# Power Grid Inventory

# User's Manual

## Intro

Hello and welcome to *Power Grid Inventory*, or *PGI*, for short. In this manual you will find details pertaining to some of the less-than-obvious elements of PGI as well as how to bend it to your will to suit your needs. If you're looking for a quick n' dirty guide with examples to get things rolling then have a look at the *GettingStarted.pdf* guide before reading this. As well, be sure to check out the documentaion html files for complete details on all of the classes and variables in PGI.

At the time of this writing, PGI is currently released with Unity 5.5. A lot of care has been taken to try to make PGI backward compatible as far back as 5.2 but it is very easy to miss some things when I don't test on every released version of Unity. If you find any issues with PGI in any version after-or-including Unity 5.2, let me know right away and I will do my best to fix it!

## **Update Notes and Other Notes**

In order to make updates easier for myself, I've integrated a small part of my own codebase into PGI. It is kept within the the subfolder entitled 'Toolbox'. You will also find that Pantagruel has been moved within this directory.

If you are upgrading from an older version of PGI I highly recommend you delete you PGI folder before doing so. I've restructured, refactored, and renamed many files and classes and there will likely be a  lot of conflicts if you don't completely remove all of the older files.

If you're still confused, having trouble getting something to work, or feel there is a feature lacking that would make PGI more suitable for your project then feel free to contact me at

pgi-support@ancientcraftgames.com

You can also find more detailed documentation files at
http://ancientcraftgames.com/pgi/docs/

Good luck and have fun!

## Model / View Approach

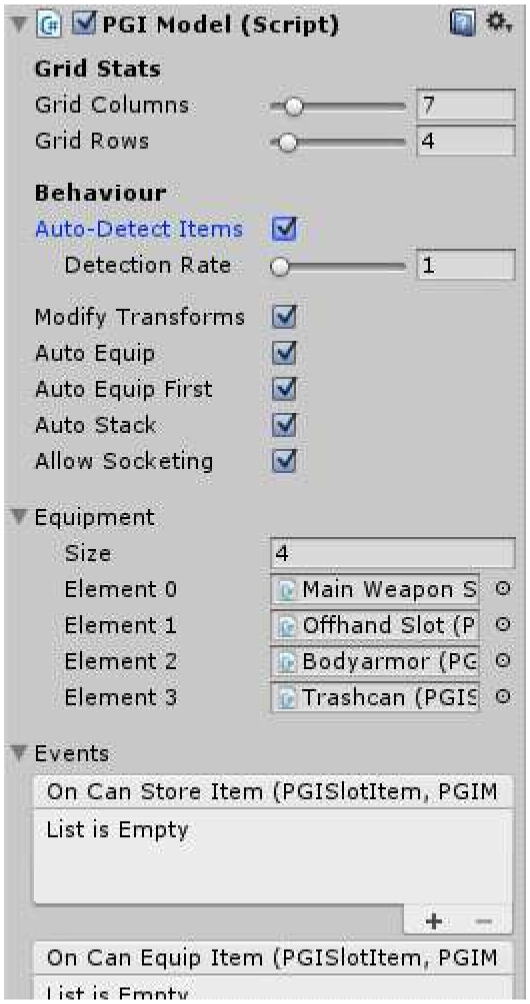
One thing that bothered me about inventory options on Unity's asset store was that a) there were very few that offered any grid-based system, and b) none that did not require complex setup or ripping tons of code out before they could be used for my projects. I feel that the true power of PGI comes from its ability to mostly stay out of the way of your vision and design.

To that end the use of a model for storing and managing data and a view for rendering based on data and allowing users to interact and manipulate the model is a key aspect of PGI. And while they might be heavily coupled data structures I've tried to design them in a way that they still allow a high degree of customization and utility. If for some reason the default view is not to your liking (say for example, you need something that supports multi-finger touch gestures or a gamepad) it is entirely possible to write your own.  As well the model is easier to manage when saving and loading data or transfering invetory states over the network without having to worry about the view state getting in the way. Hopefully between this manual and the documentation files, you will have all the information you need to realize your project through PGI.

As a final note to the intro I want to stress versatility of the model. It doesn't just have to be a grid-based inventory. It doesn't even need the grid at all! You could just as easily set up a series of equipment slots that act as 'recipe' slots for a crafting table with a another slot that stores the final result. Or use a single equipment slot to provide a location that players must place a special key to unlock a door. Or provide a shop where players can purchase items by clicking on them. Or a lootable body or chest. The possibilities are endless!

