☆☆☆☆
1-4 ☆☆☆☆☆	1-5 ☆☆☆☆☆	1-6 ★★☆☆☆
1-7 ☆☆☆☆☆	1-8 ☆☆☆☆☆	1-9 ☆☆☆☆☆

re signed in with Google. Your
ess will be automatically saved
e.

Sign Out


Level 1-3

How many stars do you think you deserve on this level?

☆☆☆☆☆

You are signed in with Google. Your progress will be automatically saved online.

Sign Out

CollectAllTheStars

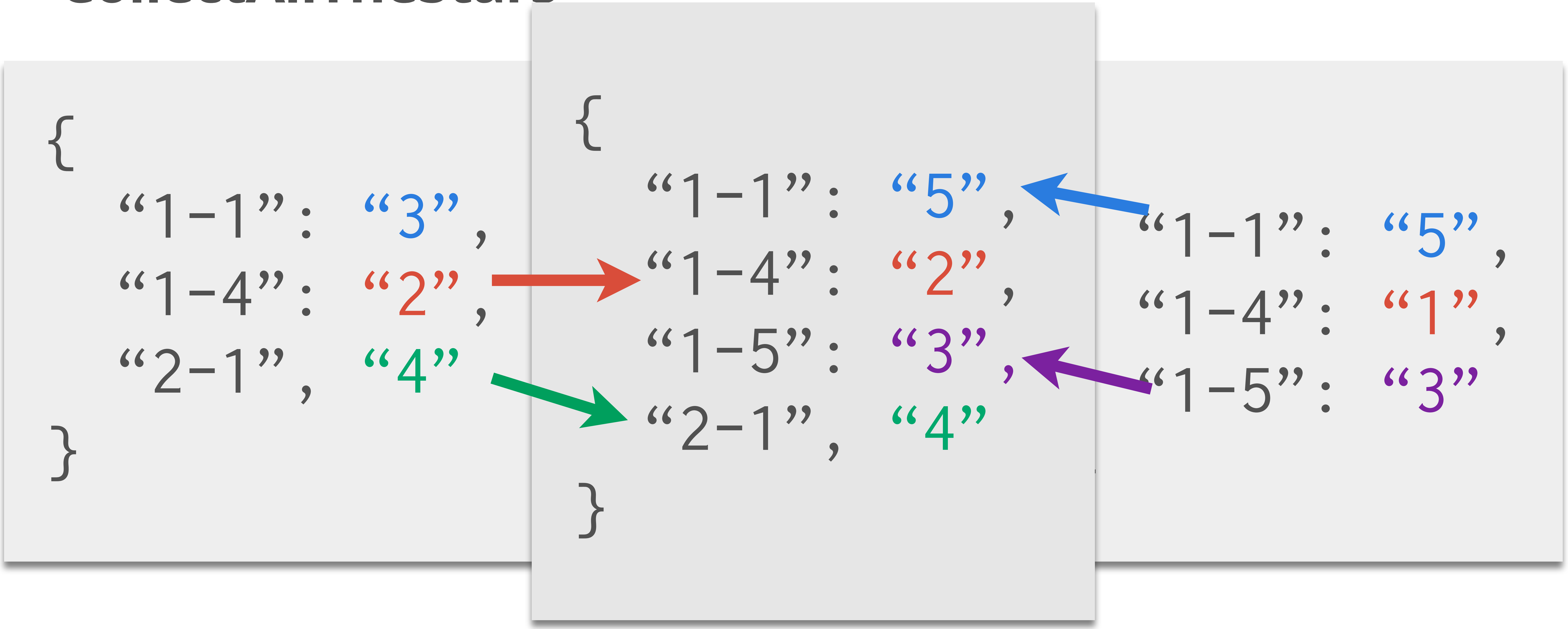
```
{
    “1-1”:  “3”,
    “1-4”:  “2”,
    “2-1”,  “4”
}
```

CollectAllTheStars

```
{
    "1-1": "3",
    "1-4": "2",
    "2-1", "4"
}
```

```
{
    "1-1": "5",
    "1-4": "1",
    "1-5": "3"
}
```

CollectAllTheStars



```
{
    "1-1": "3",
    "1-4": "2",
    "2-1", "4"
}
```

```
{
    "1-1": "5",
    "1-4": "2",
    "1-5": "3",
    "2-1", "4"
}
```

```
"1-1": "5",
"1-4": "1",
"1-5": "3"
```

Don’t lose progress.

5

How to...

Integrate with 3rd party engines

Denial

I don’t need an engine.

Denial

I don’t need an engine.

Anger

Shaders are hard.

Denial
I don't need an engine.

Bargaining
If we make everything a rectangle...

Anger
Shaders are hard.

Denial
I don't need an engine.

Bargaining
If we make everything a rectangle...

Anger
Shaders are hard.

Depression
Forget it.

Denial

I don't

er

Bargaining

rything a

e...

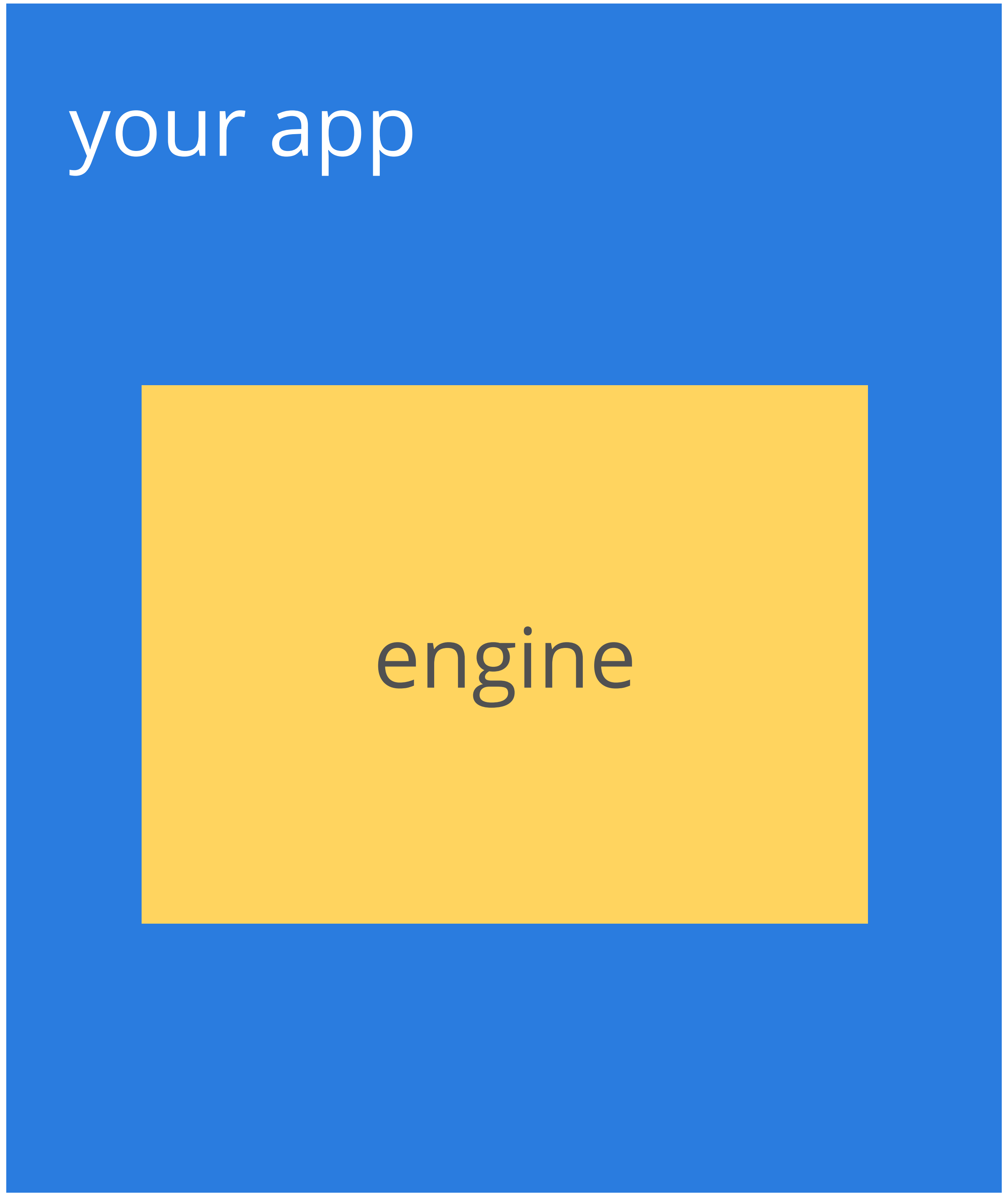
Acceptance

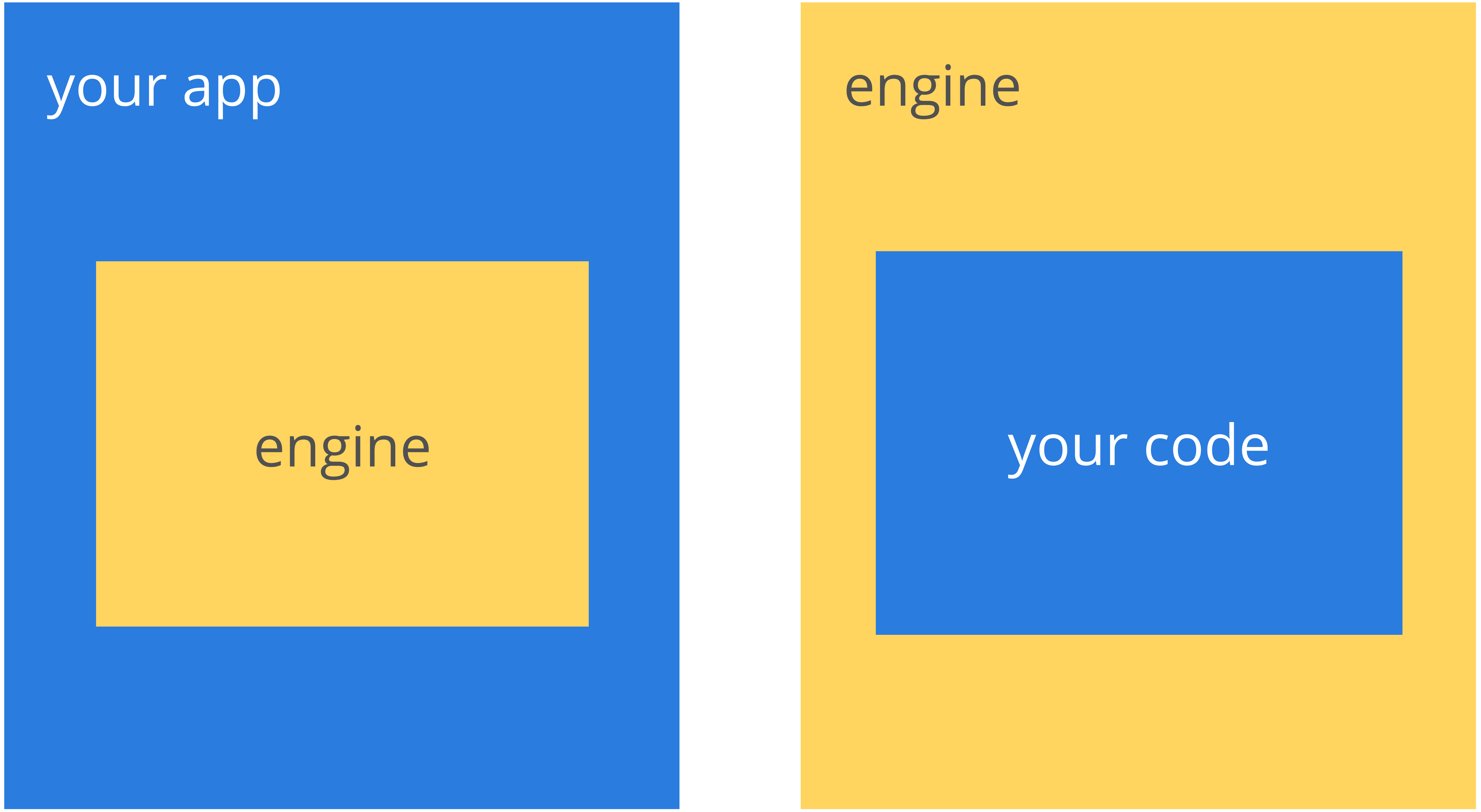
We need an engine.

