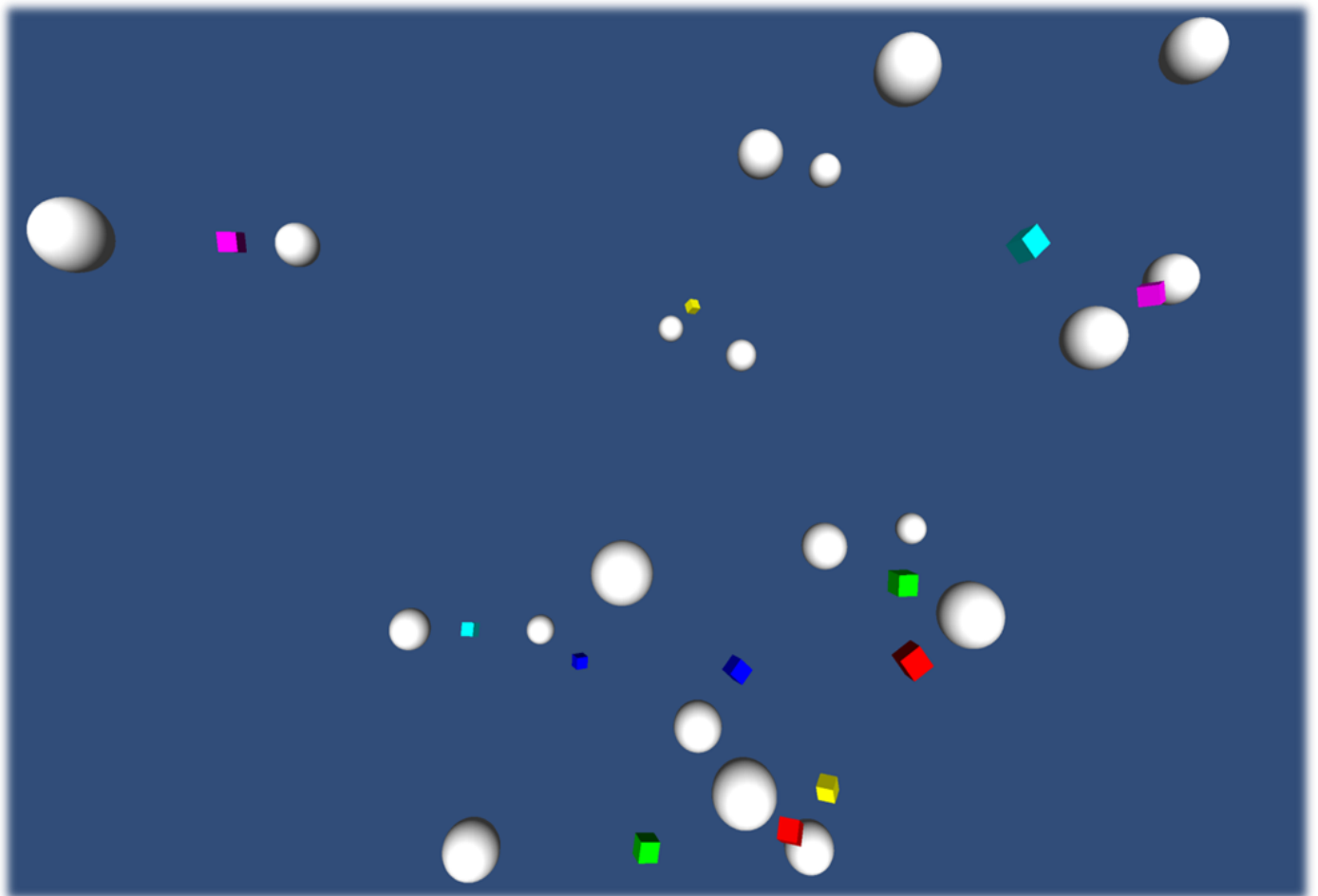


# TradeSys



A trading and  
manufacturing system

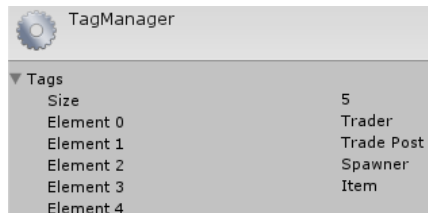
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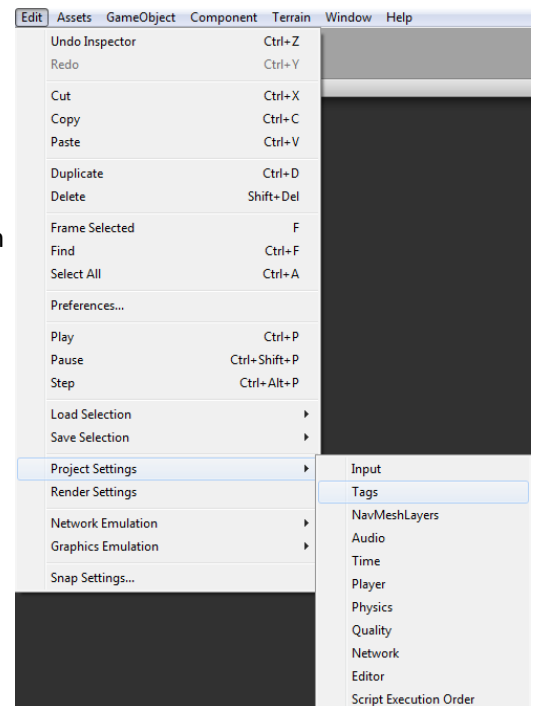
TradeSys requires some initial setup before the traders can get to work, but fortunately this is very simple.

### Initial setup:

1. New tags need to be added. The tags need to be called 'Trader', 'Trade Post', 'Spawner' and 'Item'. To add a tag, go Edit > Project Settings > Tags. Here, there is an array of tags, and you can add in the new ones.