## **Major Components**

Model - PGIModel


PGI Model (Script)

**Grid Stats**

Grid Columns: 7

Grid Rows: 4

**Behaviour**

Auto-Detect Items ✓

Detection Rate: 1

Modify Transforms ✓

Auto Equip ✓

Auto Equip First ✓

Auto Stack ✓

Allow Socketing ✓

Equipment

| | |
|---|---|
| Size | 4 |
| Element 0 | Main Weapon S |
| Element 1 | Offhand Slot (P |
| Element 2 | Bodyarmor (PG |
| Element 3 | Trashcan (PGIS |

Events

On Can Store Item (PGISlotItem, PGIM

List is Empty

On Can Equip Item (PGISlotItem, PGIM

List is Empty

• **Grid Colummns & Grid Rows** values control the dimensions of your inventory grid. These values can be zero if you wish to use no grid and instead rely on manually created equipment slots - A useful feature for crafting stations or inventories that should trigger special events (placing a specific key in a lock, a vender that rewards a player by customizing the name of an item of their choice, etc..)

• **Auto-Detect Items:** Setting this flag will activate a reoccurring coroutine that attempts to syncronize the model's internal state with any PGI inventory items that have been moved to or from the model's GameObject hierarchy. In otherwords, if a new *PGISlotItem* is found as a child it will be registered with the model and show up in the associated view (assuming there is room - otherwise it will be dropped from the inventory). As well, previously registered items will be removed if they are suddenly found to be missing from the model's hierarchy. This functionality is off by default as the recommended (and more efficient) method is to manually call *PGIModel.Picku()p* and *PGIModel.Drop()* in your code to add or remove items.

• **Modify Transforms:** By default PGI will move your items around in the transform hierarchy when they enter and leave various inventories. If this behaviour is inappropriate for your game, simply disable this flag. WARNING: This should be left on if you are using the built-in save/load feature as it requires all items to be children of the model when it is serialized.

- **Auto Equip & Auto Equip First:** Normally when an item is first entering the inventory using the *PGIModel.Pickup* method it will only search for available grid spaces. When the *Auto Equip* flag is set equipment slots will also be considered. If the Auto Equip First flag is set then equipment slots will be considered before using the grid, otherwise they will only be checked if the grid does not have enough space for the item.

- **Auto Stack:** This is used to determine if stackable items should be combine when entering the inventory (see more details about stacking below).

- **Allow Socketing:** This is used to determine if a socketed item stored in this model can accept socketable items to enter it (see more details about sockets below).

- **Equipment:** The Equipment slots array can be assigned PGISlot objects that were directly placed into the scene and represents specialized slots that items can be 'equipped to'. They are not considered part of the grid and do not take the item's size into account. They can be used for any number of features including equipment slots, crafting station material slots, trashcans, and more (see the paragraph above). You will learn more about this in the 'Equipment Slots' section below.  IMPORTANT: It is recommened that you keep the equipment slots as children of the model in your hierarchy. This way when you save the model using the built-in system the equipment slots will be saved with it. In the event that this is not feasable you will have to 're-wire' the slots to the model after loading.

- **Events:** A variety of events are triggered on the item, model, view, and slot when items are moved around during play. The most interesting are *OnCanStore*, *OnCanRemove*, *OnCanEquip* and *OnCanUnequip*. By testing various situations and then setting the incoming model's *PGIModel.CanPerformAction* flag to false you can disallow items from being stored, dropped,  equipped or unequipped from certain slots. The other events might be useful for triggered events that occur after an action confirmed like playing sound effects or applying stat bonuses to a character.

**Auto-arrange Items:** You can attempt to re-arrange items automatically by calling the *PGIModel.ArrangeItems()* method. This method is still quite experimental and will often not give the most optimal results due to the potential for computationally expesive operations. However, it still might find some use when a player wants to grab that one last item that will fit if they could just move a few things around...

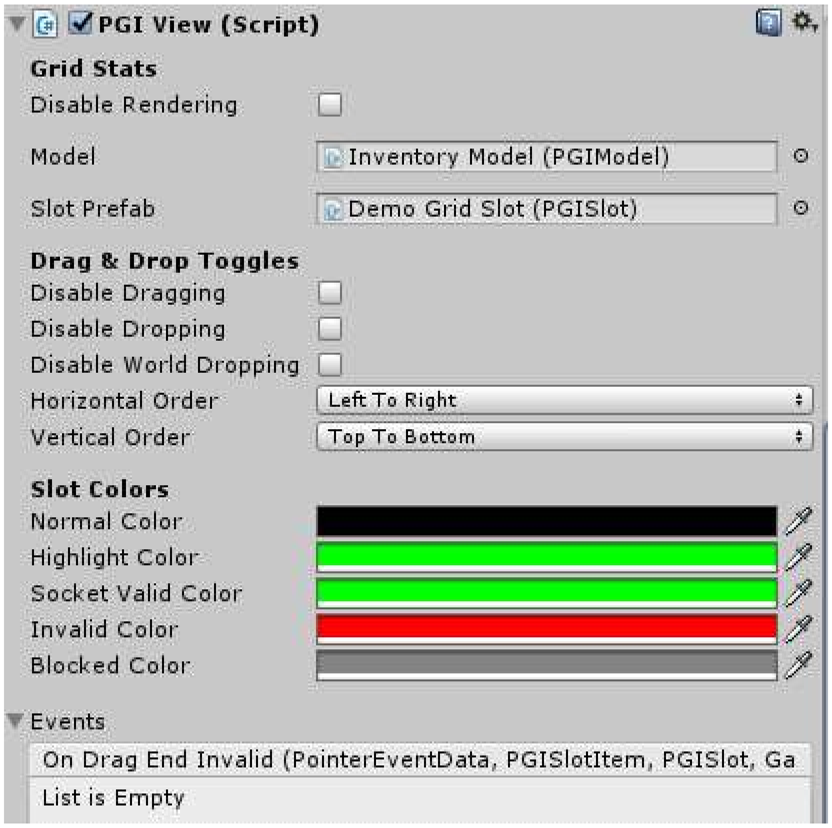
**Picking up Items:** The model can have items added to it in a varienty of ways, the common of which is using the *Store()* and *Pickup()* methods. The latter will automatically place the item in the first available space and is the recommended way of adding items to an inventory. Note that neither of these methods require interaction by the user through a view. The model will maintain state properly.