Shaders are hard.

sion

Forget it.


your app
engine

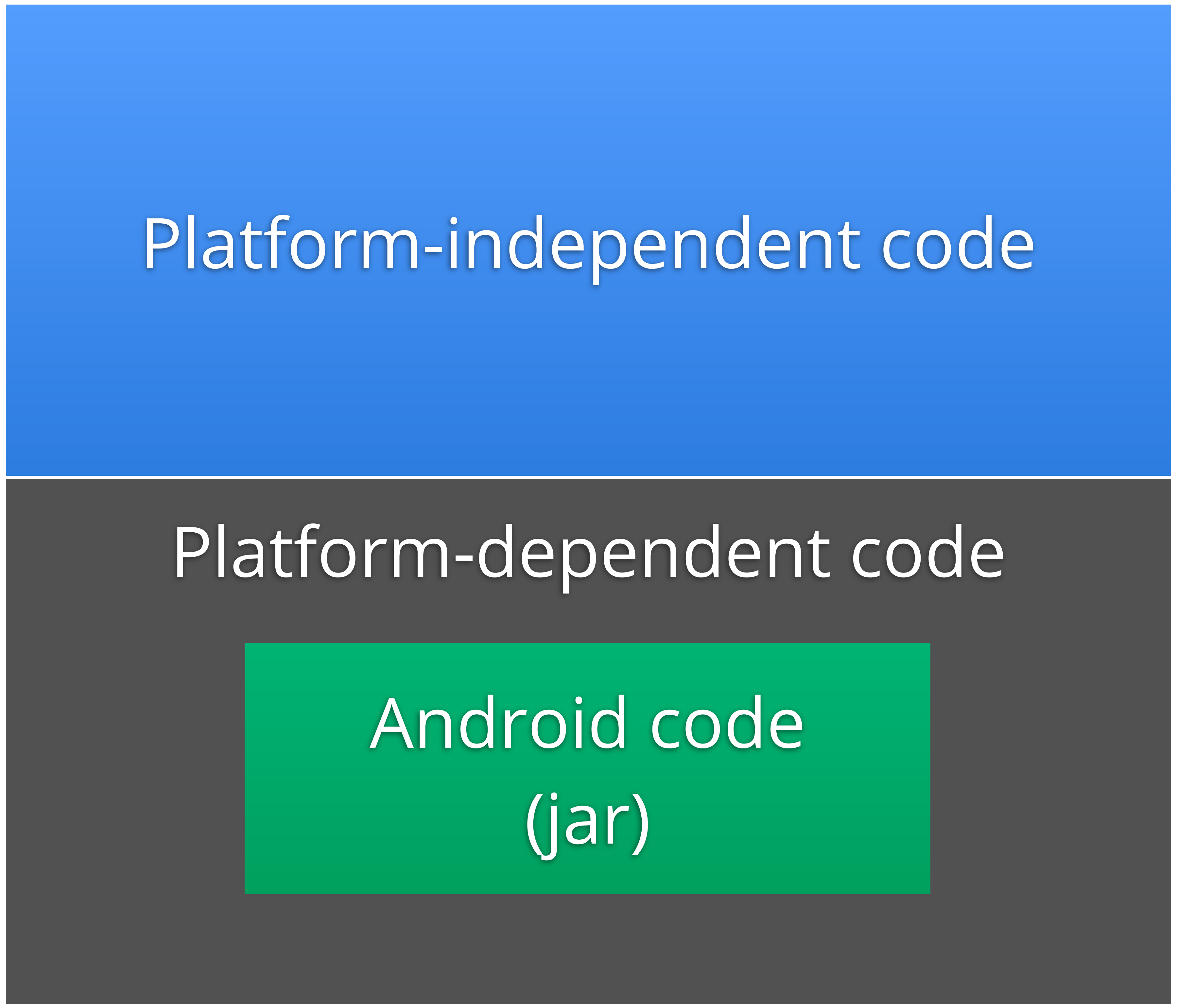

your app
engine
engine
your code

Override AndroidManifest.xml

Add games meta-data to AndroidManifest.xml

XML

```xml
<application>

    <meta-data
        android:name="com.google.android.gms.games.APP_ID"
        android:value="@string/app_id" />
    ....

</application>
```


Platform-independent code
Platform-dependent code
Android code
(jar)

BaseGameActivity

BaseGameActivity

easy to use

requires subclassing

Hook up GameHelper

Hook up GameHelper

GameHelper

Hook up GameHelper

GameHelper

```
onStart()
onStop()
onActivityResult()
```

Hook up GameHelper

```
onStart()
onStop()
onActivityResult()
onUserInitiatedSignIn()
```

Hook up GameHelper

```
onStart()
onStop()
onActivityResult()
onUserInitiatedSignIn()
onSignInSucceeded()
onSignInFailed()
```

onStart()   onStop()

onActivityResult() ?

If you can’t get to onActivityResult()...

Override your engine’s base activity

Update AndroidManifest.xml

Threading

UI thread?

Threading

UI thread?

No problem!

Threading

UI thread?

No problem!

Other thread?

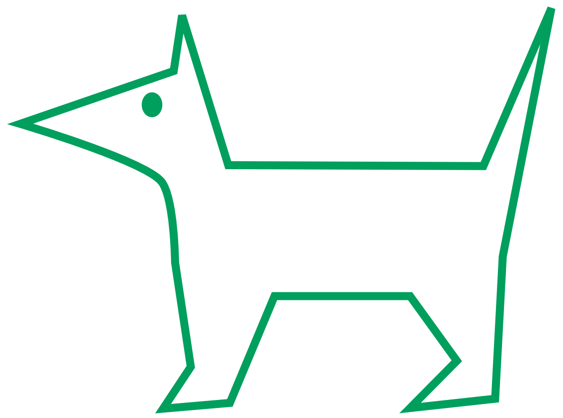
Threading

UI thread?

No problem!

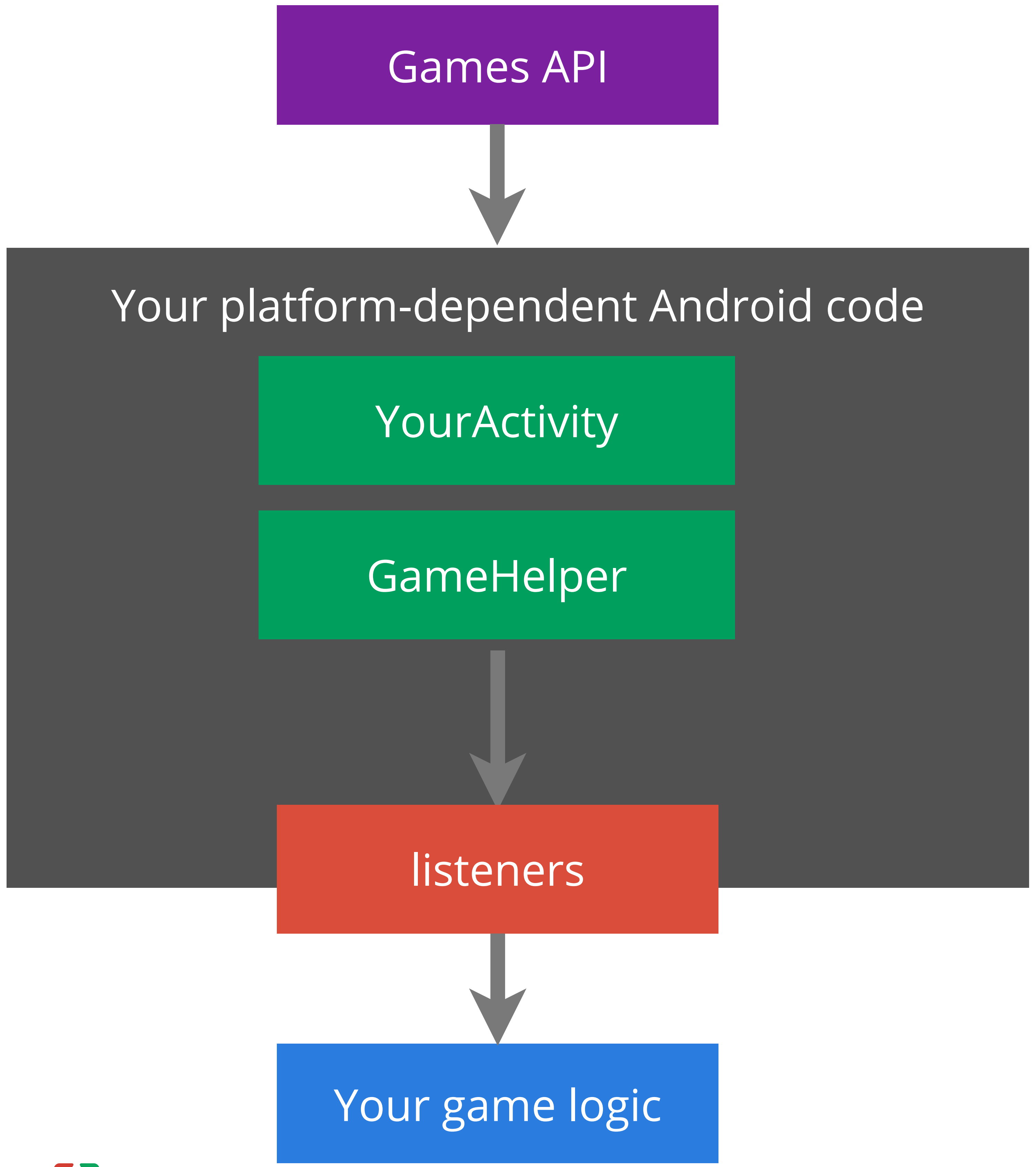
Other thread?

