Crossword Documentation

1 Crossword Builder

The Crossword Builder window is used to create crosswords that can be played in the game. It provides a GUI interface for setting blocks, placing words, and selecting clues which then get written to a text file which is read by the game at run time.

1.1 Word Dictionary

The **Word Dictionary** section provides information about the current loaded word dictionary. In order to provide speedy results when placing words on the crossword, a pre-processed word dictionary must be created / loaded.

When the Crossword Builder window is opened it will automatically start loading the word dictionary that comes with the asset. It's progress will be updated in the **Status** with the percentage loaded, once complete Status will say display **Ready.**

NOTE: If you do not intend to add / remove / change the words used when creating crosswords then you can ignore this next section.

If you would like to change the words that are used when creating crosswords then you have to create a "word file" which contains all the words and every clue for each word. Each line of the word file must start with the word followed by all the clues for that word separated by tabs, example:

WORD<tab>The first clue<tab>The second clue<tab>The third clue

Once you are happy with your word file drag it into the **Word File** field and click **Process Word File**. This will take a little while to complete but once it's finished the new word dictionary will automatically be loaded and crosswords can then be created.

1.2 Gird Settings

The **Grid Name** is used as the name of the file when the Create File button is clicked. If there is already a file with that name then it will prompt you if you want to overwrite it or not.

The **Grid Size** is the simply the size of the crossword, the number of rows / columns.

1.3 Grid Information

Grid Information

Total Characters: 171

Total Words: 84

Total Across Words: 43

Total Down Words: 41

Word Lengths:

Length 1 : 0	Length 2 : 0	Length 3 : 49
Length 4 : 12	Length 5 : 13	Length 6 : 6
Length 7 : 0	Length 8 : 2	Length 9 : 0
Length 10 : 0	Length 11 : 0	Length 12 : 0
Length 13 : 0	Length 14 : 0	Length 15 : 2

The **Grid Information** section displays some numbers about the current crossword grid layout. **Word Lengths** displays how many words of each length there are on the board. For instance in the above example, there are 12 words of length 4.

NOTE: There are not words in the word dictionary of length 1 or 2. As you are placing blocks, check this section to make sure there are no words of those lengths or the word placement algorithms will not be able to find any words.

1.4 Clues

Clues

▼ ACROSS – 43 words

1 : RAJA
☐ Custom   Indian chief

5 : ABS
☐ Custom   Sit-up muscles

8 : NUS
☐ Custom   College sweater letters

The **Clues** section is where you assign each placed word on the crossword a clue. Every word in the word dictionary has at least one clue and the first clue (If there are more than one) will be

automatically selected. If there are more then one clue then you can change it by clicking the drop down and selecting another clue. You can also set a **Custom** clue by clicking the checkbox and typing in your own clue.
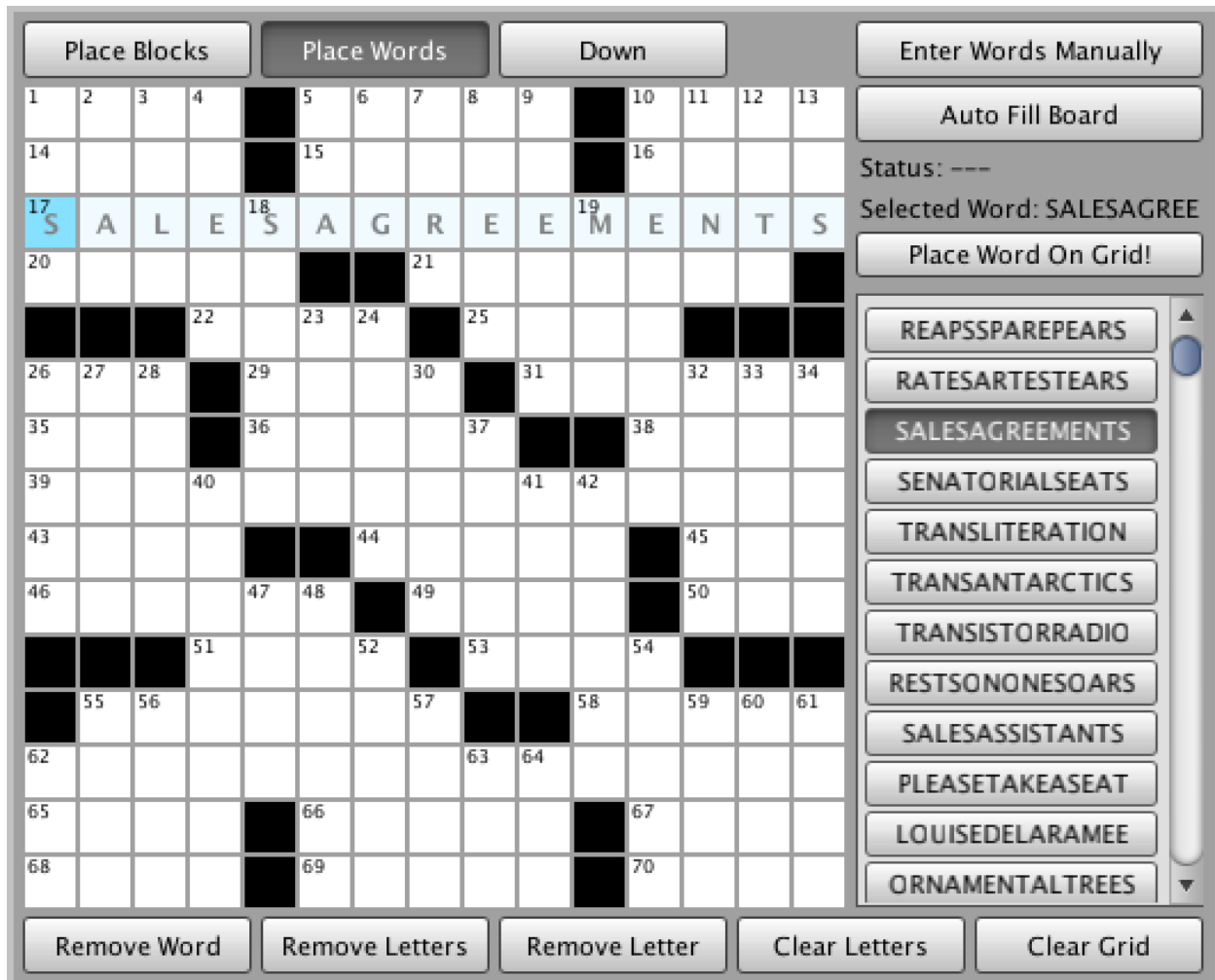
1.5 Placing Blocks

To place blocks on the crossword, make sure the **Place Blocks** toggle at the top is selected. Then simply click on the cells in the crossword to place or remove a block. The **Mirror** toggle will make is so every time you place or remove a block, a second block will be placed or removed in the mirrored position on the crossword.