**Saving and Loading:** IMPORTANT: This can be a huge topic or a small one depending on how complicated your items become. PGI uses a custom made Xml serializer to store and load the state of the model. As is often the case with serialization you will have to carfeully consider the kinds of data you expose to it to ensure corrupted states or thrown exceptions don't occur. There is much more detail about the serializer in the Serialization Manual inside the Pantagruel subfolder.

You can convert a model to an XmlDocument using the *PGIModel.SaveModel()* method and restore a model from an xml string of text using the static *PGIMode.LoadModel()* method. When you pass a model to the load method, it *will* destroy that instance and replace it with the loaded one. In many cases you may need to change other objects' the references to from the old model to the new one after loading. The *PGIModel.OnModelChanged* event can help with this. See the tutorial script *SimplePickup.cs* for an example.

There is a convienience component called *SaveLoad* that can be rigged to unity events and will save and load to and from an xml text file at the location you provide it. It provides methods for saving and loading to any directory or specifically to the persistent data directory.

View - PGIView



PGI View (Script)

Grid Stats

Disable Rendering ☐

Model: Inventory Model (PGIModel)

Slot Prefab: Demo Grid Slot (PGISlot)

Drag & Drop Toggles

Disable Dragging ☐

Disable Dropping ☐

Disable World Dropping ☐

Horizontal Order: Left To Right

Vertical Order: Top To Bottom

Slot Colors

Normal Color ■

Highlight Color 🟩

Socket Valid Color 🟩

Invalid Color 🟥

Blocked Color ▨

Events

On Drag End Invalid (PointerEventData, PGISlotItem, PGISlot, Ga

List is Empty

• **Slot Prefab:** This represents all of the functionality for a single grid cell that is replicated when the view generates a complete grid. It will used the Slot Prefab provided with PGI by default. For a customized look you will want to create one following the guidelines below in the Slot Prefab Spec. These Slot Prefabs can also be manually placed and linked to the model to create Equipment slots. If a *Slot Pool* is provides that will be used instead of this.

• **Model**: The PGIModel that this view will display.

• **Disable Dragging & Disable Dropping:** These control if this view can allow items to be dragged away from, or dropped into, this inventory view. These are useful for read-only inventories like vendors and trading screens.

• **Disable World Dropping:** Normally users can drag items into any part of the screen that does not have a UI element and it will tell the system to remove this item from the inventory and return it to the 'world'. Setting this flag disables this behaviour if it is unwanted.

• **Horizontal Order & Vertical Order:** These two values determine which way the grid is ordered in the view. If you want you grid to change sizes or items should start at different corners when they are placed into an inventory then this can be used for those purposes. This does not affect the internal grid of the model or how any items or stored, only the visible ordering of the grid's rows and columns.

- **Normal, Highlight, Socket Valid, Invalid, & Blocked Color:** The five color values control what tints the view's slots take on when various valid and invalid drag 'n drop actions are performed.

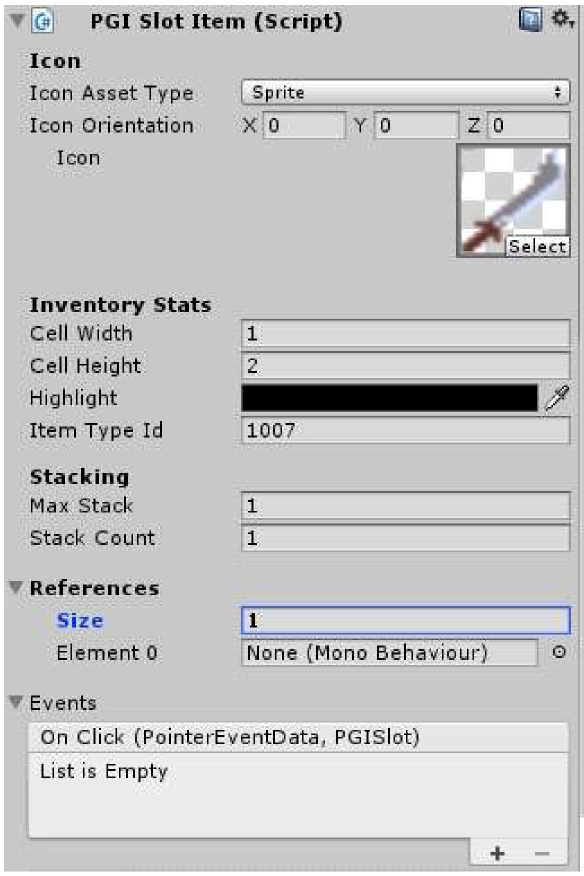
- **Events:** A variety of events are triggered on the item, model, view, and slot when items are moved around during play. The view only handles a few special cases for when a slot has been clicked, or hovered by a pointer.