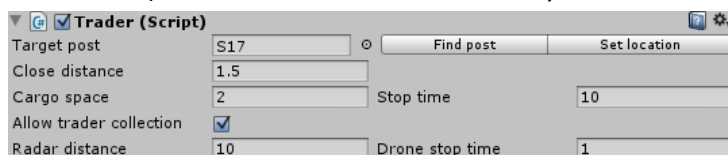


2. Add an empty GameObject, and call this 'Controller'. (GameObject > Create Empty). Add the controller script to this object. This will handle all of the possible trades that can occur in the game.
3. Now it is time to add the Trade Posts. Either add a new GameObject (this time not empty, otherwise you won't be able to see it!), or on a previously created object that you wish to be a Trade Post, set the tag to Trade Post, and add the TradePost script. Repeat this step for all posts. Alternatively, it is now even easier to create all of your Trade Posts in a script. See **useful methods** for more information.
4. If you want your traders to be able to pick up items that have been dropped or spawned, then in controller, under settings, tick 'Allow item pickup'.

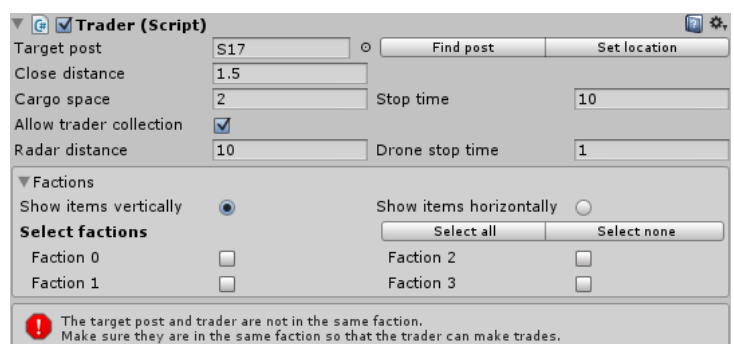


**If you are having set traders within your game going from post to post, follow step A. If you want traders to be created at the post that they are required and then destroyed when they get to their destination, follow step B.**

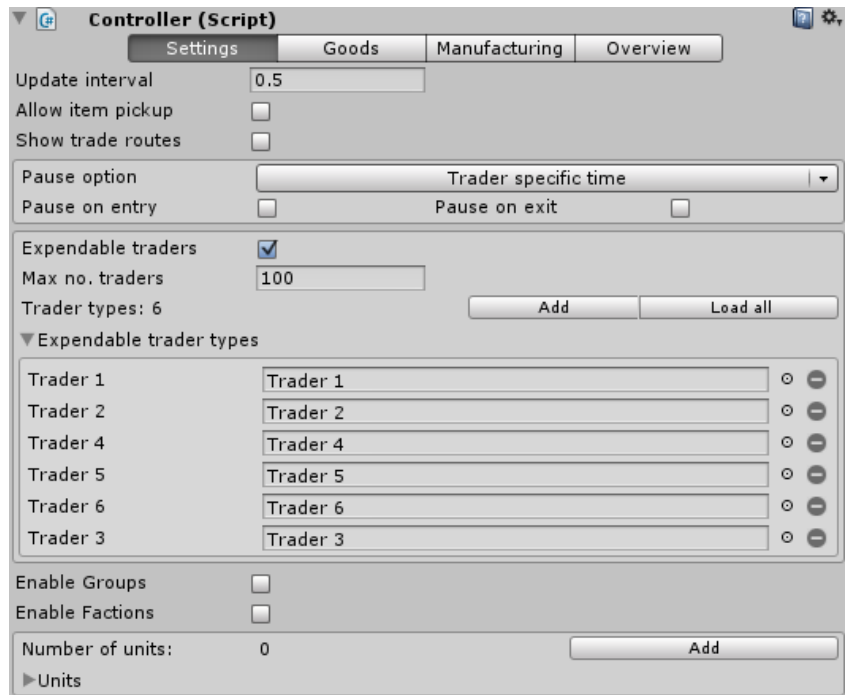
- A. The Traders are now going to be created. Once again, either create a new GameObject, or use a previously created one. Set the tag to Trader and add the Trader script. Either put the trader near the location of a Trade Post (needs to be  $\leq$  close distance away in order to be found) and press the find post button. This will find a nearby post, and set the target correctly and move it to be at the post. The other option is to set the post that you wish the trader to be at, and press the set location button which will



move the trader to the correct location. If trader specific stop time has been selected in the controller, an option to set the stop time will be displayed. The cargo space is the maximum mass of cargo that can be carried. If you want the traders to be able to pick up dropped or spawned items, then ensure that the 'Allow item pickup' option has been selected in the controller, and tick 'Allow trader collection'. This will then show two more options, the radar distance, which is how far away the trader can see an item and this can be seen in the scene view, and drone stop time. This is how long a trader will stop to pick up an item. If factions have been enabled in the controller and set up, then there will be a list of options for setting the faction of the trader. If the trader and current trade post are in different factions, then an error will be displayed as the trader will be unable to do anything.

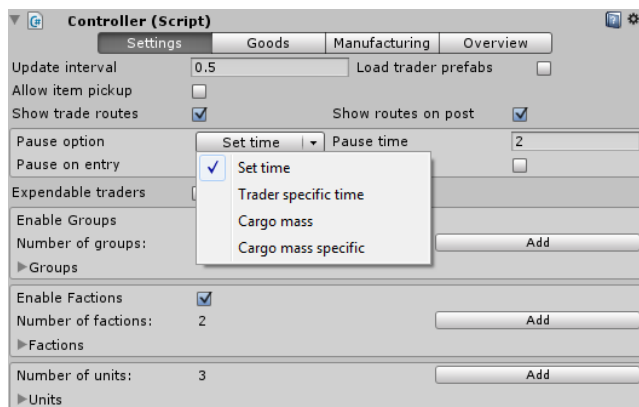


- B. In controller, under settings, there is an option for expendable traders. Enable this so that traders will be created and destroyed. If the load trader prefabs option was disabled before enabling expendable traders, a progress bar will be displayed as the controller goes through all of the assets to find any which are traders. This is so that the factions options can be updated when it is changed. The trader prefabs will only be reloaded when a file is added or removed from the project. Once it has loaded the traders, you need to set the maximum number of traders allowed at any one time. Setting this to 0 will mean that there may be an unlimited number of traders. The different types of traders that can be created need to be set, as the controller will randomly select a trader to create from this list. Pressing 'Add' will create a new trader type, where you can select a prefab for the trader. To create the prefab, add the object that you want as your trader, and follow step A to set the trader up. But don't set the target post as this is set by the controller when it is created. Once this has been done, drag the Trader into the Projects folder, where it will create the prefab. The object in the scene view can now be deleted, and the prefab added to the trader type list. Pressing the load all button will mean that any traders that had been found by the controller when it went through all of the assets will be added.