1.6 Placing Words

To start placing words on the crossword, select the **Place Words** toggle at the top then click a cell on the crossword. As soon as you click a cell the right panel will start automatically filling with all the possible words that can go where you selected. This list is sorted based on how likely it is that word will lead to a finished board. The **Status** shows the percentage of words it has checked so far.

Clicking on a word in the list will select in and it will appear on the crossword in grey letters to give you a preview of how it will look on the board. Once you are happy with the word you have chosen click the **Place Word On Grid!** button to place it on the crossword. You can also hit ENTER on your keyboard to place the word.

The toggle beside **Place Words** is used to switch the direction of the selected word. You can also use the arrow keys on your keyboard to switch the direction.

It's best to select cells that already have letters in them. The algorithm can find possible words a lot faster if it is given letters that must be in the word. For instance, in the above example is best to select 1 - 13 down because those cells cross SALESAGREEMENTS. So if 4 down is selected the algorithm can ignore all words that don't have an 'E' in as the 3rd letter.

1.7 Manual Word Placement

You can manually type words on the board by clicking the **Enter Words Manually** button in the top right corner. This button is a toggle, clicking it again will disable entering words manually. To type a word, select a cell to highlight either the across word or down word. Then type the word in the input field on the right panel. The word will not actually be place on the crossword until the **Place Word On Grid!** button is clicked.

1.8 Auto Filling

Clicking the **Auto Fill Board** toggle will show options for generating random block arrangements and randomly filling the crossword with words.

The **Max Neighbor Count** is the maximum number of blocks that can be "beside" each other either horizontally, vertically, or diagonally. The **No Squares** checkout maxes is so the blocks will not create a square (4 blocks all beside each other). Clicking the **Auto Generate Blocks** button will then clear the crossword and place blocks on it in a random order. The algorithm will never places blocks in a way that creates words of length 1 or 2.
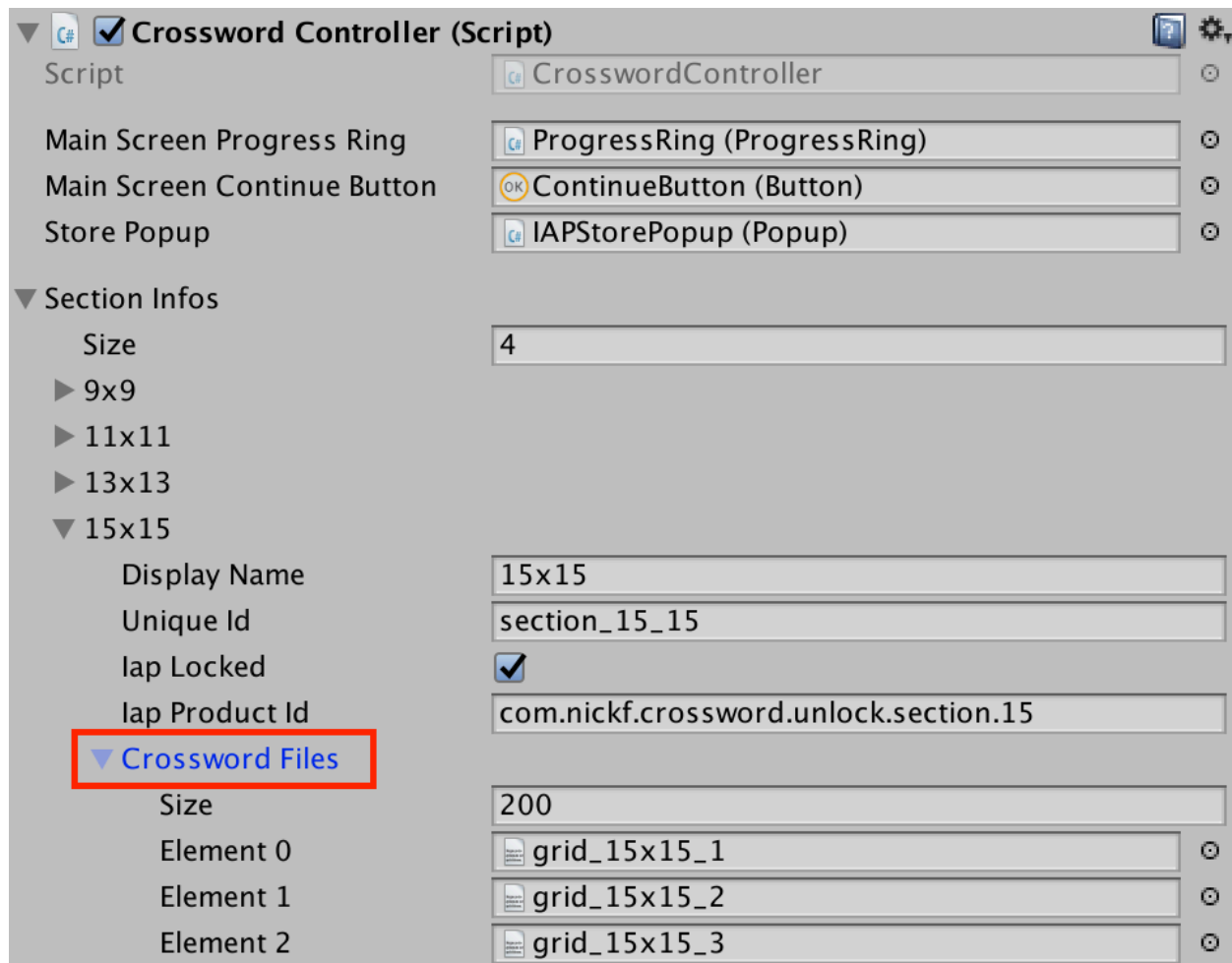
Clicking the **Auto Fill Crossword** will start the algorithm that randomly places words on the crossword. This process could take up to a couple minutes to complete and my not always be successful. This is because not all boards (with the arrangement or blocks) have a way to place any combination of words.