- **Notes:** Previous users of PGI may notice a couple missing entries here. *Batch Slot*s has been conditionally compiled out (though it can be re-enabled if you need it) due to UI rendering improvements in Unity. *Pool* has been completely superceded by an automatic, behind-the-scenes pooling system called *Lazurus*.

**Purpose of the View:** The view is designed to allow the user a visual mechanism to manipulate an inventory as well as display the current state of the model. As a result, changing the model's state through code should in most cases update the view automatically. If for some reason there is an action you are taking that leaves the view out of date (perhaps something involving networking or a custom save/load feature) you can always call the *PGIView.UpdateViewStep()* method to force it to show the latest model state.

The view is quite flexible and any time the model it points to changes, it will update to show that model's state. In this way you can have a single view than could display different inventory models depending on the situation e.g. a single view could be used to display the inventory of whatever enemey or container a player is currently looting. It is also possible to have multiple views pointing to the same model.

<u>Slot Items - PGISlotableItem</u>


PGI Slot Item (Script)

**Icon**

| | |
|---|---|
| Icon Asset Type | Sprite |
| Icon Orientation | X 0 Y 0 Z 0 |
| Icon | Select |

**Inventory Stats**

| | |
|---|---|
| Cell Width | 1 |
| Cell Height | 2 |
| Highlight | ■ |
| Item Type Id | 1007 |

**Stacking**

| | |
|---|---|
| Max Stack | 1 |
| Stack Count | 1 |

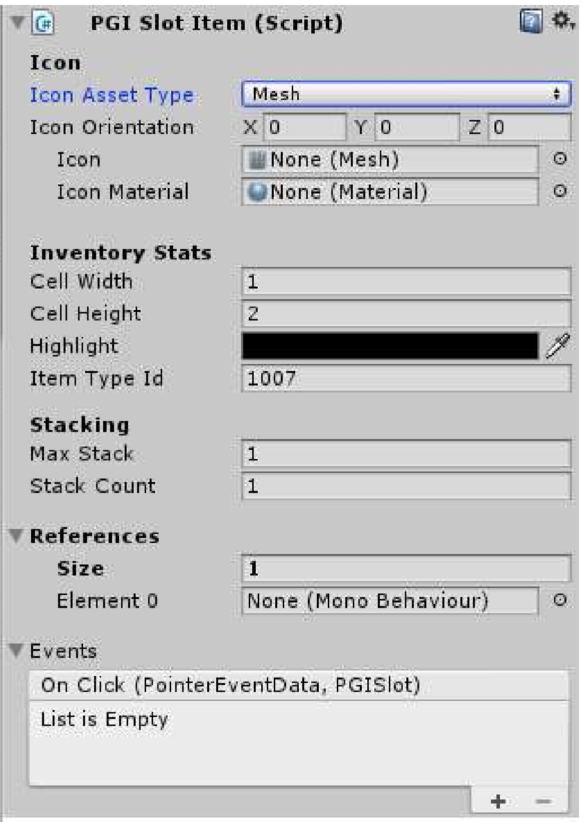
**References**

| | |
|---|---|
| Size | 1 |
| Element 0 | None (Mono Behaviour) |

Events

On Click (PointerEventData, PGISlot)

List is Empty


PGI Slot Item (Script)

**Icon**

| | |
|---|---|
| Icon Asset Type | Mesh |
| Icon Orientation | X 0 Y 0 Z 0 |
| Icon | None (Mesh) |
| Icon Material | None (Material) |

**Inventory Stats**

| | |
|---|---|
| Cell Width | 1 |
| Cell Height | 2 |
| Highlight | ■ |
| Item Type Id | 1007 |

**Stacking**

| | |
|---|---|
| Max Stack | 1 |
| Stack Count | 1 |

**References**

| | |
|---|---|
| Size | 1 |
| Element 0 | None (Mono Behaviour) |

Events

On Click (PointerEventData, PGISlot)

List is Empty

- **Icon Asset Type:** PGI now supports sprites and 3D meshes for item icons. Use this to choose which asset type you would like to use to display your item's icon within a PGI inventory.