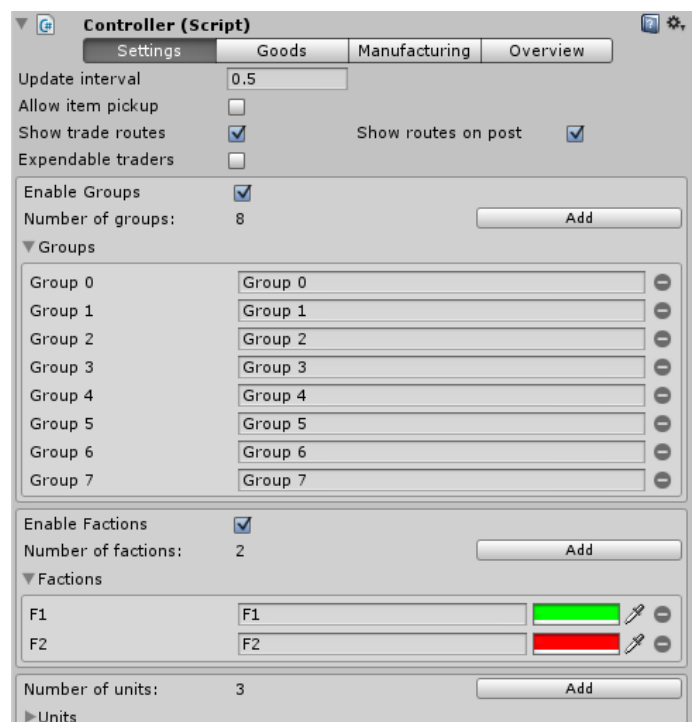
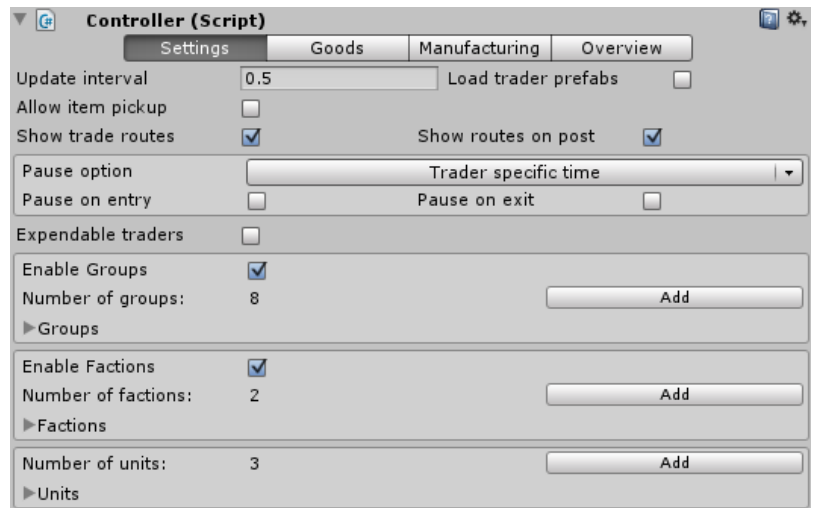
## Setting up the controller:

1. It is possible to set the update interval. This is the time between each update of pricing at trade posts and possible trades. By decreasing this number, it may be possible to improve performance.
2. Now there is the option to load trader prefabs. This means that whenever assets are added or removed, it will load any traders so that any trader prefabs can have the correct settings applied. If expendable traders have been enabled, then it is not possible to disable this.
3. Show trade routes is an option where once all of the trade posts have been sorted, when enabled, it will draw lines between posts where it is possible for traders to go between. The show routes on post option is so that while trade posts are selected, the links will be shown. This was to make it easier to see the connections developing, and which group is the correct one.
4. There are now different options for when a trader pauses and how long this is for. There are four pause options, set time, trader specific time, cargo mass and Cargo mass specific. Set time means that all traders will pause for this amount of time, trader specific means that some traders can pause for longer than others.



Cargo mass allows you to set the pause time for every 1 unit. If units have been set up, this will display the unit that a mass of 1 will have, e.g. t. Cargo mass specific means that a pause time for each cargo can be set. This pause time is for every unit of cargo, so 7 units of cargo of mass 3kg will be  $7 * \text{the time specified}$ . This pause time can be applied when a trader enters the trade post, before items are unloaded, and / or before the trader leaves a trade post.

5. There is also an option to enable groups. When this is enabled, all of your Trade Posts can belong to different groups, which have been set here. It is possible to add as many groups as you want, remove groups or change the names.
6. There is another option to enable factions. Factions differ from groups because traders belong to the factions. Both factions and groups can be enabled together, so limiting the trades. Each faction also has the option to set the line colour. This is so that it is obvious what faction the post is in. Groups do not have colours because all traders can trade with every post.



5. In order for the items to display a unit, the units found under settings in the controller needs to be sorted. Press 'Add' to add a new unit, and enter the suffix you wish the unit to have. The min and max values also need to be set. An item will have that unit if the mass is greater than or equal to the min, and less than the max. The final unit needs to have a max value of infinity, so type in 'infinity'. If there are any overlaps, or no units extending to infinity, a warning will show in the inspector, to help with correctly setting up the units.

Number of units: 3 Add

Units

Unit suffix	Min	Max
g	1e-06	0.001
kg	0.001	1
t	1	Infinity

mass is 0.000001, which if 1 = 1 ton, then this value is 1 gram! If the allow item pickup option in settings has been enabled, then there will also be an option for the item crate to be set. This is so that spawners can create the item, and unique crates or items are created for each type of good. To easily find the crate, press the 'Find crate' button. This will search through the assets for a GameObject with the same name as the item, and set the crate. The search has a progress bar, which is especially useful if you have a large project, and has the option to cancel the search.