A good strategy is if the auto filling is taking to long then click the **Stop Filling Crossword** button and create a new arrangement of blocks either manually or by clicking the Auto Generate Blocks button.

1.9 Create Crossword File

Once the crossword has been filled with words, click the **Create Crossword File** button. If there are no errors then a crossword file will be generated and placed in the **Assets/Crossword/CrosswordBuilder/CrosswordFiles** directory.

In order to use this crossword in the game, add it to a **Crossword Files** list in the **Crossword Controllers** inspector.

2 Ads

You can enable / disable banner and interstitial ads in the **AdsController** inspector. You can use either Unity Ads or AdMob for interstitial ads. AdMob ads will only appear on device, Unity Ads can be enabled to appear in the Unity Editor for testing purposes.

Interstitial ads will display right after the player selects a crossword to play. You can set the number of crosswords that must be started before a new interstitial ad appears by changing the **Num Crosswords Till Ad Shown** field on the **CrosswordController**.

The AdMob Unit IDs that come with the asset are Googles test ids, you will need to replace them with your own if you would like to use AdMob.

UIScreen / Banner Ads

The UIScreen inspector can be used to enable / disable banner ads and also set the position of the banner ads on a screen by screen bases. There are three screens currently in the asset (MainScreen, SectionsScreen, and GameScreen). If banner ads are enable on a UIScreen then at run time the UIScreen will automatically adjust it's layout to make room for the banner ad so that it does not block any UI.

2.1 Unity Ads Setup

In order to enable Unity Ads in the project, navigate to **Window -> Services** and enable **Ads**. When testing Unity ads make sure you click the **Enable test mode** on the Ads Services panel.