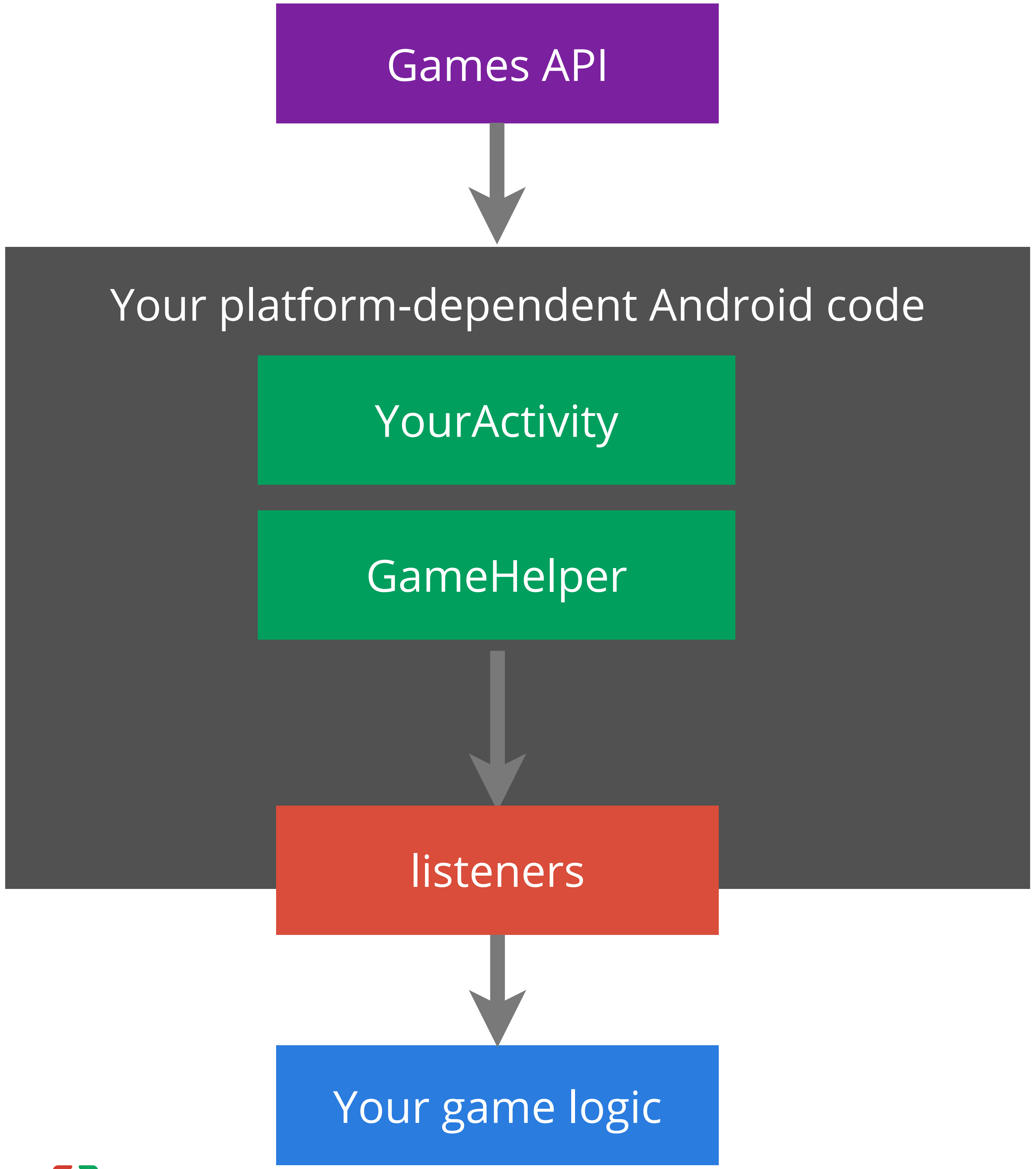
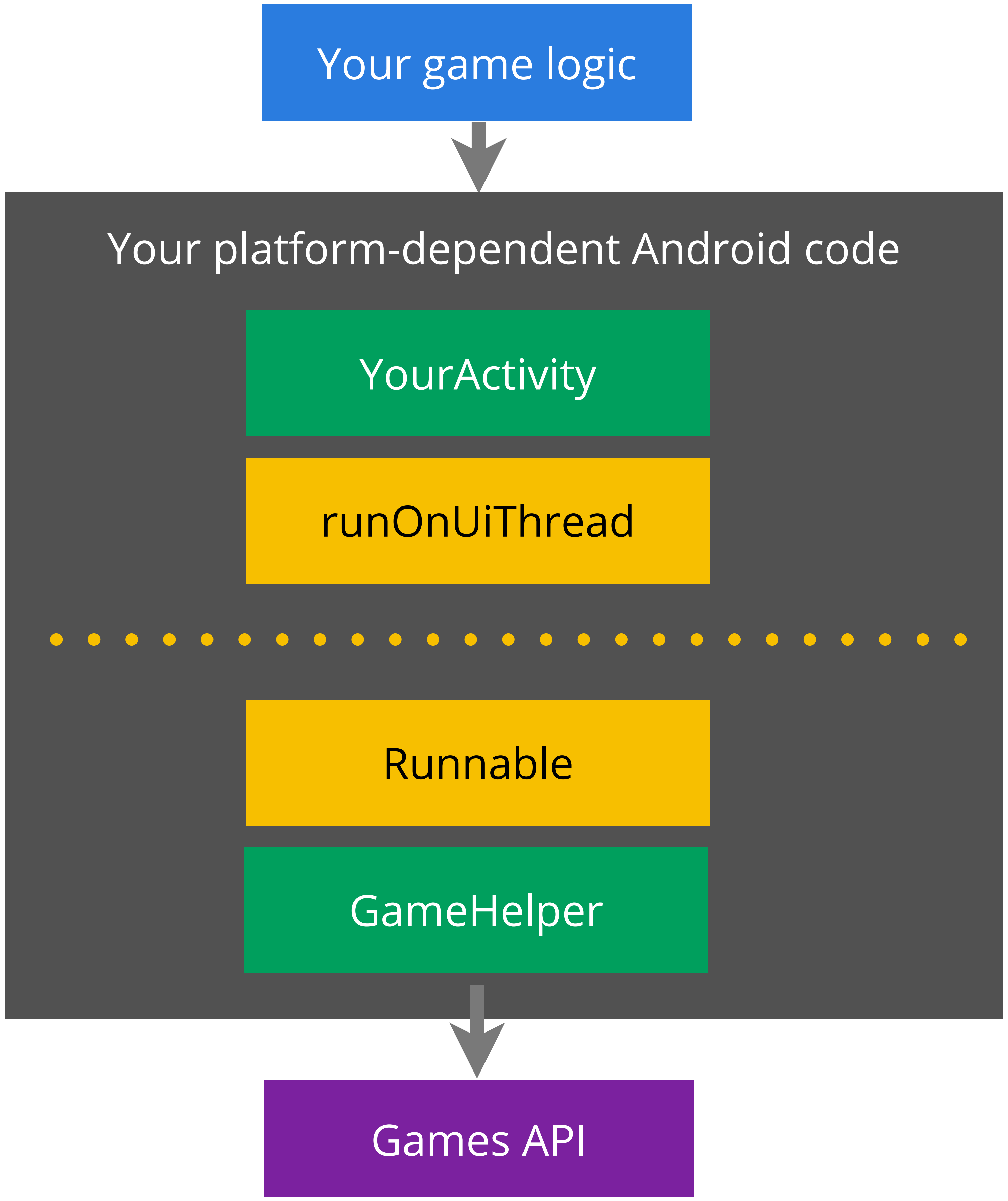
Use `runOnUiThread`



↓

ok to use on UI thread too!


Games API
Your platform-dependent Android code
YourActivity
GameHelper
listeners
Your game logic


Games API
Your platform-dependent Android code
YourActivity
GameHelper
listeners
Your game logic

Your game logic
Your platform-dependent Android code
YourActivity
runOnUiThread
Runnable
GameHelper
Games API