Number of types: 5 Expand all Collapse all

Good	Name	Mass (g)	Base Price	Min Price	Max Price
Butter	Butter	1e-06	150	80	160
Cake	Cake	1e-06	500	450	900
Eggs	Eggs	1e-06	50	20	60
Flour	Flour	1e-06	100	50	120
Sugar	Sugar	1e-06	120	80	200

remove it, or set the items in the needing and making sets. In both of these groups, you can only add items that have already been defined under goods. Under the needing and making, add items, and set the quantities that are required or are made by the process. Note the check button, more on that later!

Controller (Script) Settings

Update interval: 0.5

Allow item pickup: ☐

Show trade routes: ☒ Show routes on post: ☒

Expendable traders: ☐

Enable Groups: ☐

Enable Factions: ☐

Number of units: 1 Add

Units

Unit suffix: g

Min: 1e-06 Max: 0.001

Warning: None of your units extend to infinity. As a result, some items may not have any units. To extend to infinity, type infinity into the max field.

6. Now goods can be added, under the goods setting in the controller, press the 'Add' button to create a new tradable item. Here, you can set its name, mass, and trade prices. If the units have been set up, next to the mass, the unit will display in brackets. The minimum

Controller (Script) Goods

Number of types: 1 Expand all Collapse all

Flour

Add before Remove Add after

Name: Flour Mass (t): 1

Item crate: Flour Find crate

Prices

Base: 100

Min: 50 Max: 120

7. There are three pricing options to be set. The base price is used to work out the price at each trade post, and the min and max will limit the prices so that it cannot increase too much or be too low. Each item can be removed using the 'Remove' button, and new items have the option to be added before or after the current one, so it is possible to keep your items in alphabetical order.

8. Manufacturing processes are also set in the controller. Under the manufacturing tab, add a new process by pressing 'Add'.

Here, you can set the name,

Controller (Script) Manufacturing

Number of types: 2 Expand all Collapse all

Cake Baking

Name: Cake Baking Remove

Needing

Type	Quantity
Butter	5
Eggs	3
Sugar	6
Flour	5

Making

Type	Quantity
Cake	4

Person

Name: Person Remove

Needing

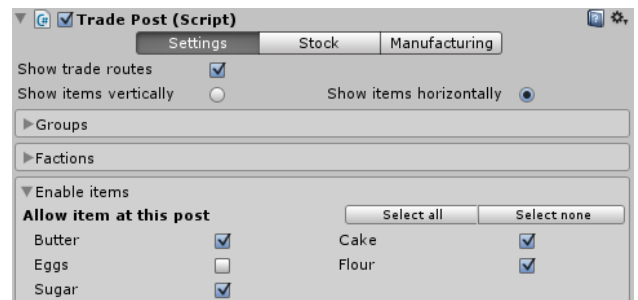
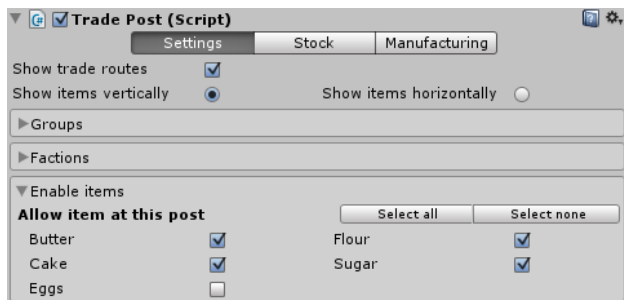
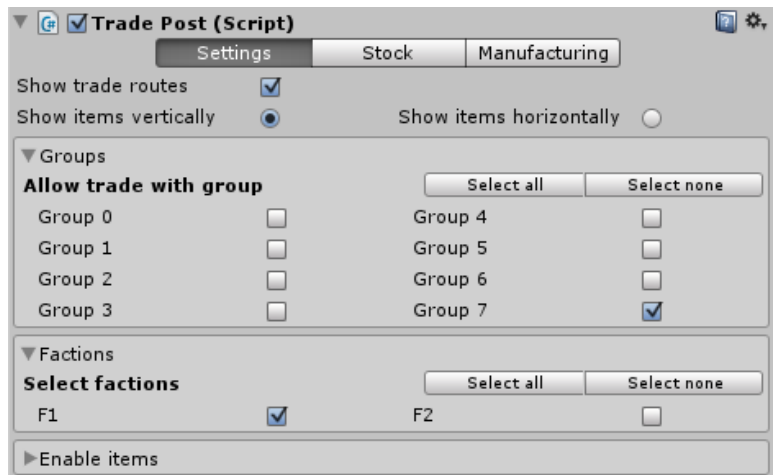
Type	Quantity
Cake	2

Making

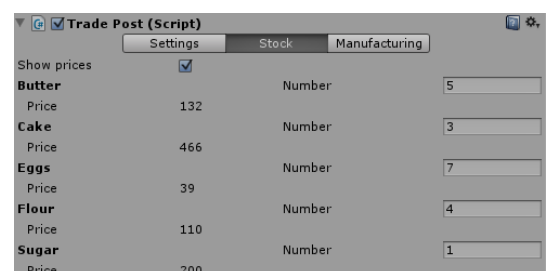
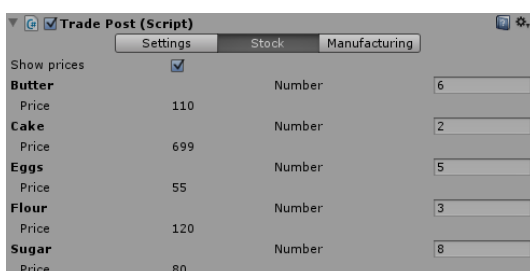
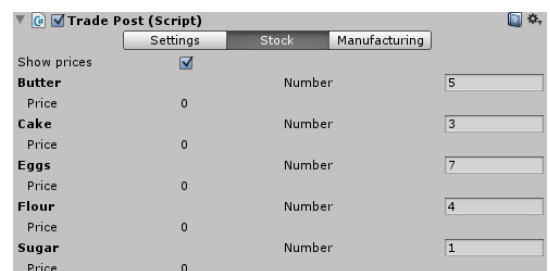
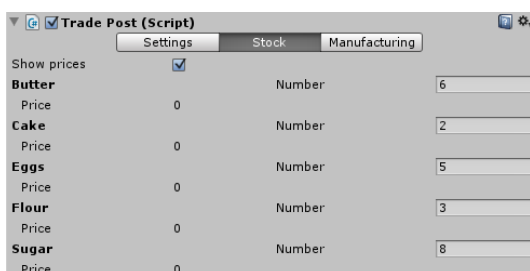
Type	Quantity
Cake	2