- **Icon:** If the icon asset type is set to 'Sprite' this will be the sprite asset displayed for the item within an inventory. If it is set to 'Mesh' this will be the 3D mesh asset displayed for the item when in an inventory.

- **Icon Material:** This is only visible for 3D mesh icons. It is the material to apply to the mesh icon when in an inventory. Note that in many cases world lighting may not be applied if your PGIView's canvas is not in camera or world space. In these cases it might be desirable to use a material with a shader that requires no light source. Another alernative is to set up a special lighting rig local to the PGIView and allow its lights only to interact with that view through the use of tags.

- **Icon Orientation:** Use this to rotate the item's icon when viewed as an inventory icon. *CoolTip*: It is possible to rotate an item in real-time by changing this value every frame. However, this process can be quite expensive and should only be used with relatively simple meshes and only a few at a time.

- **Inv Width:** The number of horizontal cells this item requires in a model grid.

- **Inv Height:** The number of vertical cells this item requires in a model grid.

- **Highlight:** When this item is placed into a PGISlot, that slot's highlight will use this color until the item is removed from that slot.

- **Item Type Id:** Used to uniquely identify the type of item. The model uses it to determine stacking elegibility as well as a means of filtering items when performing an inventory query. Previous users may recall this was named *Stack ID*. It has been renamed due to its more general-purpose use now.

- **Max Stack:** The maximum stack count this particular item can have. Items that do not stack should have a value of 1. keep in mind the details below about stacking - This max stack size only takes affect if another item is stacked 'into' this one. If another, otherwise identical, item were to have a different value here and other items were stacked into it, then the max size of that item would be honored instead.

- **Stack Count**: The current stack size of this item.

- **References:** Often you will need to access other components of your items when calling your methods that are hooked to PGI events. This array can be used to store references to those components so that you only have to cast them rather than make a call to *GetComponent<>()*. This should help improve performance in some cases.

- **Events:** A variety of events are triggered on the item, model, view, and slot when items are moved around during play. The most interesting are *OnCanStore*, *OnCanRemove*, *OnCanEquip* and *OnCanUnequip*. By testing various situations and then setting the incoming model's *PGIModel.CanPerformAction* flag to false you can disallow items from being stored, dropped, equipped or unequipped from certain slots. The other events might be useful for triggered events that occur after an action confirmed like playing sound effects or applying stat bonuses to a character.

**Requirements:** There are only two requirements for your items to be compatible with PGI. Each item must be represented as its own *GameObject* hierarchy, and a *PGISlotItem* component must be attached to the root GameObject of that item. As well, you must be willing to settle for viewing your item as a Sprite within the default PGIView. Other than that, you are free to use any kind of data structures and design patterns you wish for your project's items.

**Stacking:** PGI supports stacking items but some care must be taken. You may use the *Item Type Id*, *MaxStack*, and *StackCount* values within the PGISlotItem to control stacking behaviours. If *MaxStack* is set to a value of 1 then stacking will not take place. If *MaxStack* is above 1, then it can potentially be stacked with any other item that has a *MaxStack* above 1 and has the same *StackID*. If stacking is below one then stacking will also occur but there will be no limit to the stack size.

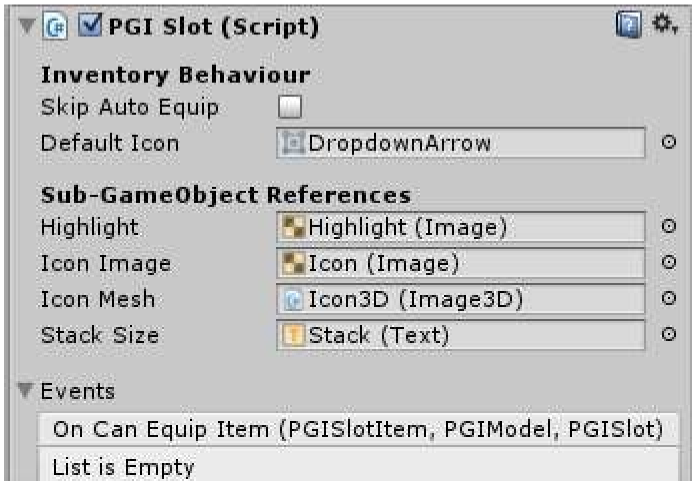
If *StackCount* is equal or greater than *MaxStack*, then no more items will be allowed to stack with it using the *PGIView* (however, in code it is possible to exceed the limit by manually setting the *StackSize* value).

**Important!** PGI does not use true stacking! Instead, each *PGISlotItem* keeps a counter of how many 'virtual' copies it has. Internally, the model is  manipulating this number and when two stacks are fully combined it actually destroys the item that was placed into the other! PGI assumes that all stackable items are exactly identical. If you try to use items that are different with the same *StackID* you will find your data going missing quite often. Admittedly, part of the reason for this was the fact that I somewhate shoehorned stacking in at the last minute. But mostly it was because I figure it is somewhat natural to assume that stacks of items are identical and in this way PGI can conserve memory by only keeping a single insance of an object around when stacking.