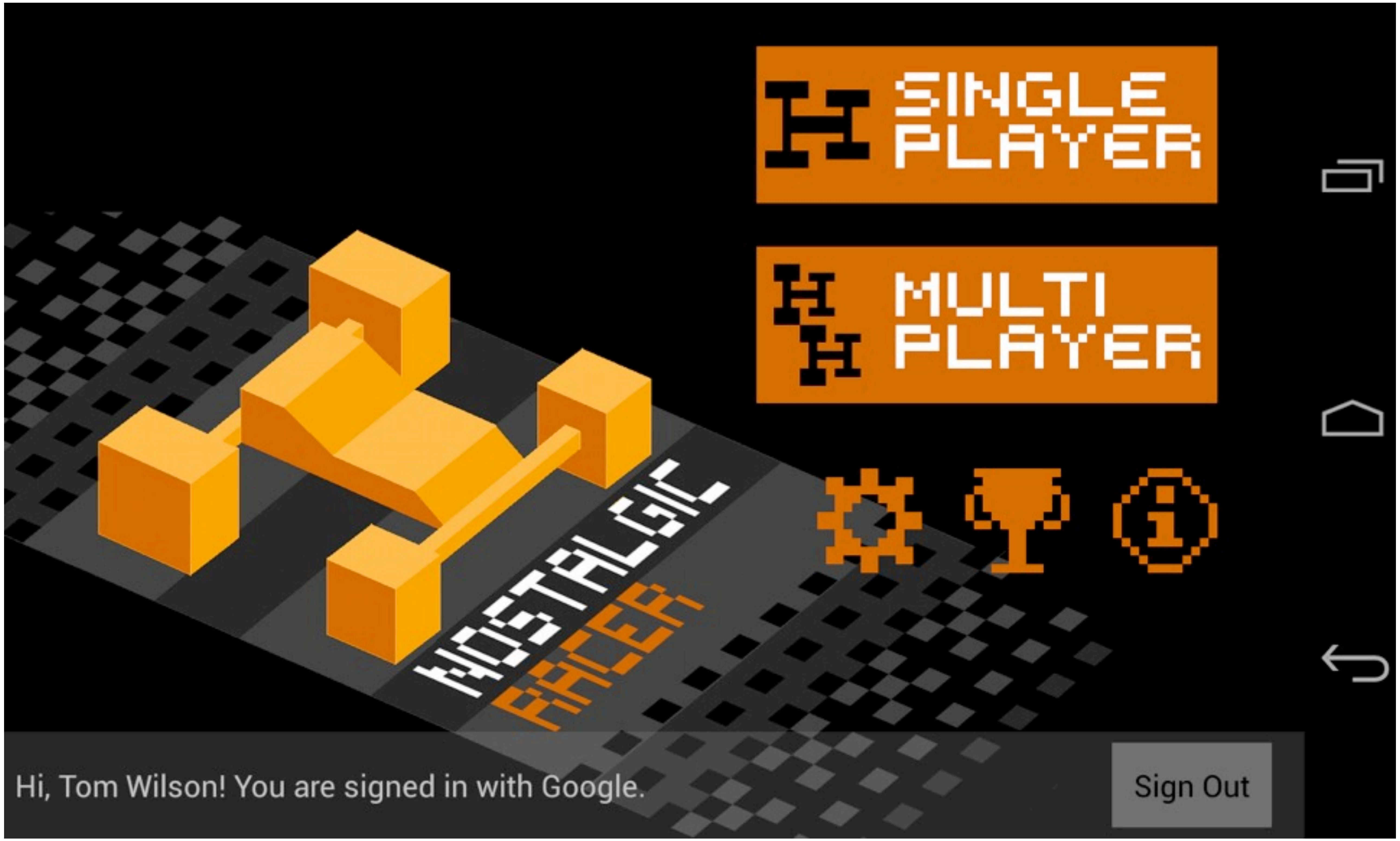
Example

code.google.com/p/outpostdefender3d

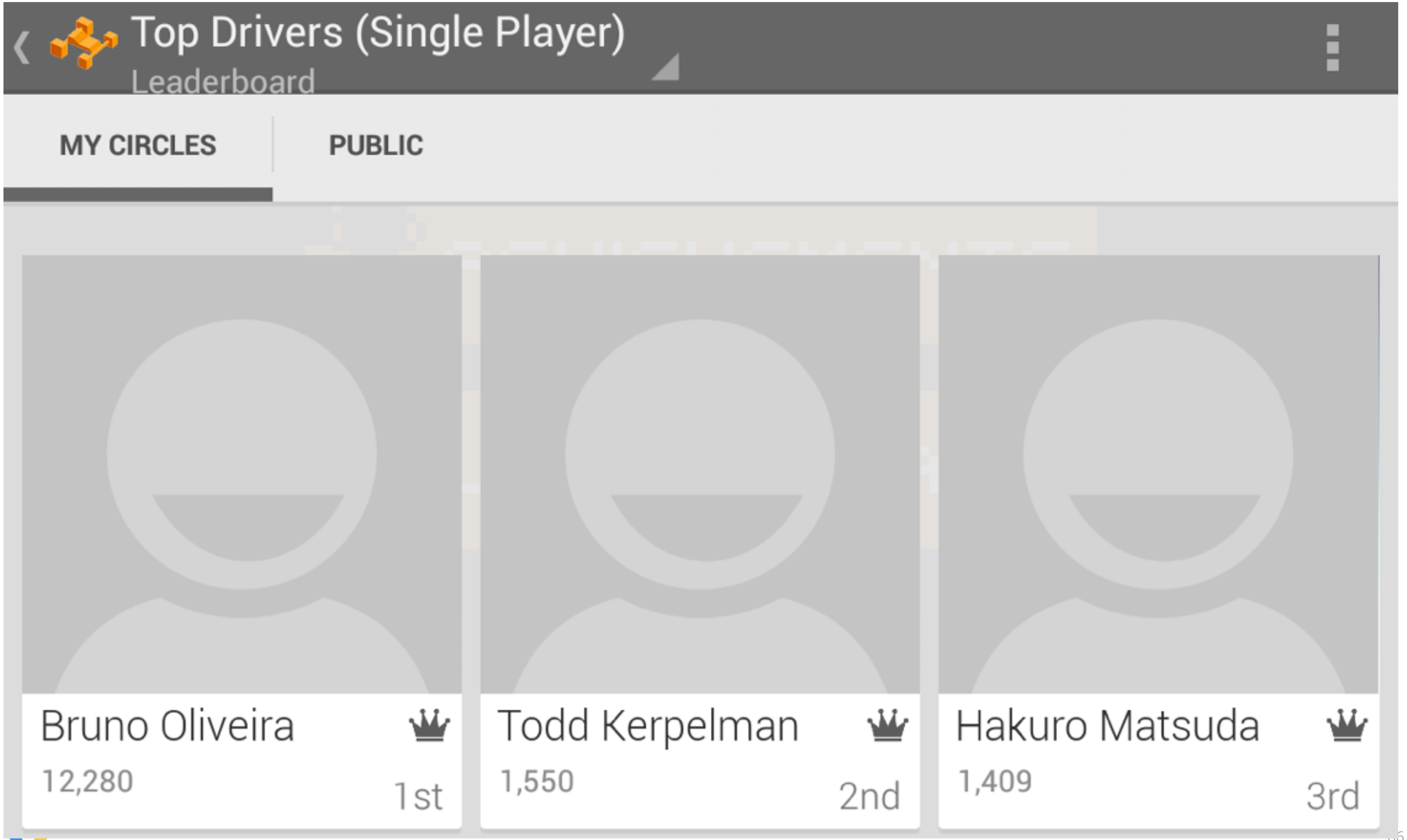
6

How to...

Write customized UIs



Hi, Tom Wilson! You are signed in with Google.


Top Drivers (Single Player)

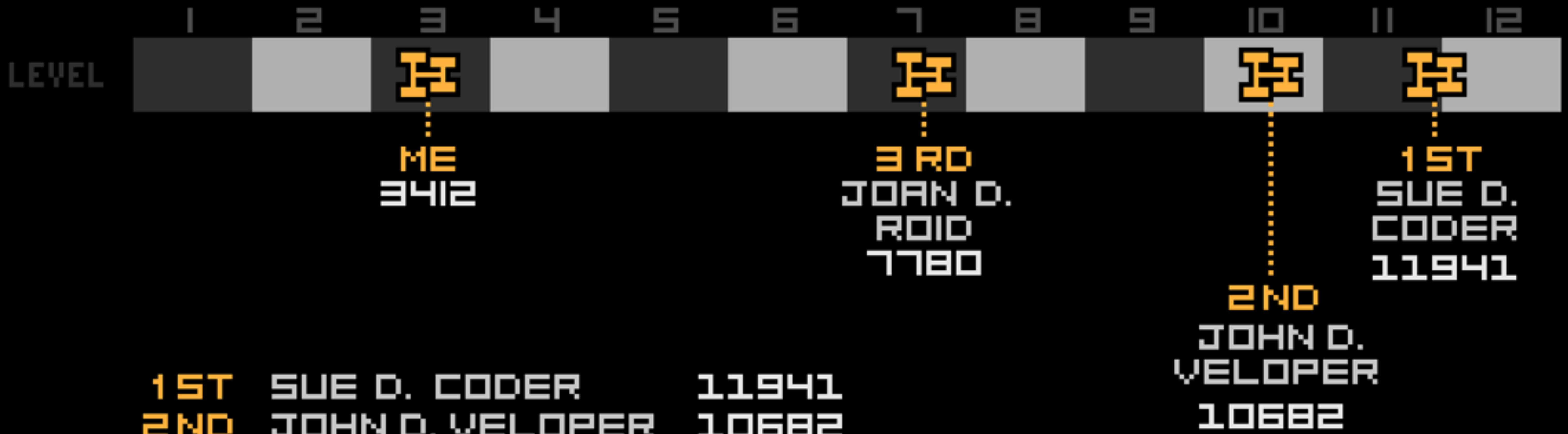
Leaderboard

MY CIRCLES

PUBLIC

Bruno Oliveira	12,280	1st
Todd Kerpelman	1,550	2nd
Hakuro Matsuda	1,409	3rd

LEADERBOARD



1 ST	SUE D. CODER	11941
2 ND	JOHN D. VELOPER	10682
3 RD	JOAN D. ROID	7780
14 TH	BRUNO OLIVEIRA	3412

Raw data APIs

achievements

leaderboards

players

invitations

...etc

Raw Data APIs

Java

```java
OnLeaderboardScoresLoadedListener listener = ....;
mGamesClient.loadPlayerCenteredScores(listener,
        leaderboardId, TIME_SPAN_ALL_TIME,
        COLLECTION_SOCIAL, 25 /* maxResults */);







}
```

Raw Data APIs

Java

```java
OnLeaderboardScoresLoadedListener listener = ....;
mGamesClient.loadPlayerCenteredScores(listener,
        leaderboardId, TIME_SPAN_ALL_TIME,
        COLLECTION_SOCIAL, 25 /* maxResults */);

void onLeaderboardScoresLoaded(int statusCode,
    LeaderboardBuffer leaderboard,
    LeaderboardScoreBuffer scores) {
    // bind scores to views
}
```

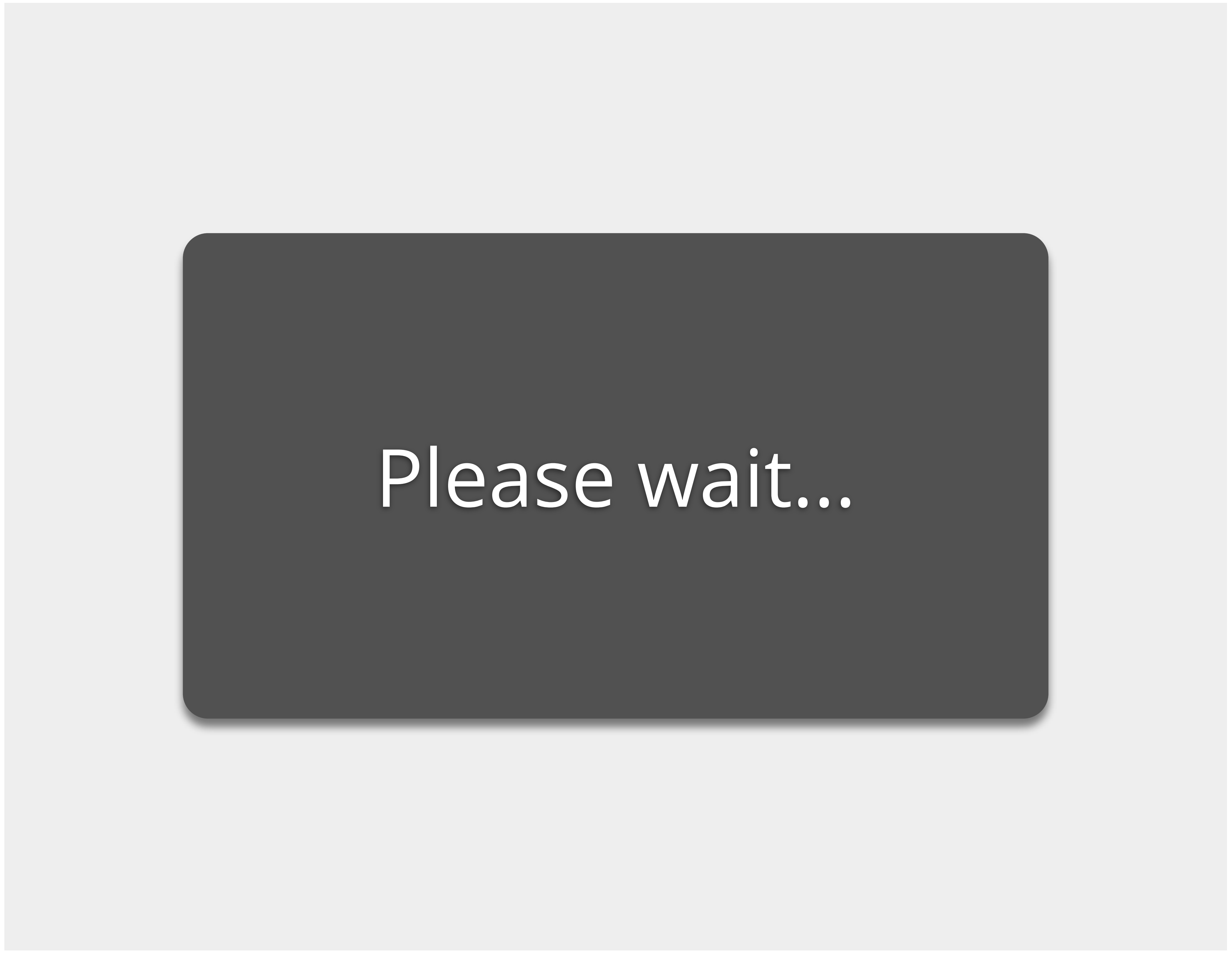
Leaderboards don’t have to be boring!