## Trade Post setup:

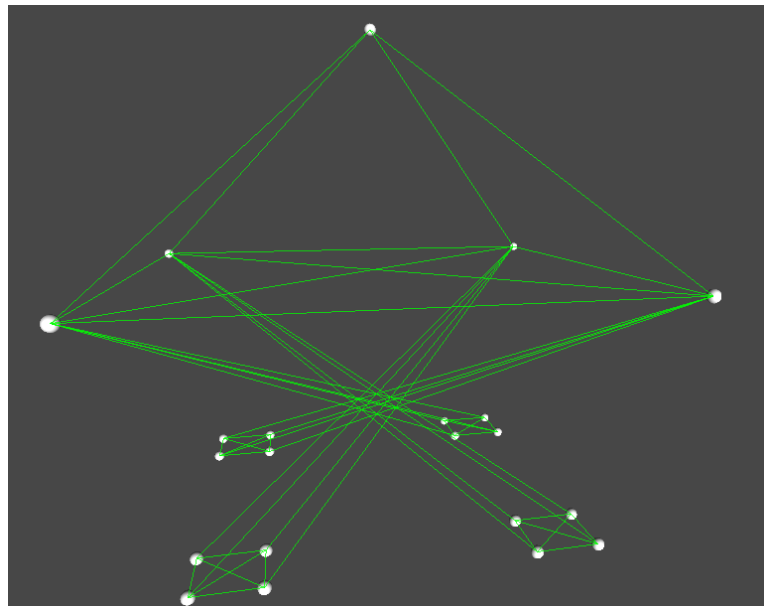
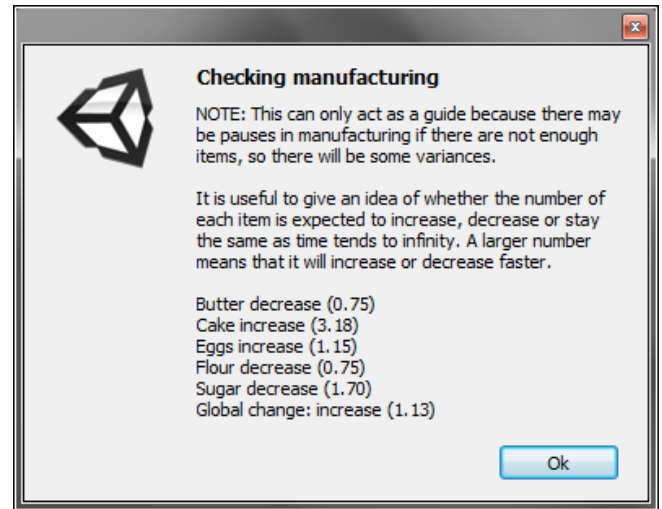
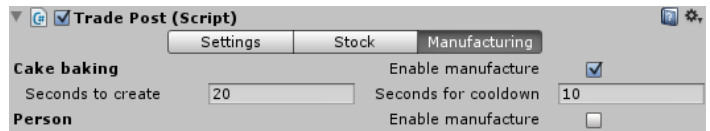
- Under the settings on a Trade Post, if show trade routes has been enabled in the controller, the show trade routes option will also appear on every trade post. This is so that you can see the links between posts establishing as groups and factions are sorted.
- There are options to set groups and factions. If either have not been enabled in the controller, then there will an information message in the relevant section. The grouping works by if a trade post is in one of the same groups, then a trade is possible. Multiple groups can be enabled because a Trade Post can belong to many groups at once, and trade with all of the posts in the different groups. Factions work in the same way, but in order for a trade to be completed by a trader, it has to belong in the same faction as the post that it is trading with. It doesn't check the post it is at because if it was in a different faction, then it couldn't get there anyway!



- Also in settings is an option to enable or disable different items at the Trade Post, preventing the purchase or sale of the item at that post. To make viewing the items easier, there is an option to view the items vertically or horizontally ascending.
- In stock, you can set how many of each item the Trade Post starts with. There is an option to view the prices, which are not editable and will show as 0 because the controller sorts all that out for you! The option is there so that it is possible to see the changes in prices when testing.