**Splitting Stacks:** Due to frequent requets, there are now a couple handy methods for splitting stacks built right into *PGIModel*. They are *SplitStack()* which will split a stack where the new one has a desired number of elements and the remainder is left in the original stack. The other is *DecomposeStack()* which can be used to instantiate a list of 'live' objects from a stack.

**Rotation:** Not to be confused with the *Icon Orientation* above, this doesn't rotate mearly the icon but the entire item within the model's grid so that its width becomes its height and visa-versa. You can change an item's roation to three different directions, normal, rotated left, and rotated right using the *PGISlotItem.Rotate()* method. Note that there is no 'Upside Down' due to the fact that it wouldn't change the dimensions and the asthetics of such a feature seem undesireable.

Slots - PGISlot


PGI Slot (Script)

Inventory Behaviour
Skip Auto Equip ☐
Default Icon: DropdownArrow

Sub-GameObject References
Highlight: Highlight (Image)
Icon Image: Icon (Image)
Icon Mesh: Icon3D (Image3D)
Stack Size: Stack (Text)

Events
On Can Equip Item (PGISlotItem, PGIModel, PGISlot)
List is Empty

• **Skip Auto Equip:** Sometimes you want specific slots to not be considered when the model auto-equips items on pickup. This can be used to toggle that functionality at a per-slot level. Very handy for something like, say, a trashcan that you don't want being supplied with items immediately upon pickup.

• **Default Icon:** Previous, the icon set to the Icon Image was used as the default icon.

However, now there is a specific public member exposed for this purpose. When no item is stored in a slot, this sprite will be used as the icon for that slot.

• **Highlight:** A reference to an Image component that represents the highlighting portion of the grid cell. This image will be manipulated by the colors specificed in the PGIView

• **Icon Image:** A reference to the image that displays the cells current icon. The sprite that is used by this Image when the cell is empty is treated as the 'default' icon and will be restored whenever that cell becomes empty. When an item is stored within the cell, that item's PGISlotableItem.Icon will be displayed in this image instead.

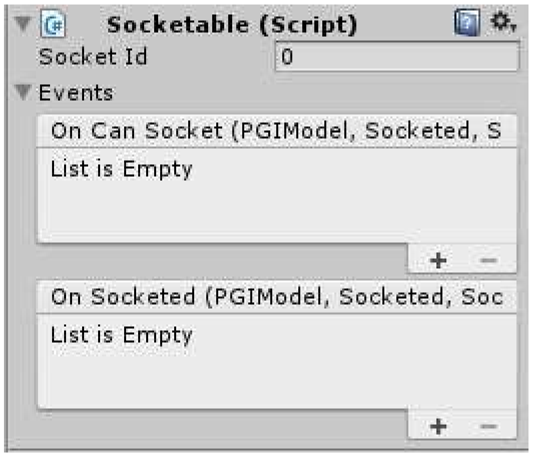
• **Icon Mesh:** A reference to the CanvasMesh component that displays the cells current icon as  3D mesh. Currently you cannot provide a default 3D mesh icon for a slot. It will be lost the first time an item is equipped to that slot.

• **Stack Size:** A reference to an Text component that displays the cell's current item's stack size. When the item's stack size is 1 or less, this Text component will be disabled.

• **Events:** A variety of events are triggered on the item, model, view, and slot when items are moved around during play. The most interesting are *OnCanStore*, *OnCanRemove*, *OnCanEquip* and *OnCanUnequip*. By testing various situations and then setting the incoming model's *PGIModel.CanPerformAction* flag to false you can disallow items from being stored, dropped,  equipped or unequipped from certain slots. The other events might be useful for triggered events that occur after an action confirmed like playing sound effects or applying stat bonuses to a character.

Slots are usually composed as a prefab that is then replicated by the PGIView for use in a grid. These prefabs may also be placed in the scene and directly linked with the PGIModel to create equipment slots. Either way, you can create custom looking slots using Unity's new UI system. However, PGI has very specific minimum requirements that must be met if you decide to do this. You can learn more about this below in the Slot Prefab Specs section.

## Socketable Items - Socketable


Socketable (Script)
Socket Id
0
Events
On Can Socket (PGIModel, Socketed, S
List is Empty
On Socketed (PGIModel, Socketed, Soc
List is Empty

- **Socket Id:** An identifying number that is compared to any socketed item you wish place this item in. They must match in order for the socketing to occur.