2.2 AdMod Setup
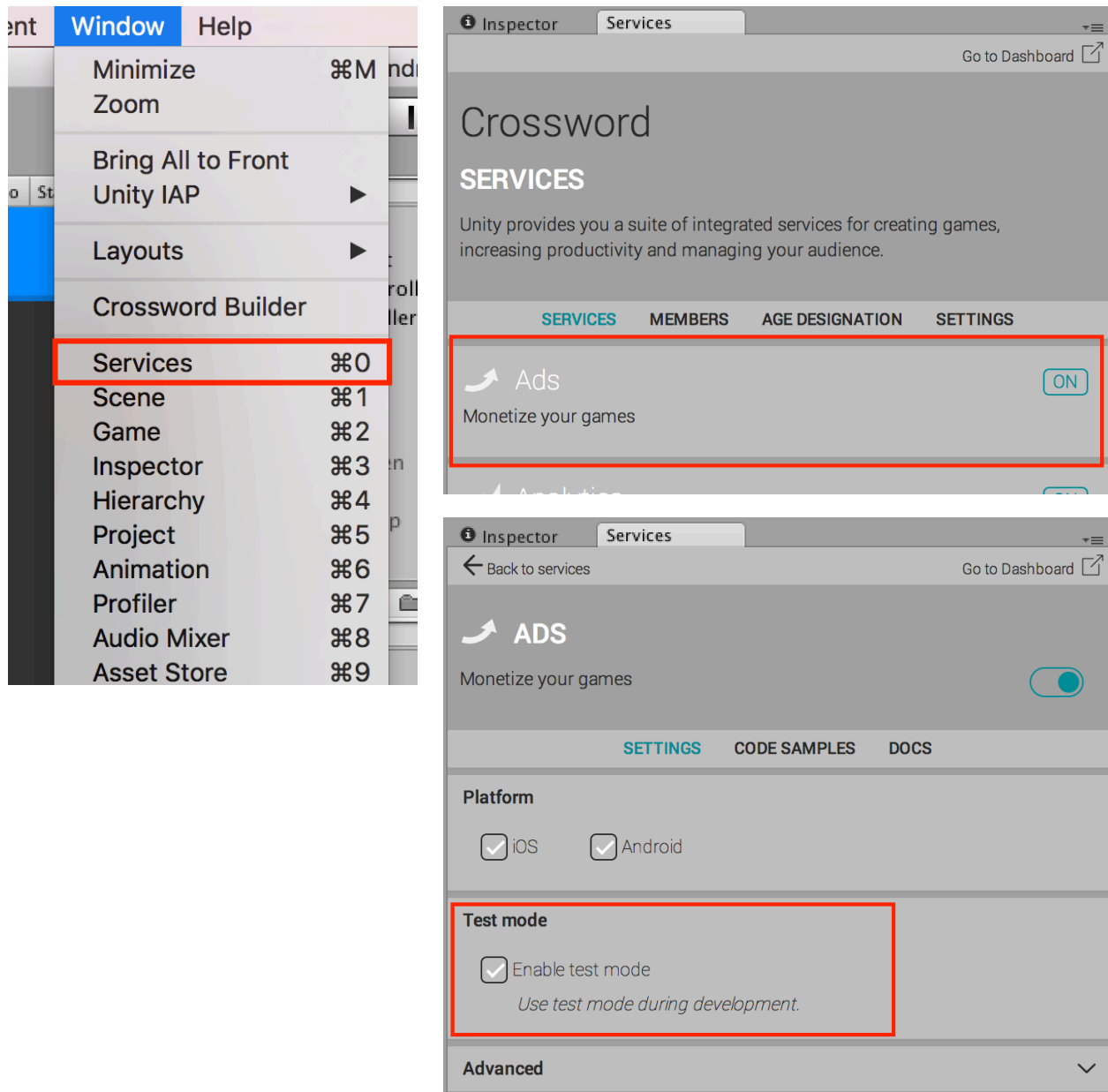
In order to enable AdMob first you need to download **GoogleMobileAds.unitypackage** from Google: https://developers.google.com/admob/unity/start. Follow the steps on that page to import the unity package.
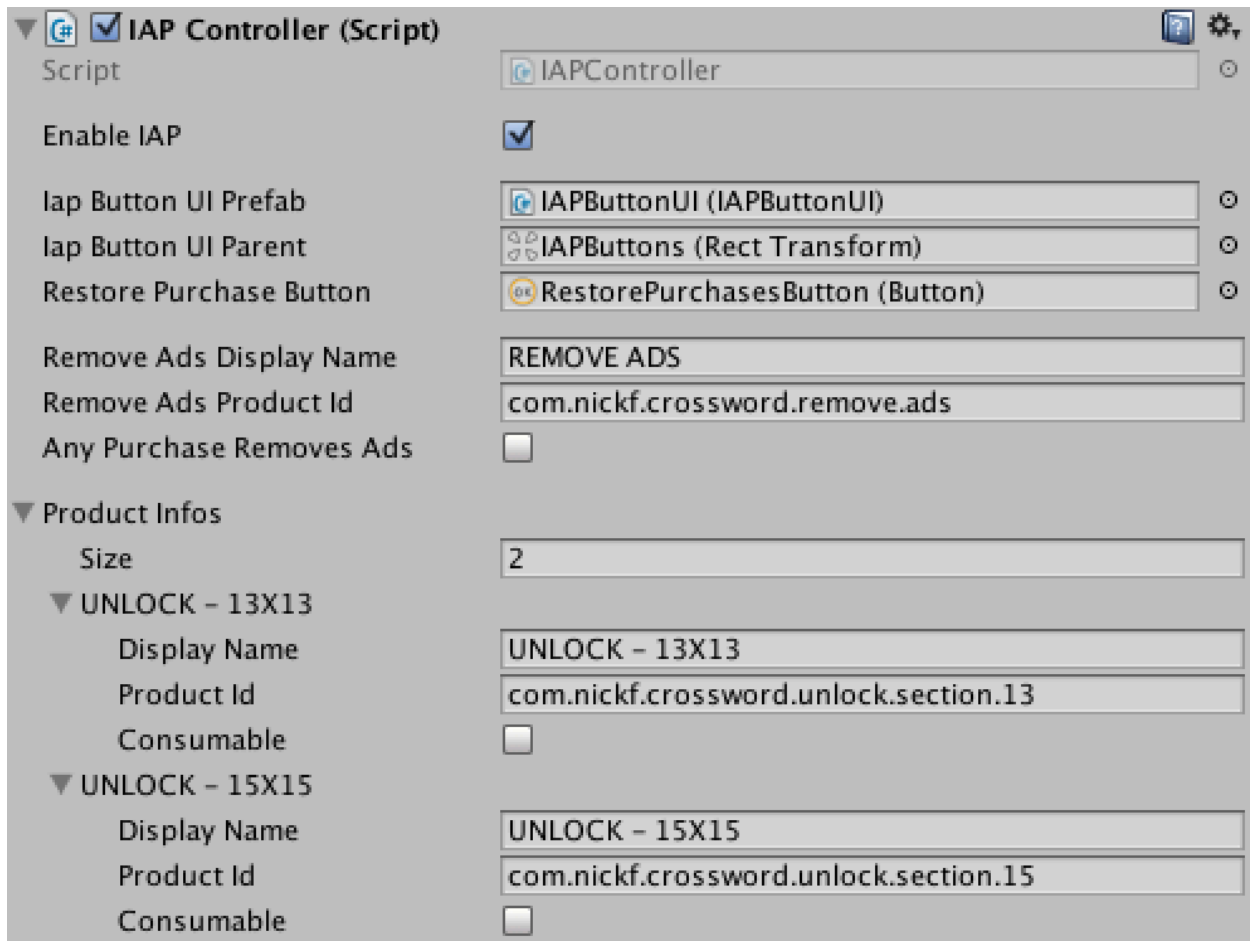
Next navigate to the **Player Settings** window and under the **Other Settings** add **ADMOB** to the **Scripting Define Symbols**.

NOTE: This setting is not shared between platforms. You need to add it to the Player Settings on both Android and iOS platforms.

3 IAP

▼ ⊞ ☑ **IAP Controller (Script)**		🔲 ⚙
Script	ⓒ IAPController	⊙
Enable IAP	☑	
Iap Button UI Prefab	ⓒ IAPButtonUI (IAPButtonUI)	⊙
Iap Button UI Parent	⧉ IAPButtons (Rect Transform)	⊙
Restore Purchase Button	⊙ RestorePurchasesButton (Button)	⊙
Remove Ads Display Name	REMOVE ADS	
Remove Ads Product Id	com.nickf.crossword.remove.ads	
Any Purchase Removes Ads	☐	
▼ Product Infos		
Size	2	
▼ UNLOCK – 13X13		
Display Name	UNLOCK – 13X13	
Product Id	com.nickf.crossword.unlock.section.13	
Consumable	☐	
▼ UNLOCK – 15X15		
Display Name	UNLOCK – 15X15	
Product Id	com.nickf.crossword.unlock.section.15	
Consumable	☐	

You can enable / disable IAP and the in app store in the **IAPController** inspector. Currently the Crossword asset is setup to handle two types of IAP purchases: removing ads and unlocking sections. A button will automatically be placed in the store popup for the remove ads (If the **Remove Ads Product Id** is set) and also for each item in the **Product Infos** list. The **Restore Purchase Button** will be disabled in all platforms other than iOS and Mac OSX (Since those platforms require explicit action from the user to restore purchases where as other platforms do it automatically)

All you need to do to enable removing ads is set the **Remove Ads Display Name** and the **Remove Ads Product Id**. If the player purchases this item then the AdsController will automatically turn off ads and remove banner ads (if they were enabled).