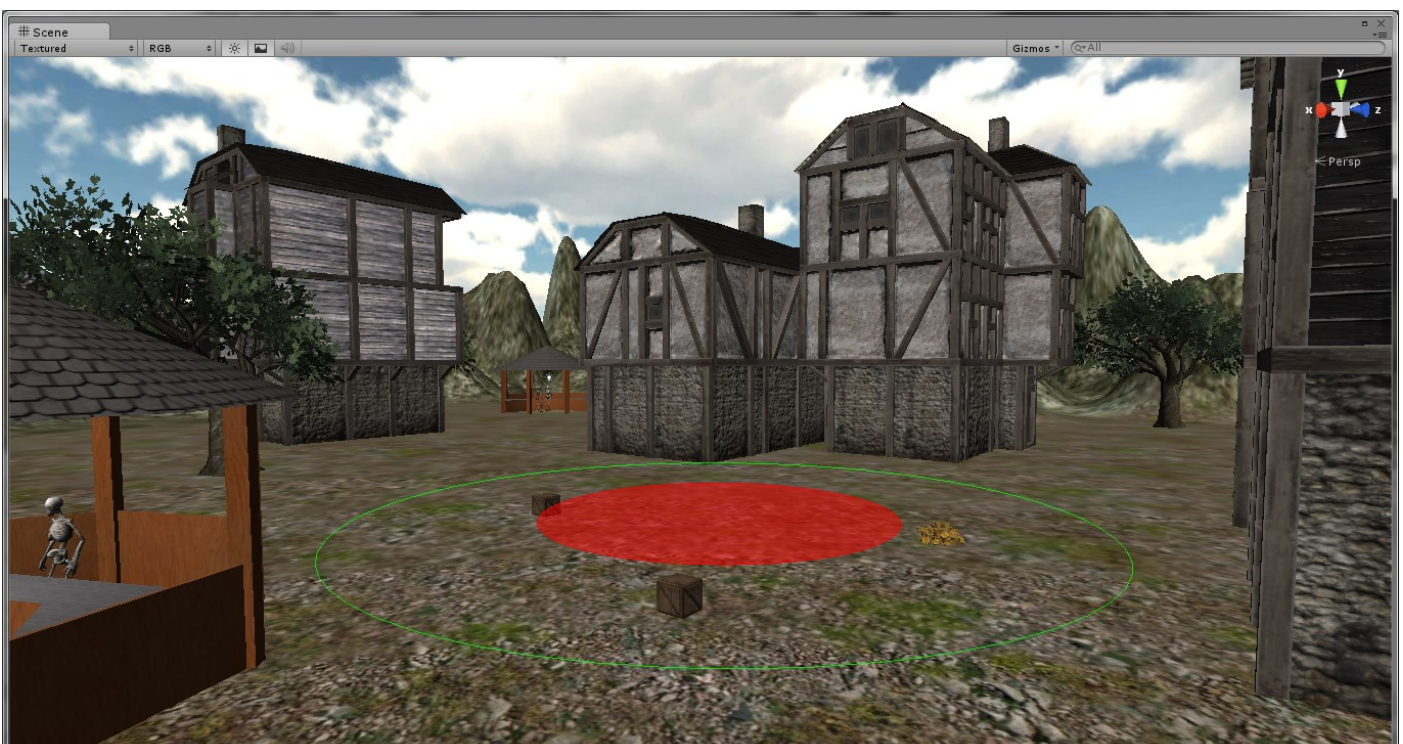
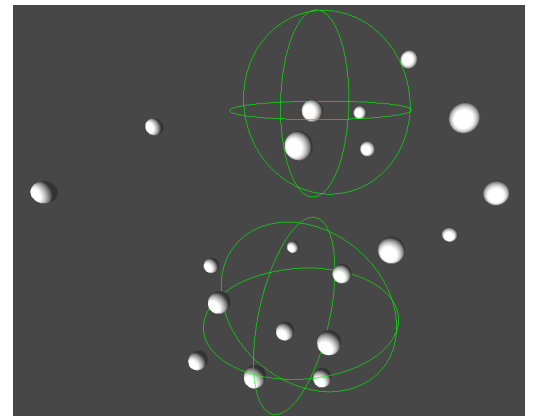
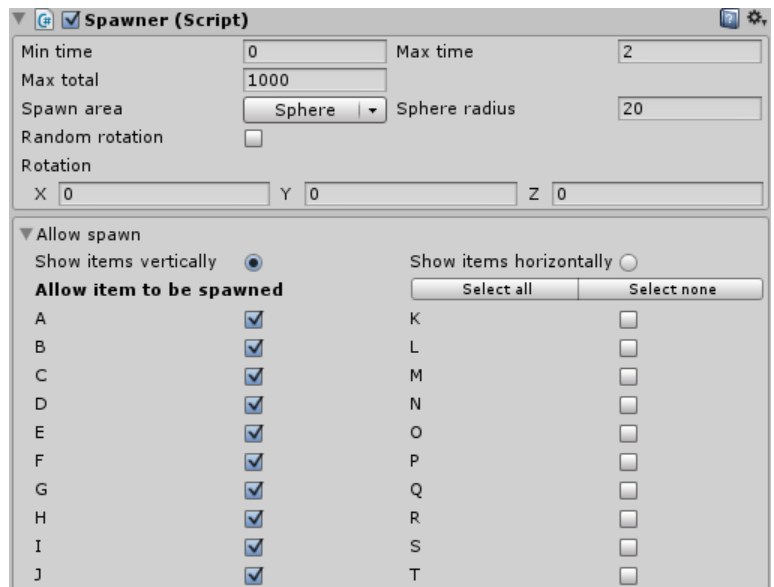
4. Under the manufacturing tab, if you want the post to be able to use the manufacturing process, then check the box. This will then give options to set the seconds to create time and cooldown time. And item will only be manufactured if there are enough of that item, where they are then removed, and manufactured into the new item(s), and added after this time. The cooldown time is the minimum time delay between subsequent manufactures, and is how the manufacturing used to work.
5. Remember the check button in the controller under manufacturing? Well, once all of the manufacturing processes have been set at the trade posts, press this. It will work out if the number of each item may be expected to increase, decrease or stay the same. After checking all of the items, there is another which is for global change, so whether the total number of items in the game will change. This can only be used as a guide because the numbers are based on the posts always being able to follow a manufacturing process when there has been enough time between manufactures. It does not take into account spawners, so can only be an estimate.
6. Once all of the trade posts have been fully sorted, if you look at the overview tab in the controller, it will show some information about the items. The groups section shows the number of trade posts that belong in each group.
7. Under factions, the first number is the number of trade posts belonging to the faction, while the second number is the number of traders that are in the faction.
8. The total number of links is the number of unique links that exist, so the number of different links between trade posts. This shows unique links, so for example, if there were two trade posts, then the number would be one, although traders can go in either direction.
9. The item totals show how many of each item exist in the game, when it is playing, you can see each of these change. The number in brackets is the number of trade posts each item is available at.
10. Manufacturing totals simply shows the number of trade posts that are able to follow that manufacturing process.
11. On the settings tab of the controller was an option to view the trade routes. This shows all of the possible routes that traders can follow, so is useful to see how the groups are working.