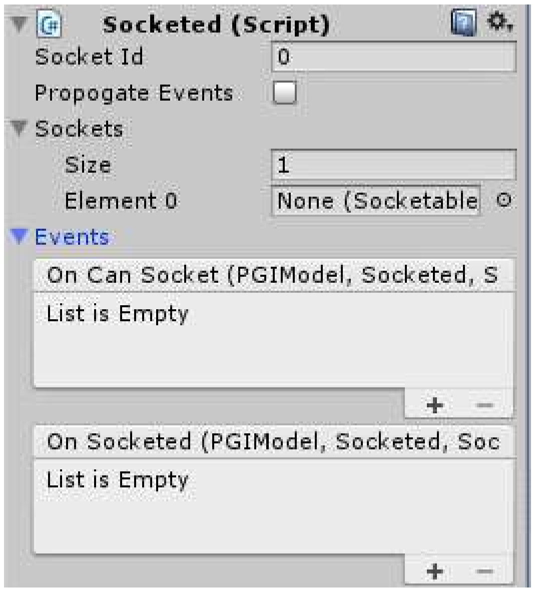
- **Events:** A variety of events are triggered on the items involved in socketing. The most interesting is *OnCanSocket*. By testing various situations and then setting the incoming model's *PGIModel.CanPerformAction* flag to false you can disallow items from being socketed.

By attaching this component to a *PGISlotItem* you can make it a socketable item. Socketable items can be 'inserted' into socketed by dragging and dropping them in the view. When socketed, this item will become a child of the item it was inserted into.

Be aware that during the socketing operation no *OnRemovedFromInventory* event will be triggered on this item so it will effectively disappear from the model's awareness. As well, once socketed, this item will no longer trigger or receive any PGI events when its parent interacts with various inventories.

It is entirely possible and valid to make a socketed item a socketable one too. In this way you can nest socketable items within others and provide extra complexity to your game.

Socketed Items - Socketed


Socketed (Script)
Socket Id 0
Propogate Events
Sockets
Size 1
Element 0 None (Socketable
Events
On Can Socket (PGIModel, Socketed, S
List is Empty
On Socketed (PGIModel, Socketed, Soc
List is Empty

- **Socket Id:** An identifying number that is compared to any socketable item you wish place into this one. They must match in order for the socketing to occur.

- **Propogate Events:** *Currently not in use!* In the future this setting will allow the parent socketed item to propogate its inventory events to any socketable items inserted into it. Currently, inventory events simply do no occur for socketable items that have been inserted into something else.

- **Events:** A variety of events are triggered on the items involved in socketing. The most interesting is *OnCanSocket*. By testing various situations and then setting the incoming model's *PGIModel.CanPerformAction* flag to false you can disallow items from being socketed.

By attaching this component to a *PGISlotItem* you can make it a socketed item. Socketed items can have socketable items 'inserted' into them by dragging and dropping them in the view. When socketed, the socketable will become a child of this item.

Be aware that during the socketing operation no *OnRemovedFromInventory* event will be triggered on the socketable item so it will effectively disappear from the model's awareness. As well, once socketed, such items will no longer trigger or receive any PGI events when its parent interacts with various inventories.

It is entirely possible and valid to make a socketed item a socketable one too. In this way you can nest socketable items within others and provide extra complexity to your game.

## Additional Information

Slot Prefab Specs

The SlotPrefab GameObjects that are fed into the models' equipment slots and the *PGIView* are fairly simple and highly customizable to allow you to make your menu look the way you want. However, there are a few minum requirements in order to ensure that the view can process and render everything the way *it* wants to.

The root of the slot should have a *RectTransform*, *Image*, and *PGISlot* components attached to it and it should be the child of a Canvas at some level (it does not have to be a direct child). The RectTransform handles sizing of the slot to match the view's rendering area. The image is needed to display the base image used by the slot, if any. And the PGISlot is obviously what PGI needs to do its job.

There should be four child GameObject under the root. One represents the area that is highlighted during drag n' drop operations and uses an *Image* component. Another is used to display stack numbers and has a *Text* component. The final two use an *Image* and an *Image3D* component respectively to represent the icon to display for the slot based on what item is stored in it. If a 2D image is supplied when the slot is empty, this will be considered the 'default' icon and will be used whenever the slot is empty. However, this only works for the *Image* componet. Currently the *Image3D* cannot be used for a default icon. All four of these child objects must also have an *IgnoreUIRaycats* component to allow the pointer to work as normal without being blocked by the UI elements that are for displaying the slot's information.

**Performance Issues & Batching**:

IMPORTANT: The following section is outdated. Slot batching has been disabled due to improvements in Unity's UI rendering. If for some reason you still have need of such a feature it can be enabled by defining `PGI_SLOT_BATCHING_AID` in your Player settings or at the top of the file *PGIView.c.* Please note that this is now considered an obsolete feature and I will not be supporting it going forward.

Due to the way uGUI batches its geometry, PGIViews have an option to aid in the process by allowing any PGISlot's child GameObjects that have a *SlotBatch* component attached to be moved around and grouped in the view's heirarchy. This may cause rendering artifacts, esepcially when transparent menus overlap one another frequently. However, the performance gains can be quite significant so it is recommened to keep this feature active. When designing custom slots with additional UI elements, be sure to attach a *SlotBatch* component to any GameObject that you wish to take advantage of this batching behavior.