Monday, May 20,

7

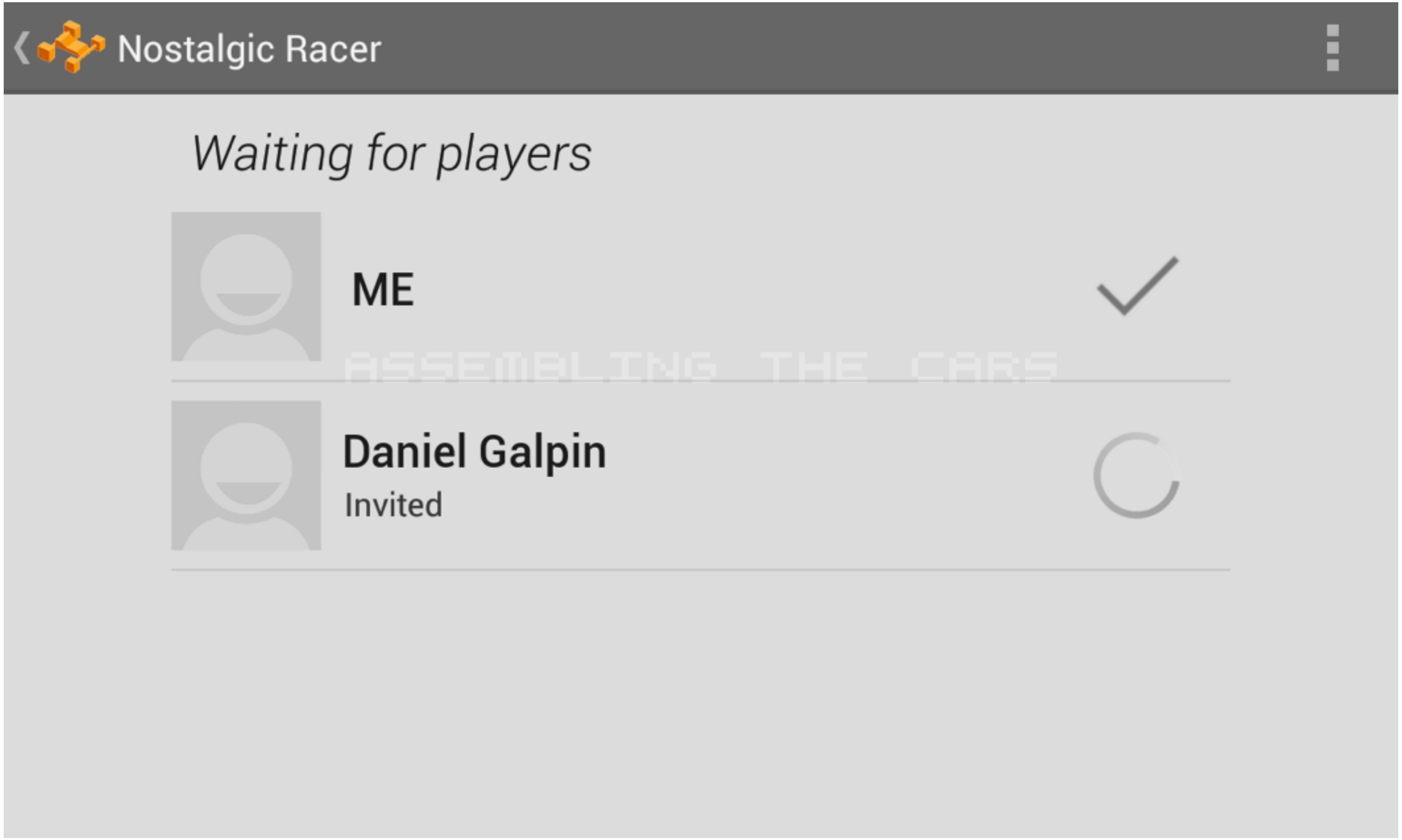
How to...
Show a waiting room

Please wait...



Please wait...

Please wait...


Nostalgic Racer

Waiting for players

ME ✓

ASSEMBLING THE CARS

Daniel Galpin
Invited

Launch the Waiting Room

Java

```
int minPlayers = Integer.MAX_VALUE;

Intent i = getGamesClient().
    getRealTimeWaitingRoomIntent(room, minPlayers);

startActivityForResult(i, RC_WAITING_ROOM);
```

Do this in `onRoomCreated()` and `onRoomJoined()`

Handle the Waiting Room result

Java

```
void onActivityResult(int req, int resp, Intent data) {
    if (req == RC_WAITING_ROOM) {
        if (resp == Activity.RESULT_OK) {
            // start game
        } else if (resp == GamesActivityResultCodes.
                        RESULT_LEFT_ROOM) {
            // user wants to leave the room
        } else if (resp == Activity.RESULT_CANCELED) {
            // user dismissed waiting room
        }
    }
}
```

Starting Early

Java

```java
int minPlayers = 2; // can start with this many players

Intent i = getGamesClient().
        getRealTimeWaitingRoomIntent(room, minPlayers);

startActivityForResult(i, RC_WAITING_ROOM);
```

Starting Early

Java

```java
// when someone else started game early,
// dismiss waiting room
finishActivity(RC_WAITING_ROOM);

// start playing
```

8

How to...
Use match variants

What's a variant?

What's a variant?

Deathmatch, capture the flag, etc

Use when automatching.

Using Variants

Java

```java
// Variants can be between 1 and 1023.
private static final int DEATHMATCH_VARIANT = 1;

public void onStartClicked() {





}
```

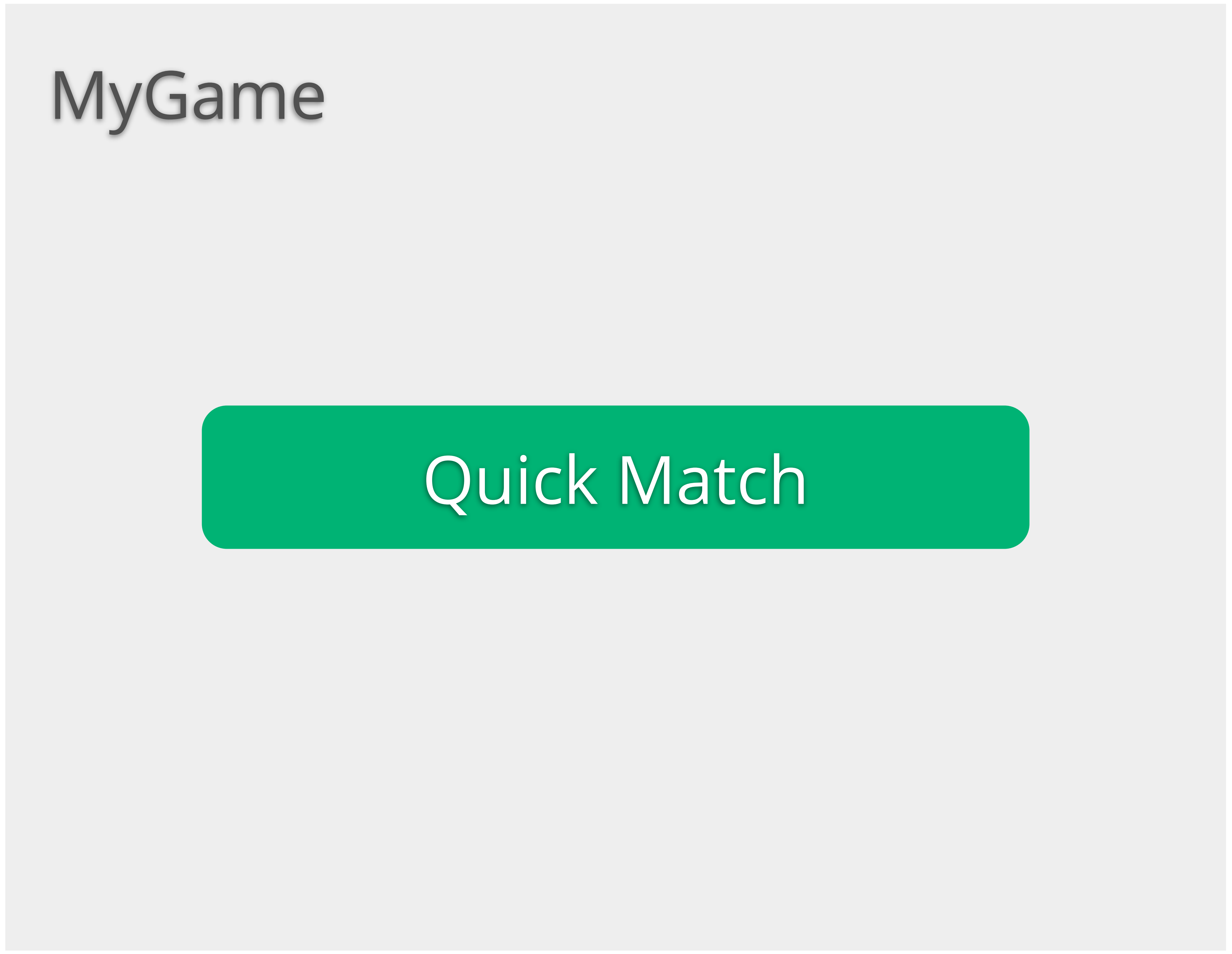
Using Variants

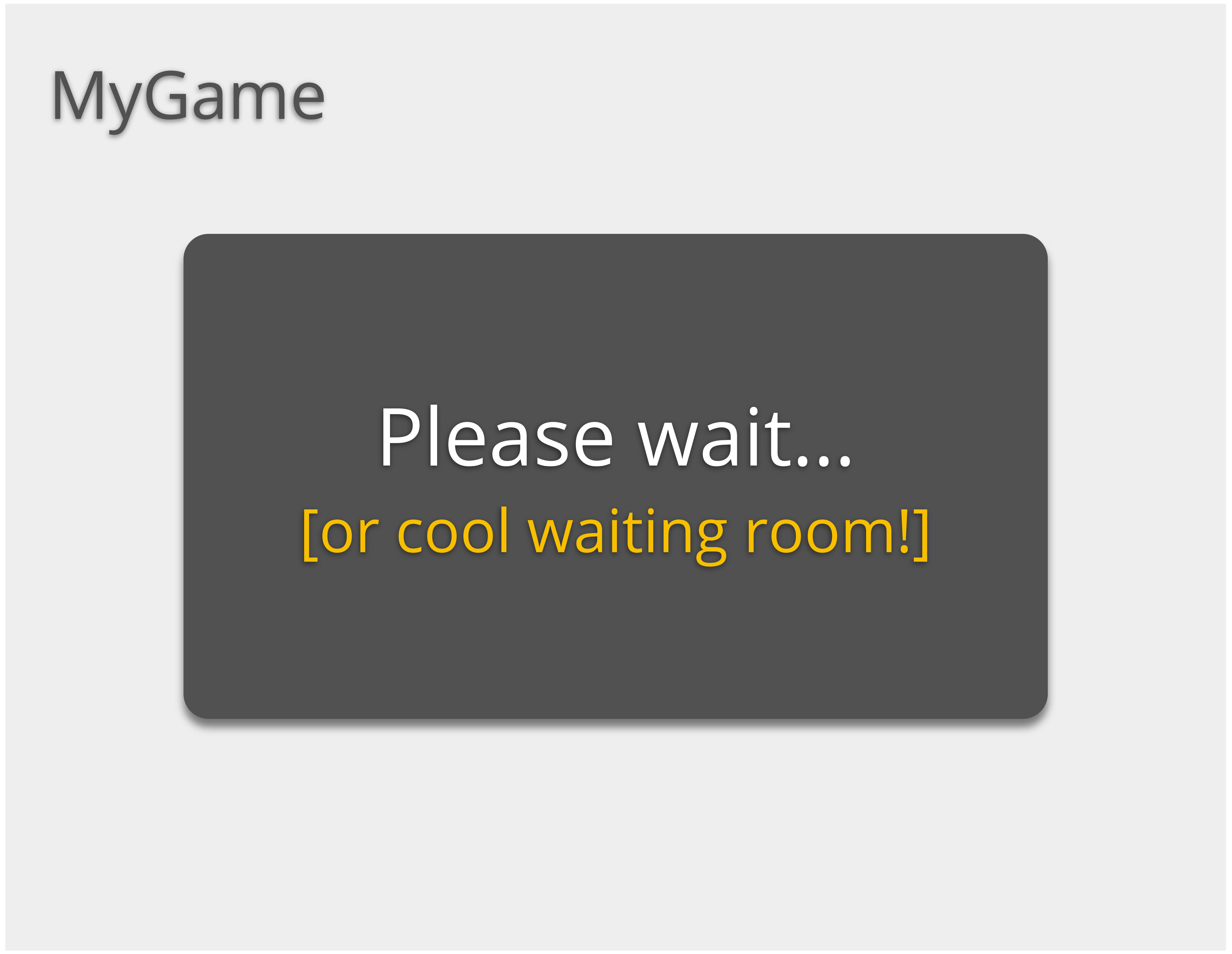
Java

```
// Variants can be between 1 and 1023.
private static final int DEATHMATCH_VARIANT = 1;

public void onStartClicked() {
    RoomConfig.Builder b = RoomConfig.builder(this)
        .setMessageReceivedListener(mMsgListener)
        .setVariant(DEATHMATCH_VARIANT)
        .setAutoMatchCriteria(mAutoMatchCriteria);
    mGamesClient.createRoom(b.build());
}
```

..but don’t go crazy!