## Spawner setup:

1. Spawners can be added to the game by creating an empty gameObject, setting the tag to 'Spawner' and adding the spawner script.
2. Once the spawners have been added, select the controller, and then you can go back to the spawners. This is so that the controller can tell the spawners what goods there are.
3. This has the option of setting the min and max times for spawns, which a random time will be generated between these two. When there are spawners, it is not possible to turn off item pickup in the controller.
4. The maximum number of items can be set to limit the number of items, so that the effects on performance can be limited.
5. There are four options for the area in which an item may be spawned. These are: Sphere, Circle, Cube, Square. Once selected, the diameter / radius options allow you to select how far away items can be spawned. Each of the areas correctly show up in the scene view, so you can see the area, even if you have rotated the spawner.
6. You can either select random rotation, or select the rotation that all spawned items will have. The plane of rotation is also shown as a red circle or square, so you can see what the rotation will be
7. The options for allow spawn means that it is possible to limit the item that gets spawned randomly.



## Extra Info definitions:

Once everything has been set up, and playing your game, the controller provides extra information of what is going on.

**List totals:** The sell list is the number of items where the trade post has too many and wants to sell them, the buy list is where the trade post has too few and wants to buy them. The compare list is where two posts that want to buy and sell the same item have been found, so a possible trade between them.

**Item totals:** The left hand number is the number of trade posts the item is available at. The middle number is the total in the game, and the number on the right is the average. The average is used to work out the prices of items at each trade post.

**Trading totals:** The left hand number is the number of traders trading the item, the right number is the total number being traded.

**Spawned totals:** This shows the number of items that have been spawned and currently available in the game.

**Traders:** This is showing the trader, the final post which the trader will eventually reach and the current target. The current target may change if the trader decides to go and collect an item in radar distance.

Controller (Script)

Settings

Goods

Manufacturing

Overview

Extra info

Please see the manual for what each category is showing.  
Click here to open

Show items vertically

Show items horizontally

List totals

Sell list

5

Buy list

20

Compare list

8

Item totals

Gold

9, 38, 4.22

Cloth

9, 42, 4.67

Wood

8, 46, 5.75

Food

10, 62, 6.20

Weapons

8, 72, 9.00

Stone

7, 26, 3.71

Metal

8, 47, 5.88

Total number of items:

333

Trading totals

Gold

1, 3

Cloth

0, 0

Wood

1, 2

Food

0, 0

Weapons

0, 0

Stone

0, 0

Metal

1, 2

Total trades

3

Spawned totals

Gold

2

Cloth

0

Wood

4

Food

0

Weapons

0

Stone

0

Metal

0

Total spawned

6

Traders

Trader count

5

Trader name

Current target

Final post

skeleton5

Post4

Post4

skeleton2

Post6

Post6

skeleton3

Post2

Post2

skeleton4

Post4

Post4

skeleton1

Post5

Post5

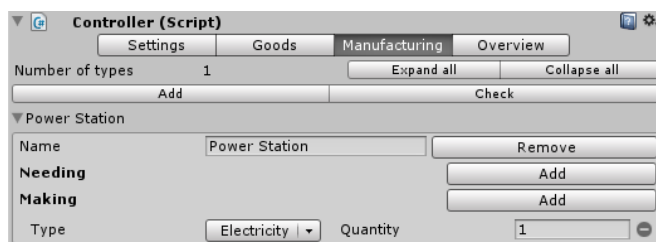
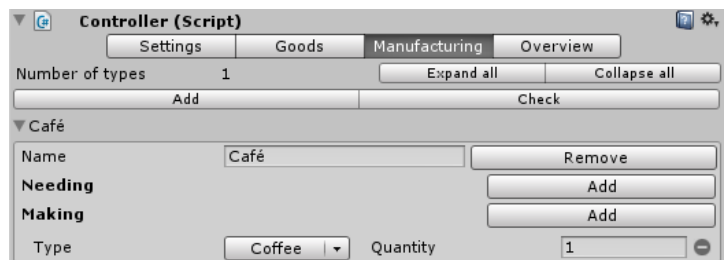
### Information:

- In the trader, the Update() is demo code, added to show trader movement. This would be replaced with your own AI with the target post as the final target destination. When it reaches the destination, it needs to call the AtLocation() method.
- You may wish to replace the destroy and instantiate methods with other methods which pool the gameobjects. Instantiate methods can be found in controller, and spawner. Destroy methods are in controller, and trader.

**Update Instructions:** Some methods have been edited, so may produce errors, but this is because of a name change to be similar to other named methods or that they now require extra inputs. Check in the useful methods section for more information.

### Tips:

- The manufacturing processes do not need to have items in needing or making; for example, a café would use coffee, but not produce anything because it is used inside. As a result, only the needing section would be used.



- Equally, a solar power station may only produce electricity and not require inputs, so only electricity on the making would be needed.

- A more industrialised trade post would have quicker manufacturing processes, so reduce the time to create, and possibly a lower cooldown time. Less industrialised places would take longer, so would have higher values.

## Useful Methods:

Any names of variables written in bold will need to be changed to the desired values

- To enable a new Trade Post, use:

```
nameOfTradePost.GetComponent<TradePost>().NewPost(int[] itemNumbers, int[] manufactureCreate, int[] manufactureCooldown, bool[] groupsAllow, bool[] factionsAllow);
```

ItemNumbers is an array which is the number of each item found at the post. If the number is greater than or equal to 0, the item will be enabled, and will have that number of items in stock. ManufactureCreate is an array of creation times which is used to set whether a manufacturing process occurs or not. If this number is greater than 0, it will be enabled and the time will be set to the number passed in. ManufactureCooldown is an array containing the length of time it takes for the process to cool down, and is the minimum time between successive manufactures. GroupsAllow and factionsAllow are arrays which are used to select which groups and / or factions that the trade post belongs to. All of the arrays need to have the same length as the respective lists in the controller. If they are not the same length, an error will be displayed when the method is called.

- To enable or disable a post that has previously been enabled:

```
nameOfTradePost.GetComponent<TradePost>().PostEnableDisable(bool enable);
```

Setting enabling to true means that the prices will be updated, but your code will need to enable or disable the post, otherwise trading to the post will continue as usual.