Event Triggers

Event Triggers are the real power of PGI and allow you to make anything from crafting tables to diabolical puzzles for your players to solve! In fact they are so important that a large number of features listed in the asset store are implemented entirely using them! Indeed, most of the really cool stuff isn't built right into the core of PGI but in fact is implemented as add-ons using event triggers. This was done to follow through with the belief that PGI should stay out of the way of you project as much as possible and that you should decide how things work. Check out the example scene that came with PGI for some common ideas.

**'Can...' events:** Whenever PGI is about to attempt moving an item around in some fashion is will usually perform a whole series of checks to ensure that everything is valid before going through with it. Along the way it will also invoke the 'Can...' events - so called because they check to see if the action in question *can* happen (OnCanEquip, OnCanStoreInInventory, etc...). They get called many times and are used for everything from action verification in the model to highlighting in the view. These methods are extremely useful for you to develop your own system. A frequent feature is item filtering - where you want to ensure than a particular kind of item can only be equipped to a particular kind of slot. However, it is worth noting that they can be called quite frequently, sometimes several times in a single frame, so it is worth making them relatively simple so that they don't bog down your game when your user is dragging item around.

Many of the other events are useful when certain things need to happen. For example, if you are making a game that provides players with stats bonuses when a certain weapon is equipped you will want to make a component that applies and removes these bonuses in two separate methods and then rig these method to one of the 'OnEquip'/'OnUnequip' events that are triggered. Events can be rigged using the editor as well as through code.

## Triggering Events

A very important limitation of PGI to understand is that the model almost never triggers events (except for the failure events in rare cases). The reason for this is due to the fact that internally the model may have to invoke some portions of code multiple times and it would be excessive to invoke these method multiple times. As well, if your code depends on the events being triggered exactly once - like in the above paragraph's example where we want to apply stat bonuses only once - then the model must no assume that it can call these method every time something happens.Instead, the view is responsible for handling many of the triggered events. When moving items around, equipping, unequipping, and even switching inventories, the view is mostly responsible for triggering the right event at the right time.

All events for the model, the view, slot, and the item can be triggered through the *PGISlotItem*'s various 'Trigger...' methods. You can read more details about them in the documentation files. As well, you can see an example of a manually triggering events in the examples folder in the *Example->CompleteExample->Scripts->Trashcan.cs* file. In this file you will see that because it is forcing items to be removed from the inventory it must also trigger the appropriate events to ensure everything stays in sync.

## Nesting Inventories

Nested inventories is a snap! Really, it just works. Just attach a PGIModel and a PGISlotItem and you have one. You could even technically store an item in iself (though I wouldn't recommend it). To see an example with the proper safegaurds in place check out the example scene's Storage Bag and then look at the file *Examples->CompleteExaple->Scripts->*

*ContainerItemcs* for more info.

## Customizing

As stated before, PGI is designed to stay out of your way as much as possible so to that end I tried to incorperate as little design as I could into the system and rely on using the new UI system in Unity 4.6 and later. As a result, PGI will not work with earlier version of Unity but the benefit is that anyone who has worked with the new UI system will feel right at home and will be able to quickly and easily adapt PGI to any look and feel they desire.

## Pantagruel

This was originally a hacked-together piece of my own game, an item-database system that could be used to define items and item attributes at edit time and then generate randomly speced items at runtime as well as efficiently save/load and network these items. It worked well enough along side of PGI and I didn't see a problem until some users suggested that PGI really, *really* ought to have a built-in save/load feature.

As a result I designed a very powerful xml serializer that can be used both for normal classes as well as Unity objects. Pantagruel also reaped benifits from this now that I could properly store data that Unity's built-in system does not allow (polymorphic and generic data). So I've decided to rebuild it from the ground up and once it is polished off for general use I will include it as an optional complimental system to PGI. Consider it an extra gift from me for all the support.

The serializer that comes with Pantagruel is very powerful and also very complex. I've included a user's guide with it in the subfolder Toolbox/Core/Serializer. I strongly recomend you take a look at it before attempting to use the built-in save/load features. You'll likely run into problems otherwise.

## The Future

PGI was originally started because I could not find a decent grid-based inventory system for Unity and I felt that enough of my heart and soul went into creating this that it warranted making it available to others. I truely hope that it will provide you with what you need to make your projects better and am looking forward to improving it in the future. Features I have planned for the future will include: more Views that support GamePads and a Click 'n Drop mouse interface, more variety of events, a few optimizations, and perhaps other ideas suggested by users.

If you have any questions, concerns, or feature requests, please contact me at the pgi-support@ancientcraftgames.com in the top of this manual and let me know. You can read more in the generated documentation files at http://ancientcraftgames.com/pgi/docs/.

~James 'Sluggy' Clark