For unlocking sections, add a new item in the **Product Infos** list for each unlock-able section. Next copy the **Product Id** into the corresponding **Iap Product Id** field located in the **Section Info** in the **CrosswordController** inspector:

When the item in the store is purchased the section will automatically become unlocked in the game and be playable.

3.1 IAP Setup

To enable Unity IAP, first open the Services window by navigating to **Window -> Services** and enable **IAP**.

Next navigate to the **Player Settings** window and under the **Other Settings** add **UNITY_IAP** to the **Scripting Define Symbols**. (If there are already scripting define symbols, you can add others by simply separating them with a semi-colon):

Other Settings

Rendering

Color Space*	Gamma
Auto Graphics API	☑
Multithreaded Rendering*	☑
Static Batching	☑
Dynamic Batching	☑
GPU Skinning*	☐
Graphics Jobs (Experimental)	☐
Virtual Reality Supported	☐
Protect Graphics Memory	☐

Identification

Bundle Identifier	com.nickf.crossword
Version*	1.0
Bundle Version Code	1
Minimum API Level	Android 4.0 'Ice Cream Sandwich' (API level 14)

Configuration

Scripting Backend	Mono2x
Mute Other Audio Sources*	☐
Disable HW Statistics	☐
Device Filter	FAT (ARMv7+x86)
Install Location	Prefer External
Internet Access	Auto
Write Permission	Internal
Android TV Compatibility	☑
Android Game	☑
Android Gamepad Support Lev	Works with D-pad

Scripting Define Symbols
ADMOB;UNITY_IAP

Optimization

Api Compatibility Level	.NET 2.0 Subset
Prebake Collision Meshes	☐

NOTE: This setting is not shared between platforms. You need to add it to the Player Settings on both Android and iOS platforms.
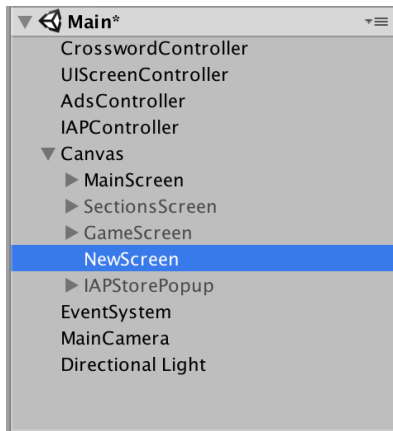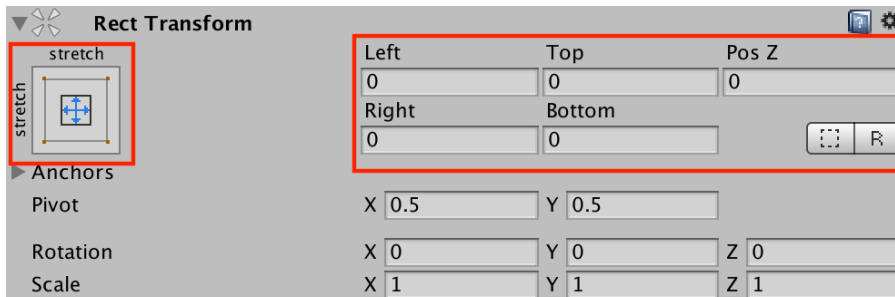
4.0 Project Setup

4.1 Screen Transitions

There are three screens in the Crossword game: MainScreen, SectionsScreen, and GameScreen. The **UIScreenController** is used to transition between screens.
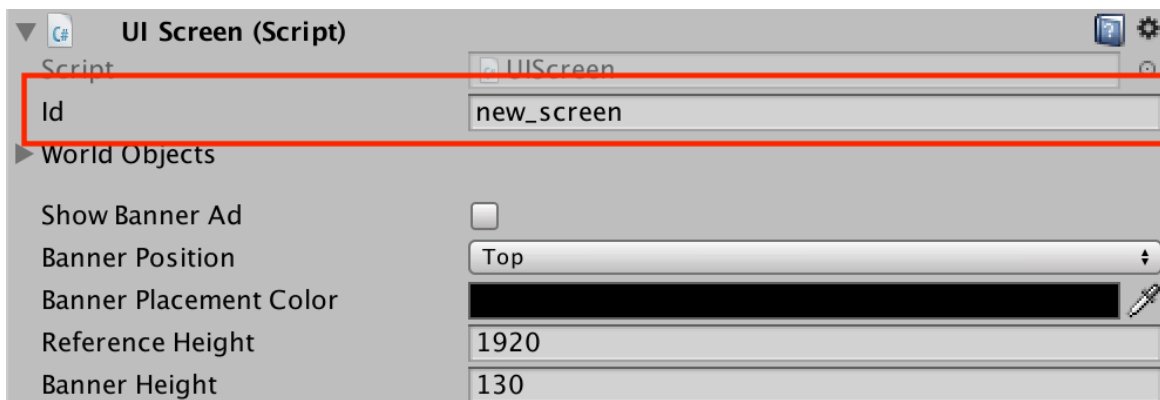
To create a new screen:

1. Create an empty **GameObject** as a child on the Canvas
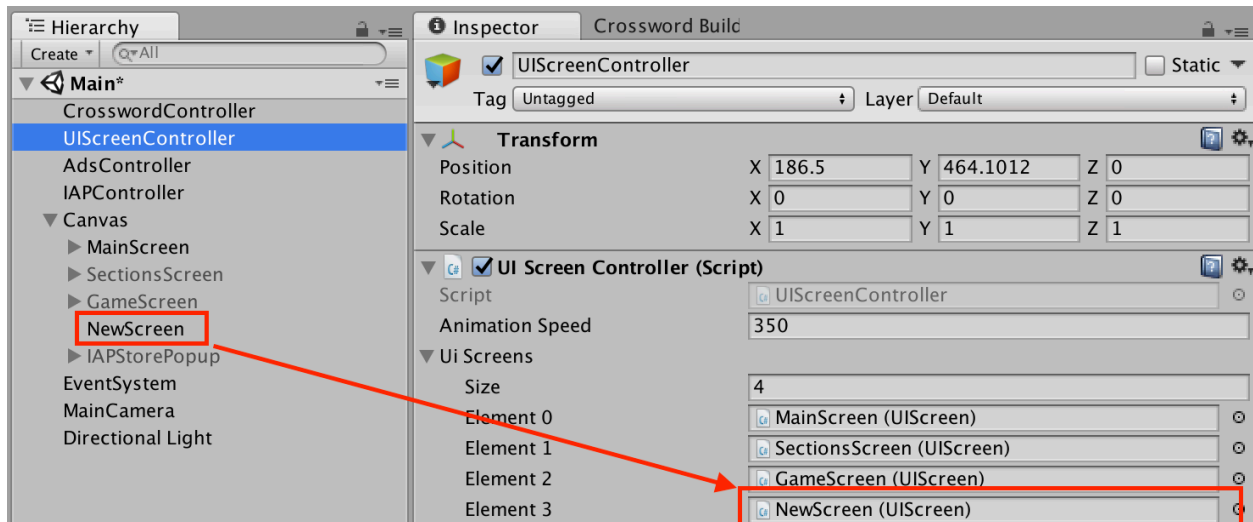

2. Sets its **RectTransform** to stretch all

3. Add a **UIScreen** component to the GameObject and give it a unique Id (Different then all other UIScreens)

4. Add a reference to the new UIScreen in the UIScreenControllers **Ui Screens** list.

To transition to a screen, you can use the **UIScreenButton** component or you can call **UIScreenController.Instance.Show("new_screen")**. The UIScreenController will keep track of what screen it's currently showing so that it can automatically hide the screen when another is being shown.

4.2 Sections

Sections are used to group crosswords together. There are four sections in the Crossword game: 9x9, 11x11, 13x13, and 15x15. New sections can be added in the **CrosswordControllers** inspector in the **Section Infos** list.
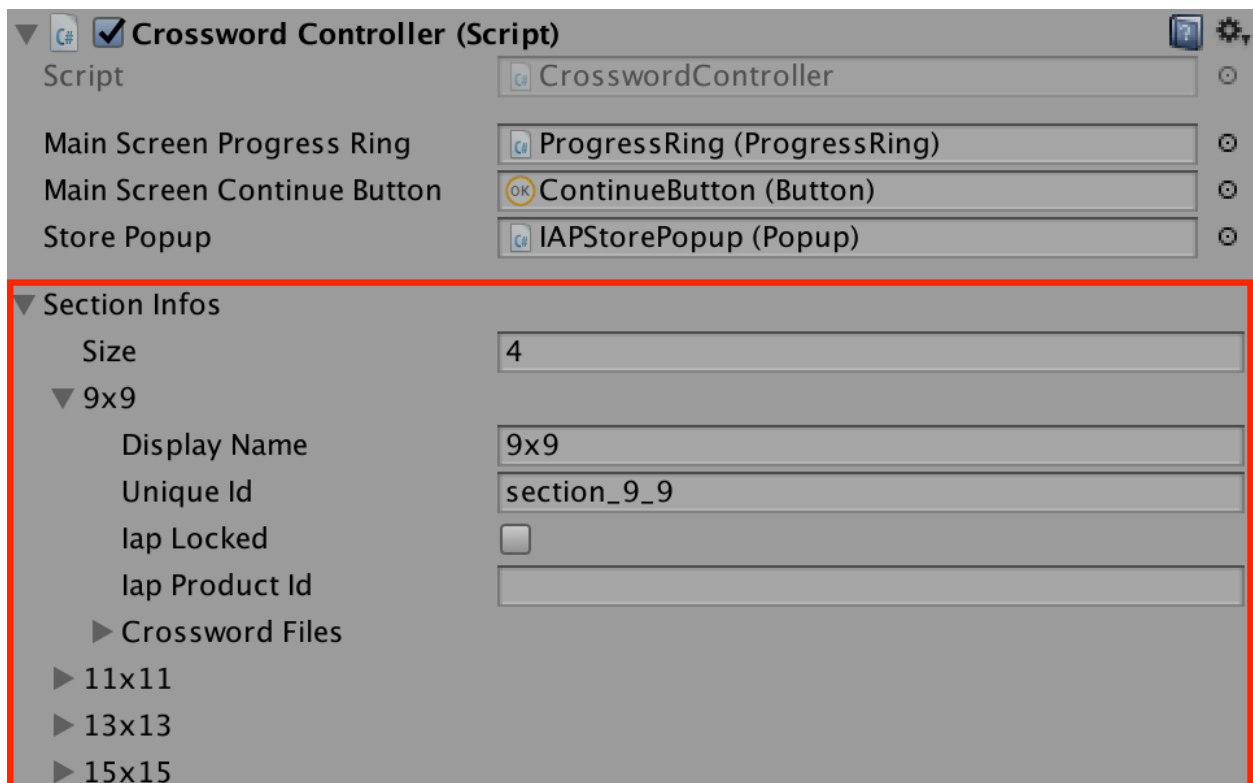
For each section added to this list, a new **Section UI Prefab** will be instantiated and placed in the **Section UI Container**.

The crossword icons are automatically generated at run time using the contents of the crossword file. You can change the style of them under the **Crossword Icon Settings**.

Only six crossword buttons are displayed (and created) at a time. This is because there are 200 crosswords per section and there would be significant lag if all were created and displayed at once.

4.3 Grid Cells

|	
Grid Cell Prefab	ⓒ GridCell (GridCell) ⊙
Grid Cell Parent	▦ Grid (GridLayoutGroup) ⊙
Grid Cell Design Size	214.4
Min Number Text Scale	0.5

The crossword grid cells display is controlled by the **Grid Cell Prefab**. When a crossword starts, a new GridCell is created and placed in the **Grid Cell Parent** for each cell in the crossword.

The **Grid Cell Design Size** is the width / height that was used when the GridCell prefab was created. This size is used to scale the **Number Text** and the **Character Text** on each GridCell when they are placed in a crossword at runtime. It is best to use a large size when designing the GridCell so the the texts are scaled down instead of up, this way they wont look blurry.