Another use of variant...

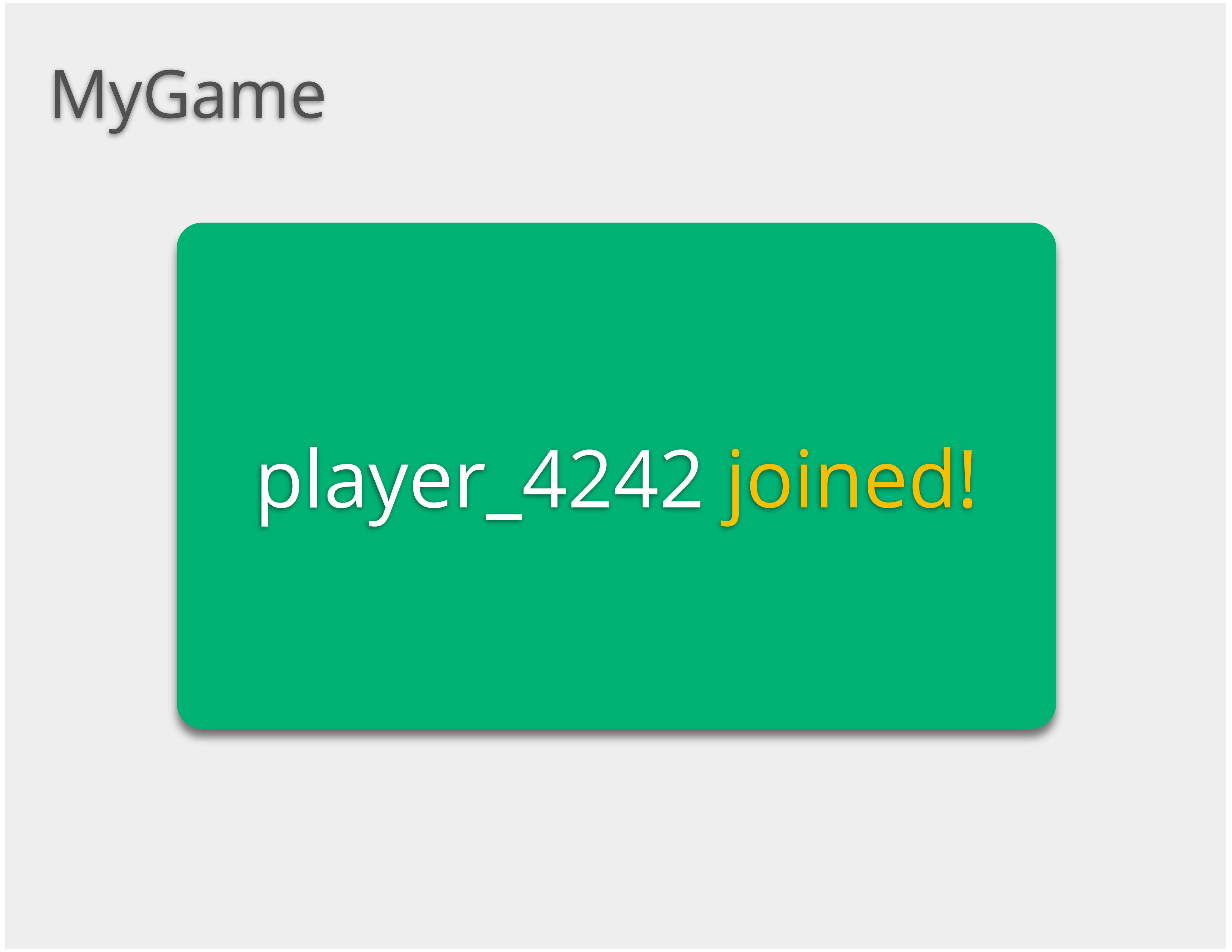

MyGame
Quick Match



MyGame

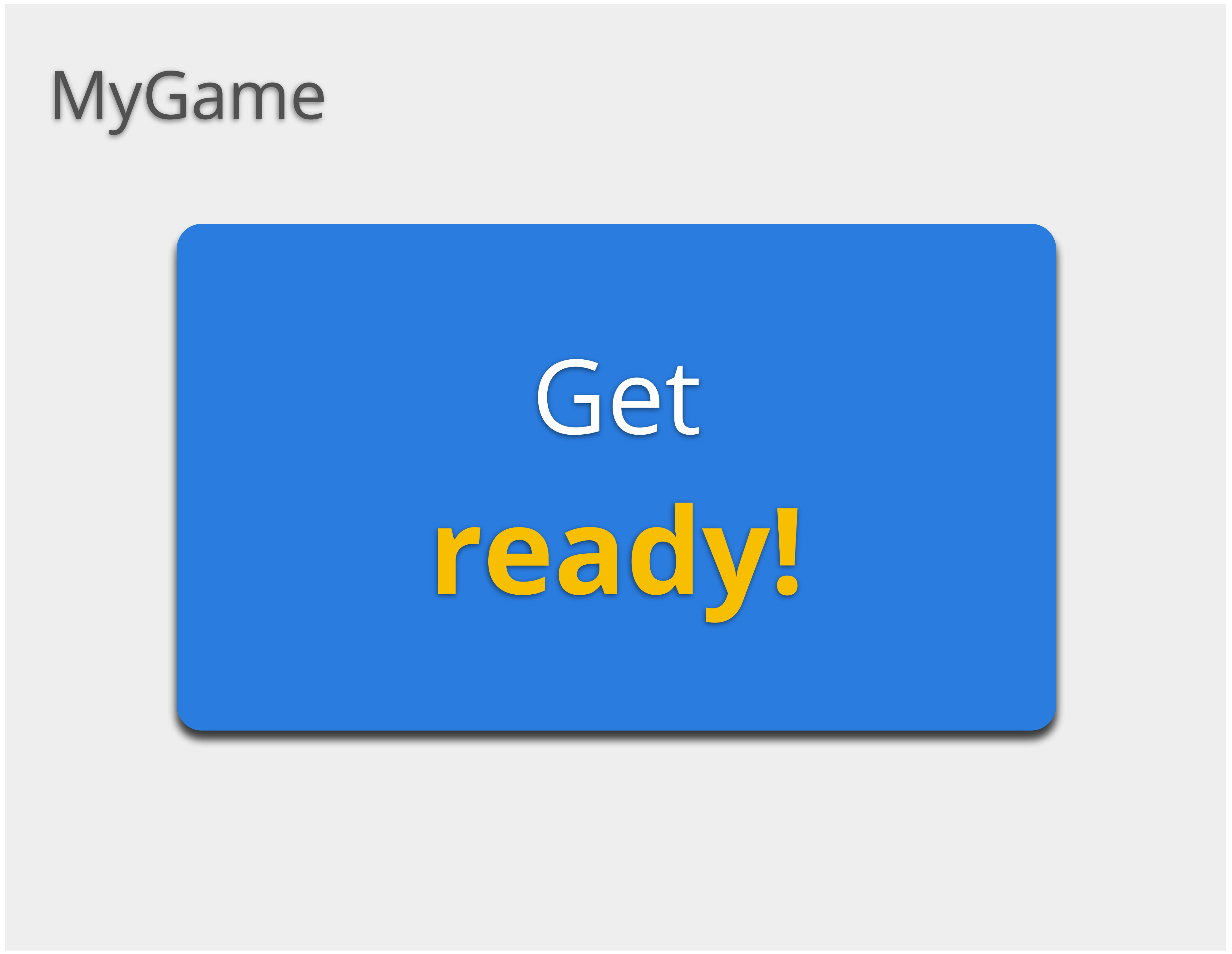
Please wait...

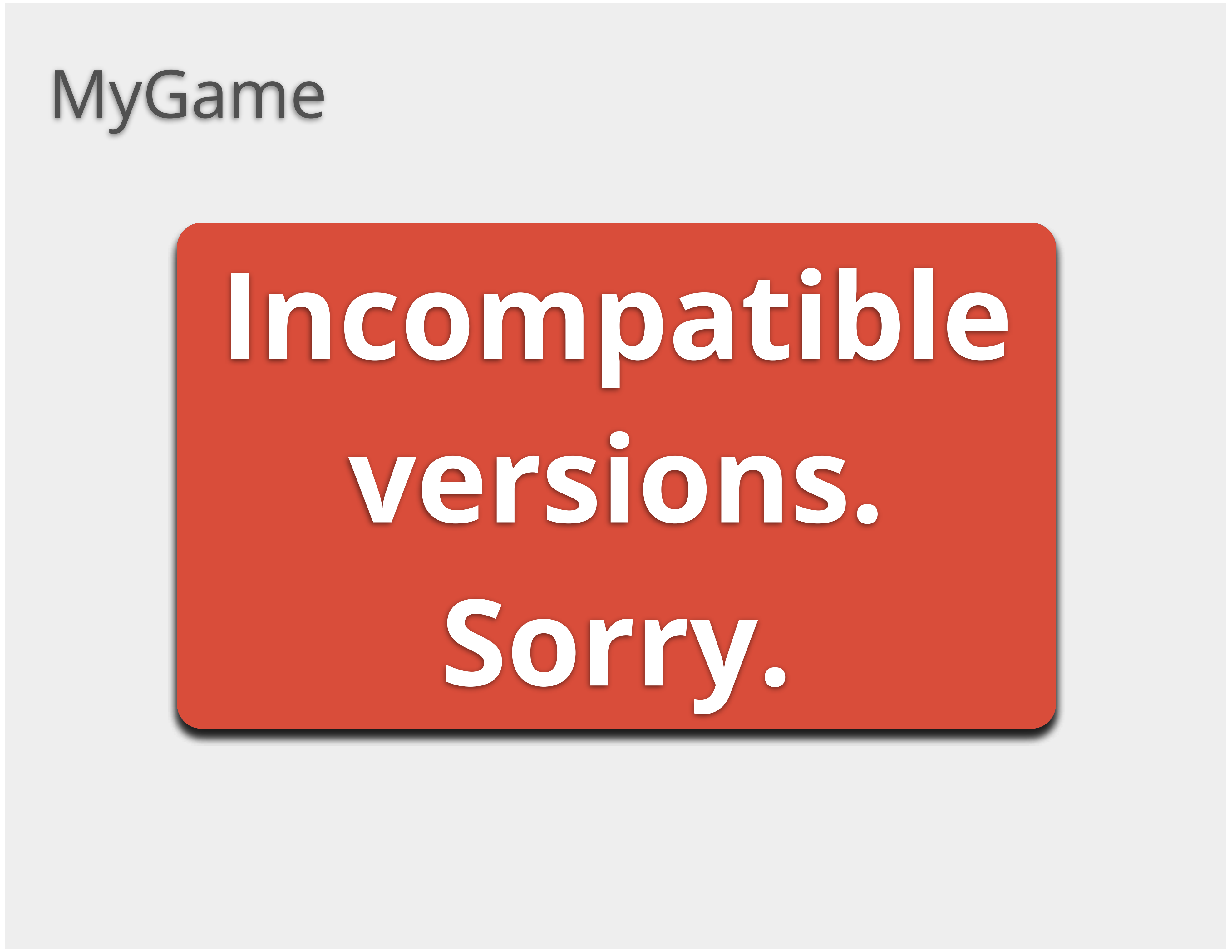
[or cool waiting room!]