- To enable or disable a certain manufacturing process during gameplay:

```
nameOfTradePost.GetComponent<TradePost>().ManufactureEnableDisable(bool enable, int manufactureID, int createTime, int coolTime);
```

Enable is true if the manufacturing process is going to be enabled, manufactureID is the manufacturing process number in the array, so the first process has an ID of 0. The createTime is how long the manufacture time, and coolTime how long it takes to cool down.

- To enable or disable a certain item:

```
nameOfTradePost.GetComponent<TradePost>().ItemEnableDisable(bool enable, int itemID);
```

Enable is true if the item is going to be enabled. The ItemID is the item number as found in the controller, so the first will have an ID of 0.

- If you are not using expendable traders, to enable a new trader, use:

```
nameOfTrader.GetComponent<Trader>().NewTrader (GameObject post, float space, float stopTime, bool[] factionsAllow);
```

Post is the Trade Post that the trader is starting at, space is the amount of cargo space available. The stopTime is the amount of time that a trader has to wait for before being allowed to leave a trade post. If the stop time setting in the controller is set to cargo mass or cargo specific, this value does not matter. The factionsAllow array is used to select which factions the trader belongs to.

- To make a trader drop items from the cargo hold:

```
nameOfTrader.GetComponent<Trader>().DropItems(int itemID);
```

You will need to change the variables written in bold to chosen ones. The itemID is the item number as found in the controller, with the first being 0. This method could be used when a trader dies, and a loop used to drop all the items.

VERSION	CHANGES
<b>V1.0</b>	- Initial release
<b>V1.1</b>	<ul style="list-style-type: none"> <li>- Traders have cargo size and items require mass specified so traders cannot take an infinite number of items.</li> <li>- Traders can now take multiple types of item as long as they all go to the same place.</li> <li>- Traders can be set as expendable, so will be created at the required station and destroyed on arrival.</li> <li>- Can disable items at posts so will not be traded or manufactured.</li> <li>- UI tweaks: <ul style="list-style-type: none"> <li>• Can hide or show prices at trade posts.</li> </ul> </li> </ul>
<b>V1.2</b>	<ul style="list-style-type: none"> <li>- Traders have custom inspectors. This also includes buttons for post finding based on location, or location setting based on the target post.</li> <li>- Goods now have units which are based on the mass of each item.</li> <li>- Can check the numbers of items expected as time increases through manufacturing.</li> <li>- Added a fully commented player script and created a new scene with this in. This includes a fully functioning shop mode, and click on a trader to view info about the trader.</li> <li>- Added a post enable disable method.</li> <li>- Added a method for easy allowing trade of an item at trade posts.</li> <li>- Fixed the pricing of items as before any items being carried would be ignored because it would recount each time. Now this does not happen, so should improve performance!</li> <li>- UI tweaks: <ul style="list-style-type: none"> <li>• Can now view the items to enable / disable at trade posts increasing horizontally or vertically.</li> <li>• Select all / select none on enable / disable at trade posts.</li> <li>• Expand all / collapse all on goods and manufacturing in the controller.</li> </ul> </li> </ul>
<b>V1.3</b>	<ul style="list-style-type: none"> <li>- Spawners have been added, and the code to allow traders to collect dropped items and continue to the correct trade post, and added a DropItem method for traders</li> <li>- Groupings. It is now possible to group trade posts together, so that not every trade post trades with every other one.</li> <li>- Added an option to change the update frequency of the post prices, and possible trades to try and improve performance.</li> <li>- Added in an overview to controller, showing information about groups, goods and manufacturing.</li> <li>- Can view trade links, spawn sphere radius and radar sphere in the scene view.</li> <li>- Removed speed multiplier from traders - this was part of the demo code, but changed the scales of everything in the scene view so it is no longer needed.</li> <li>- Fixed bug where items could not be added to manufacturing processes without trade posts being present.</li> <li>- Fixed issue where it was not possible to set the maximum number of expendable traders to 0, so could not be infinite</li> <li>- Some other performance enhancements.</li> <li>- Massive UI changes: <ul style="list-style-type: none"> <li>• Controller and trade posts have a toolbar to make editing easier.</li> <li>• Boxes have been added to many editor windows to make groups more obvious and clearer.</li> <li>• Changed style of remove buttons, drop down lists and horizontal / vertical items to improve experience</li> </ul> </li> </ul>

VERSION	CHANGES
<b>V1.4</b>	<ul style="list-style-type: none"> <li>- Added factions, with both trade posts and traders having faction options.</li> <li>- Changed group selection so uses checkboxes like items.</li> <li>- Option to view trade links while trade posts selected has been added, making it easier when editing groups and factions.</li> <li>- Sorted new trade post and new trader methods so includes faction selections, and trade posts have group selection.</li> <li>- UI tweaks: <ul style="list-style-type: none"> <li>• Edited units so is the same style as the other options.</li> </ul> </li> </ul>
<b>V1.5</b>	<ul style="list-style-type: none"> <li>- Spawners now don't spawn inside each other.</li> <li>- Spawners have more options - can now select what shape the spawn area is and the rotation.</li> <li>- Pause time options, so can change what the pause time for traders is, and when they pause.</li> <li>- Controller has a new tab when in game, showing extra information.</li> <li>- Manufacture pause has been edited. There is now also a cooldown time, and the way it works has been edited.</li> <li>- Target posts for prefabs not found in hierarchy now gets disabled rather than being hidden.</li> <li>- Can now add all trader prefabs into the expendable trader list, so no more searching for the prefabs.</li> <li>- Improved performance of the controller editor for large projects - options to find trader prebas each time.</li> <li>- Fixed player script, where incorrect numbers shown if the trade post does not trade all items.</li> <li>- Added ability to select groups in the player script in game.</li> </ul>
<b>V1.5.1</b>	<ul style="list-style-type: none"> <li>- Can now use TradeSys in versions of Unity after 4.0.0!</li> <li>- Fixed trader stop time, so will stop for the correct length of time.</li> </ul>