Scaling down the **Number Text** could make it unreadable on some boards. You can set the **Min Number Text Scale** so that the Number Text will not scale below a certain value.
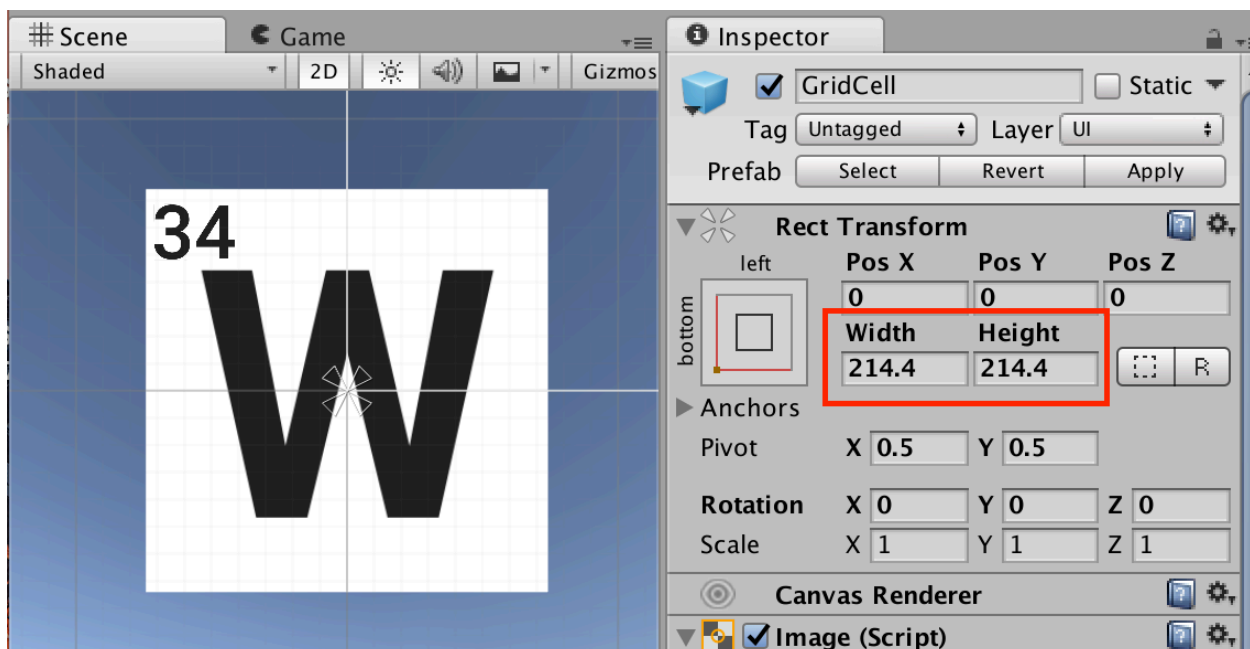
The crossword grids **line color** and **size** are controlled by the Image component attached to the **CrosswordGrid** GameObject and the Grid Layout Group components Spacing which is attached to the **Grid** GameObject.
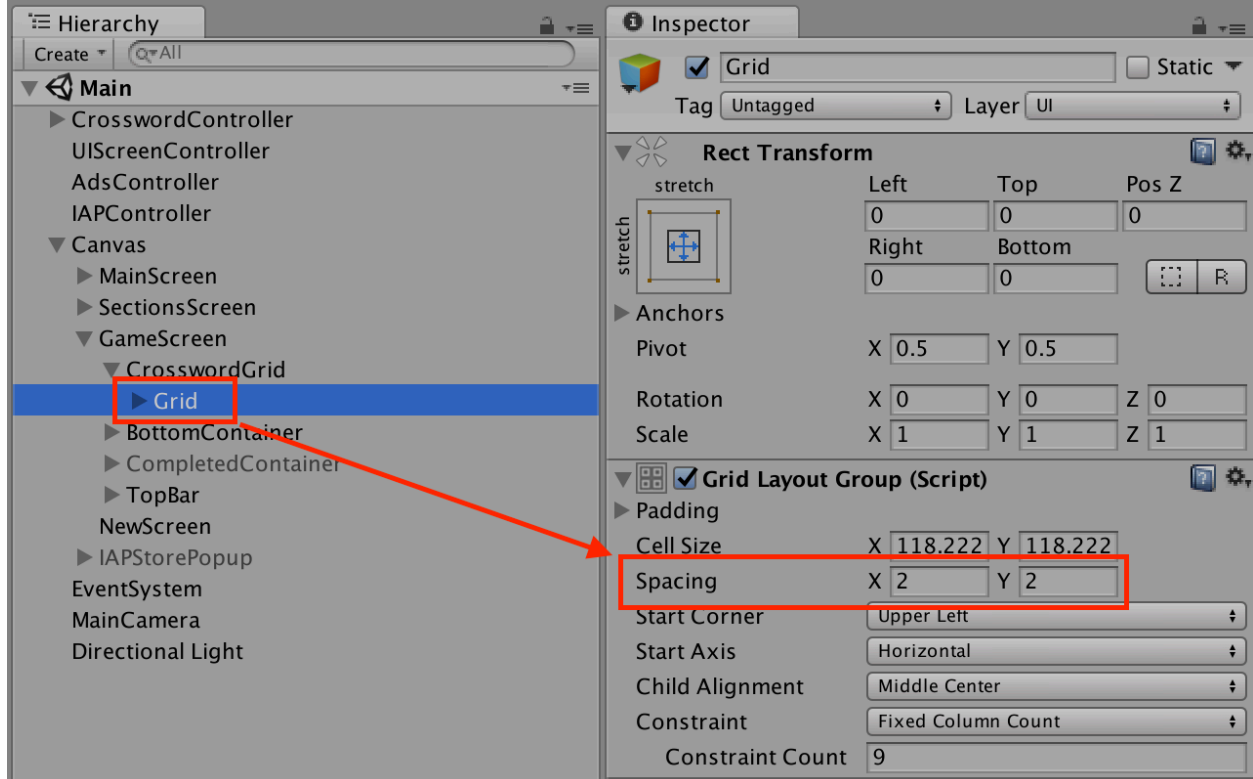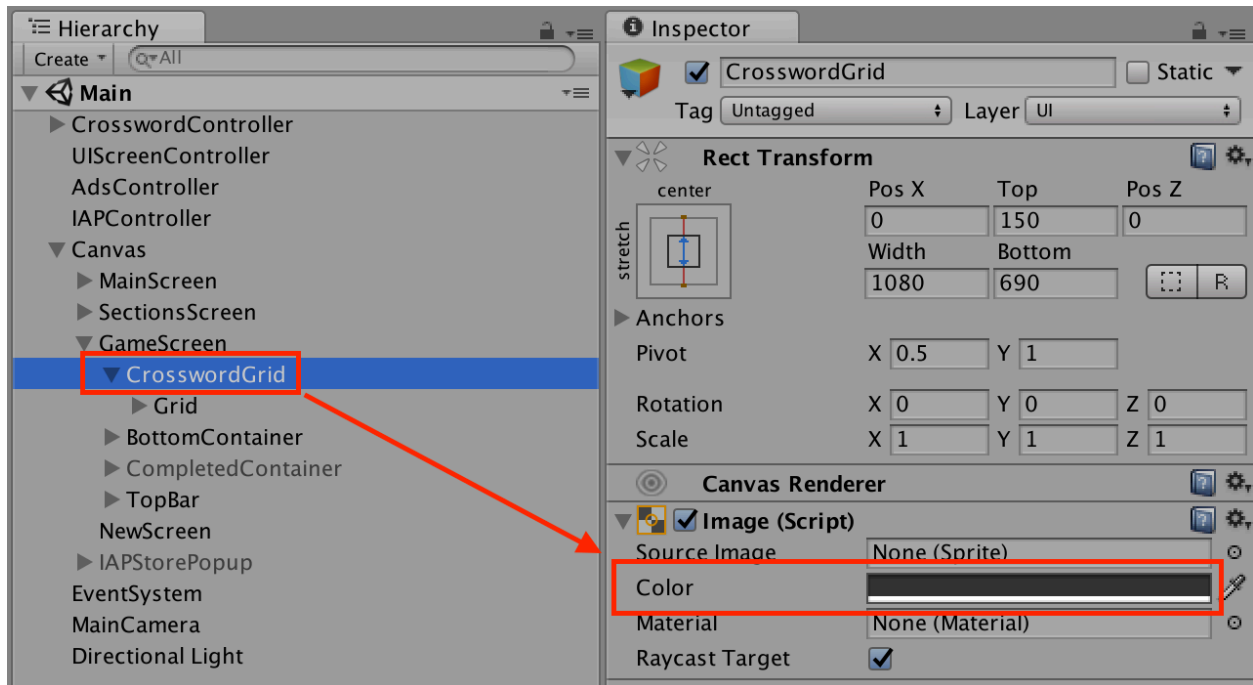
4.4 Keyboard