MyGame

player_4242 joined!


MyGame
Get
ready!



MyGame

Incompatible versions. Sorry.

be backwards-compatible

be backwards-compatible

...if you can't, use variant.

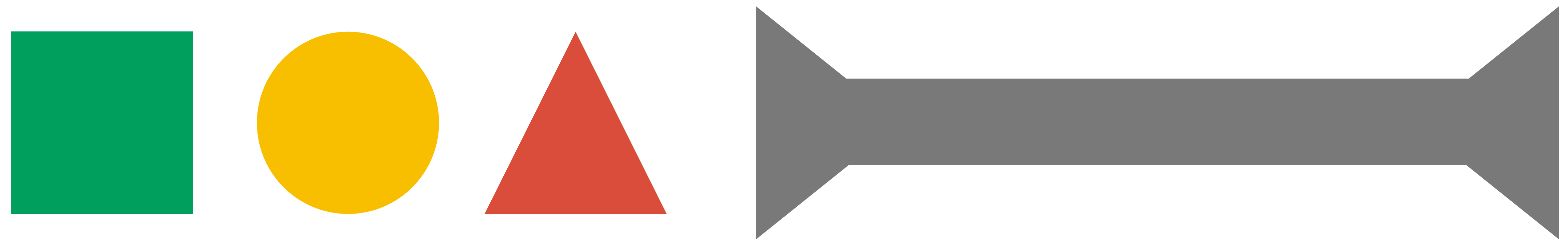
9

How to...

Use sockets

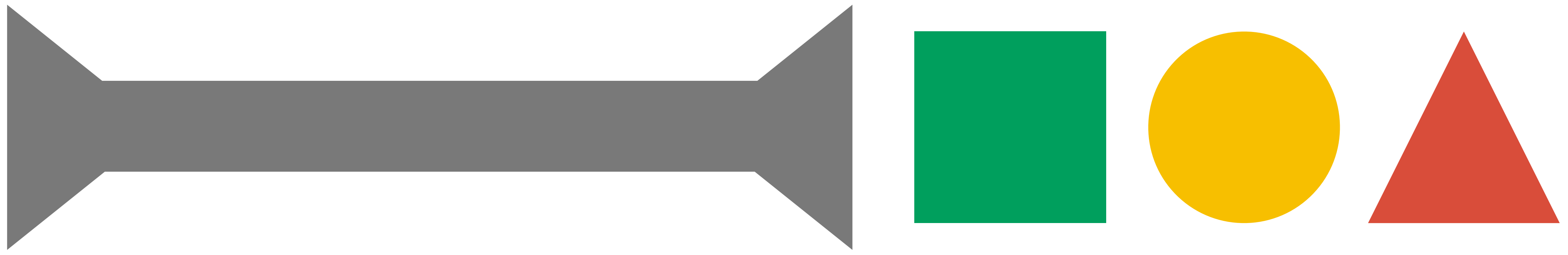
reliable

think TCP



reliable

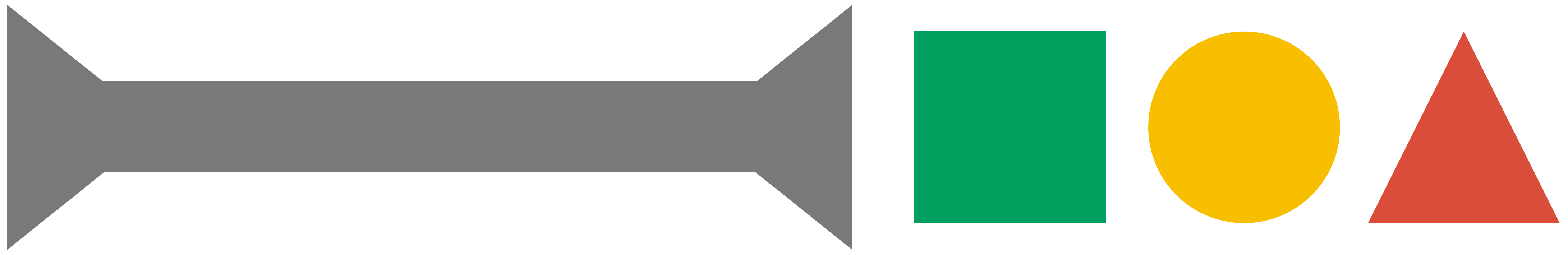
think TCP



reliable

think TCP

not how our sockets work!

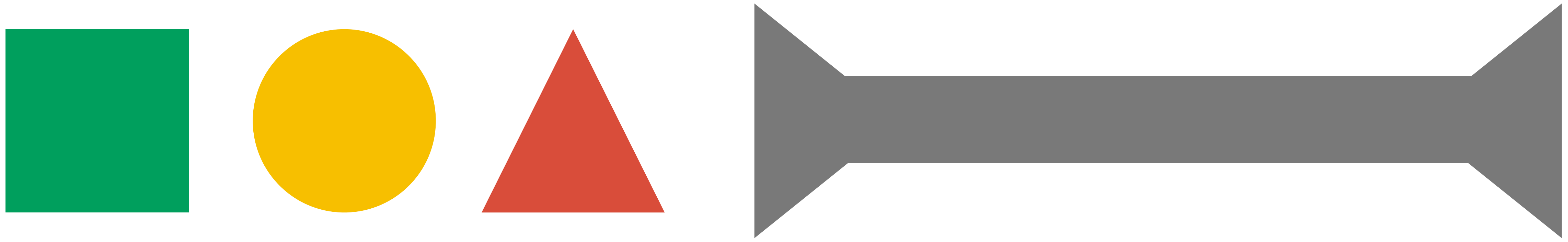


reliable

think TCP

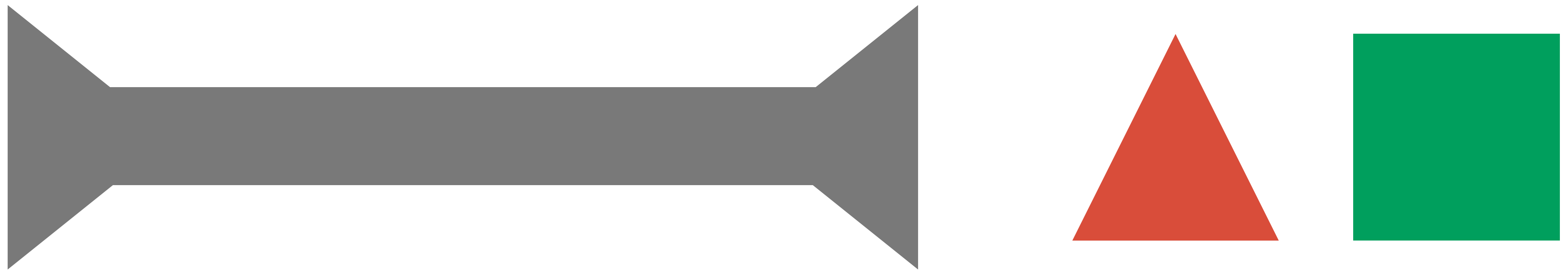
unreliable

think UDP



unreliable

think UDP



unreliable

think UDP

Why?

Why?

Engine or existing code that uses sockets

Why?

Engine or existing code that uses sockets

Easier to write logic as a stream-like object

Why?

Engine or existing code that uses sockets

Easier to write logic as a stream-like object

Native code

Enable sockets

Java

```
RoomConfig cfg = RoomConfig.builder(this)
     .setMessageReceivedListener(this)
     .setRoomStatusUpdateListener(this)

     .build();
```

Enable sockets

Java

```
RoomConfig cfg = RoomConfig.builder(this)
    .setMessageReceivedListener(this)
    .setRoomStatusUpdateListener(this)
    .setSocketCommunicationsEnabled(true)
    .build();
```

Enable sockets

Java

```
RoomConfig cfg = RoomConfig.builder(this)
     .setMessageReceivedListener(this)
     .setRoomStatusUpdateListener(this)
     .setSocketCommunicationsEnabled(true)
     .build();
```

~~sendUnreliableRealTimeMessage()~~

Get a socket for a given participant

Java

```java
// participant id here
String participantId = .....;
```

Get a socket for a given participant

Java

```
// participant id here
String participantId = .....;

RealTimeSocket sck =
      mGamesClient.getRealTimeSocketForParticipant(
            mRoomId, participantId);
```

Get a socket for a given participant

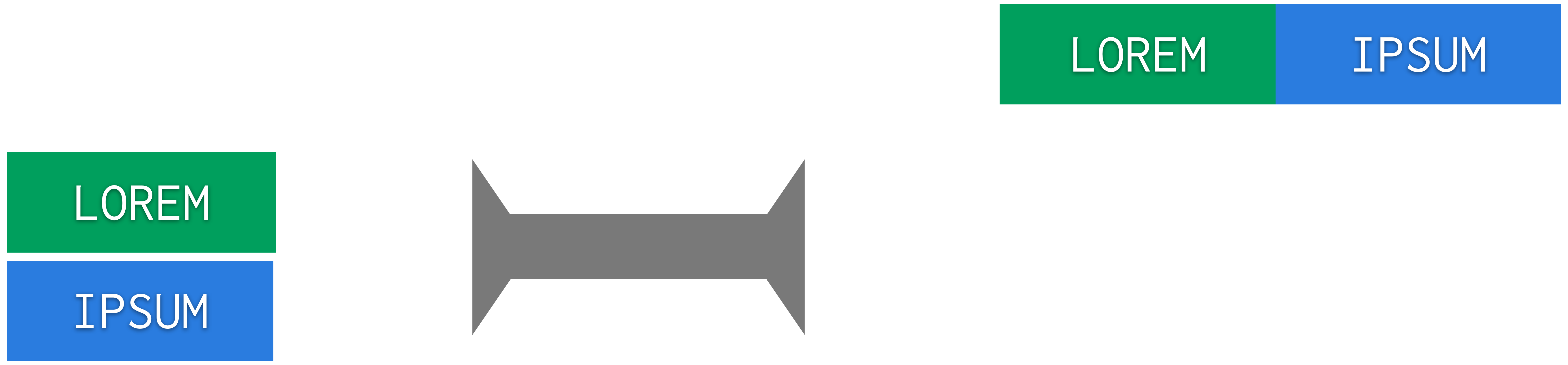
Java

```java
// participant id here
String participantId = .....;

RealTimeSocket sck =
      mGamesClient.getRealTimeSocketForParticipant(
            mRoomId, participantId);

InputStream is = sck.getInputStream();
OutputStream os = sck.getOutputStream();
```

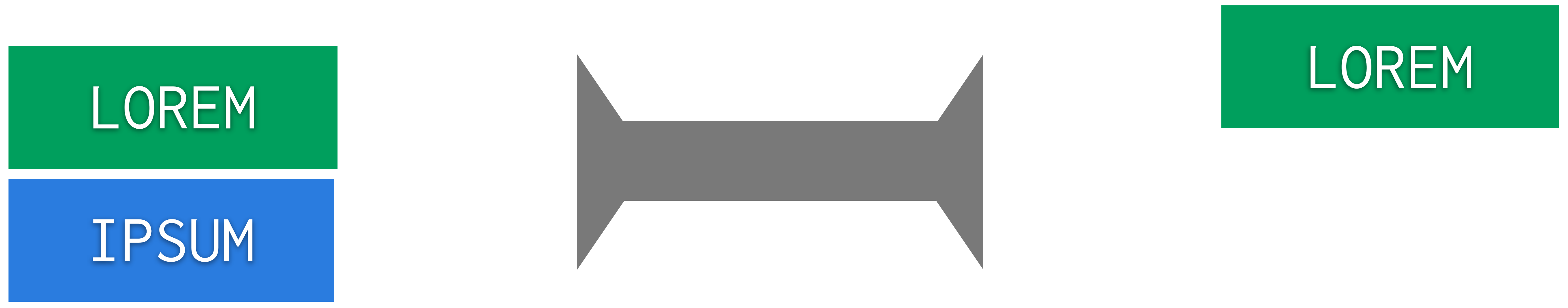
Packet loss?

LOREM
IPSUM

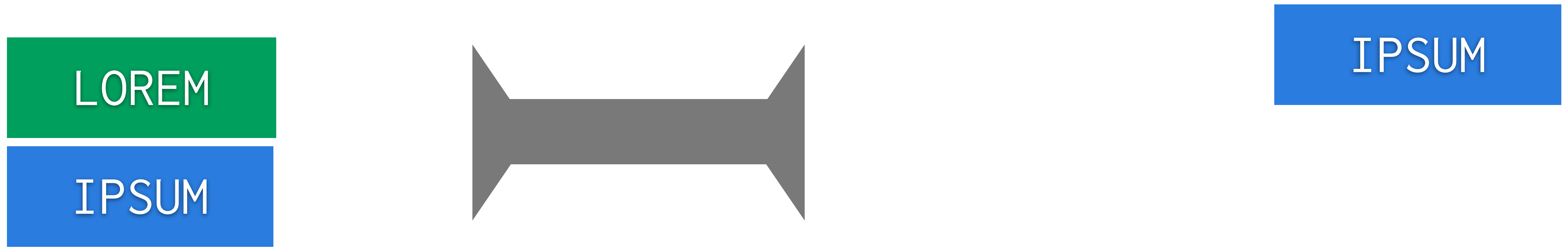
Packet loss?



Packet loss?



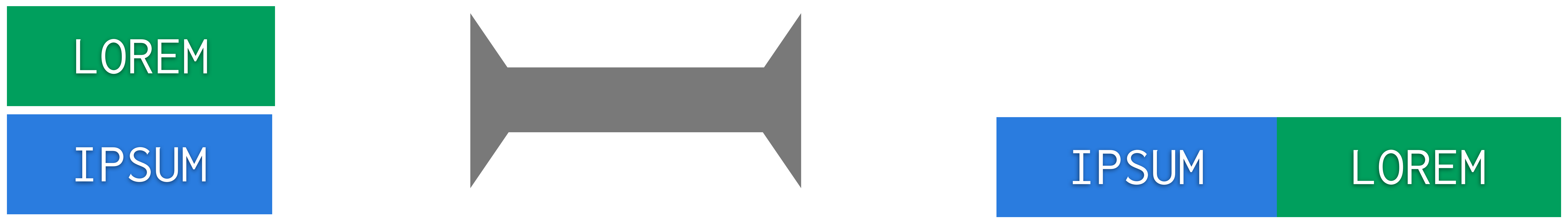
Packet loss?



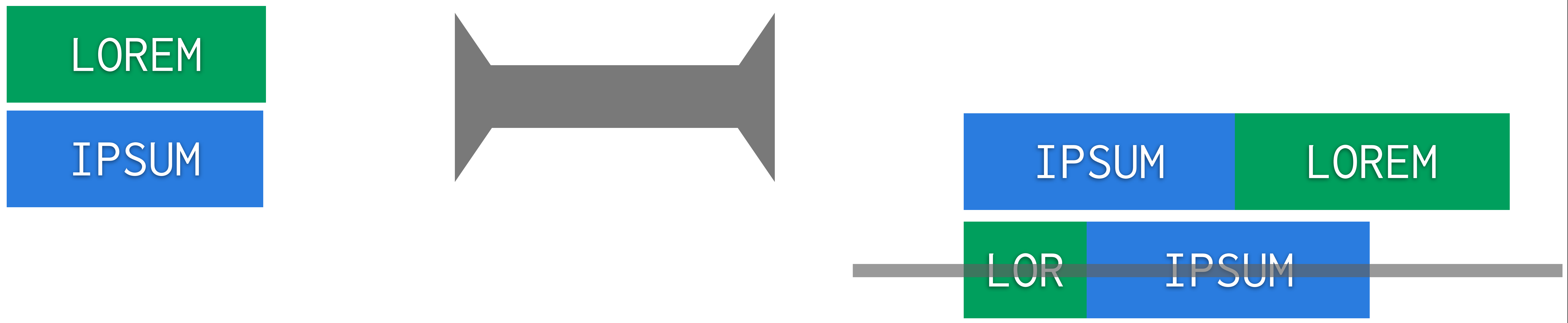
Packet loss?

LOREM
IPSUM

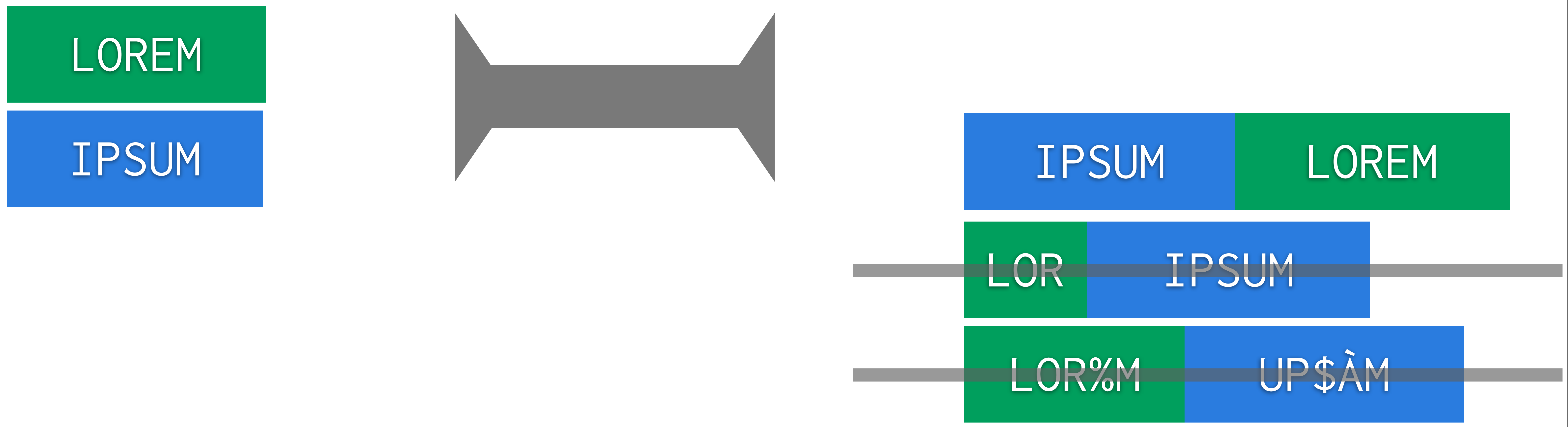
Packet loss?



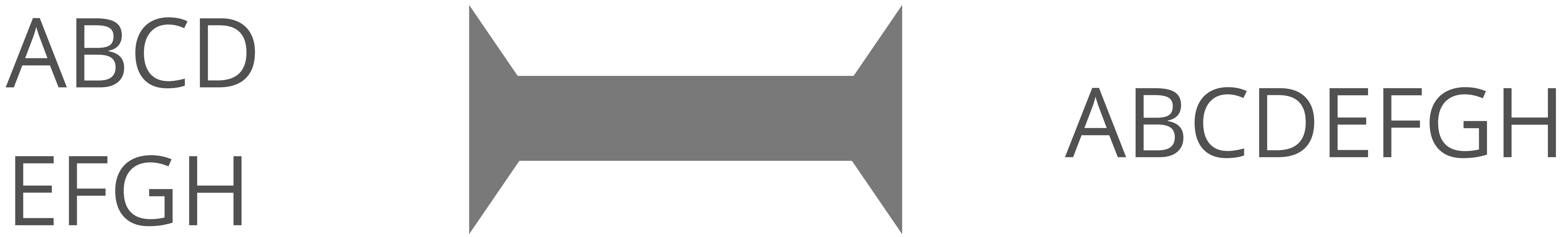
Packet loss?



Packet loss?



No delimiters!



From native code?

Java

```java
// participant id here
String participantId = .....;

RealTimeSocket sck =
      mGamesClient.getRealTimeSocketForParticipant(
            mRoomId, participantId);
```

From native code?

Java

```
// participant id here
String participantId = .....;

RealTimeSocket sck =
      mGamesClient.getRealTimeSocketForParticipant(
            mRoomId, participantId);

int native_fd = sck.getParcelFileDescriptor().getFd();

// give native_fd to native code.
my_native_method(native_fd);
```

Use from native code

C++

```
JNIEXPORT void JNICALL Java_com_my_pkg_my_native_method(
                JNIEnv *env, jclass clazz, jint fd) {
    const char* buf = “3.14159265358979323846264338327950”
                      “28841971693993751058209749445923078”
                      “16406286208998628034825342117067982”;
    int pos = 0, count = strlen(buf);
    while (pos < count) {
        int rem = count - pos;
        int n = write(fd, buf + pos, rem);
        if (n <= 0) return;
        pos += n;
    }
}
```

1. Friendly sign-in
2. Multiple clients
3. Native code
4. Advanced cloud save
5. Game engine integration
6. Customized UIs
7. Waiting room
8. Match variants
9. Sockets

“it runs ok”

it’s not enough

“it runs ok”

it’s not enough

compiles

“it ~~runs ok~~”

it’s not enough

Your game needs to be

awesome

Your game needs to be

awesome

<Thank You!>

plus.google.com/+BrunoOliveira
plus.google.com/+TomTrademarkWilson

Bruno Oliveira

Tom Wilson

Google Developers