The asset comes with a custom on screen keyboard (I did this because you cannot remove the input field that appears above the default Android keyboard).

To create keyboard buttons, create a Button and attach the **Keyboard Button** component to it.
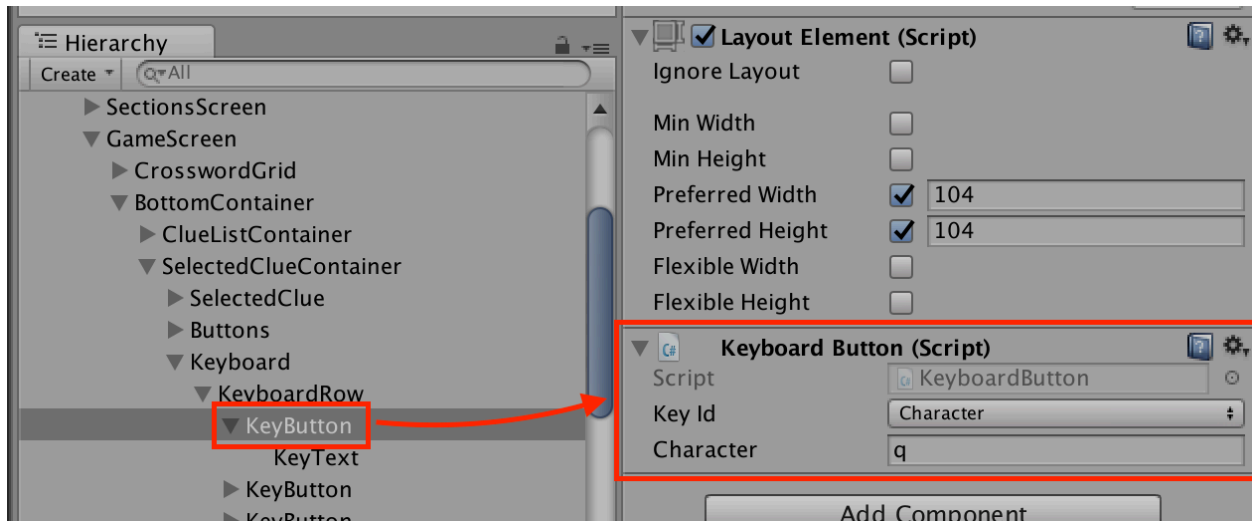
Next set the **Key Id** to **Character** (There are only three Key Ids: Character, Backspace, and CloseKeyboard). Then set the character for this keyboard button. Finally, drag the new KeyboardButton into the list of **Keyboard Buttons** on the **Keyboard** component.

Now whenever that button is click the Keyboard script will invoke its **OnKeyPressed** event. The **CrosswordController** is already setup to listen for OnKeyPressed events and handle the key press accordingly. Character button types will "type" the character into the selected cell (if there is a cell that is selected), Backspace will clear a cell, and CloseKeyboard will tell CrosswordController to close the keyboard.

When playing the crossword game on a computer (In the Unity Editor and on WebGL builds) the physical keyboard can be used to type characters onto the crossword. The arrow keys are used to change direction and the backspace key is used to remove characters.