# Unity Composition Interface

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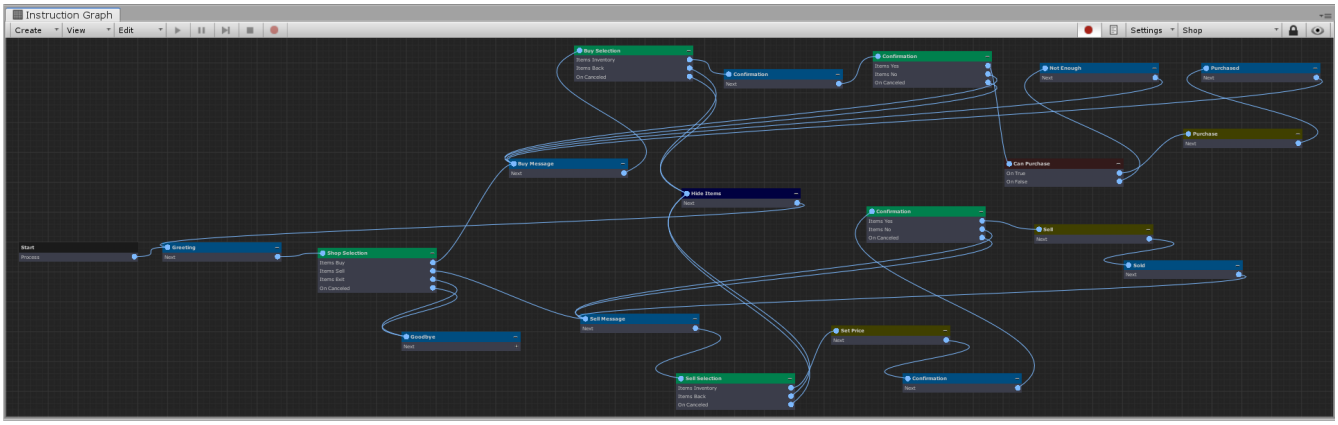
# Overview

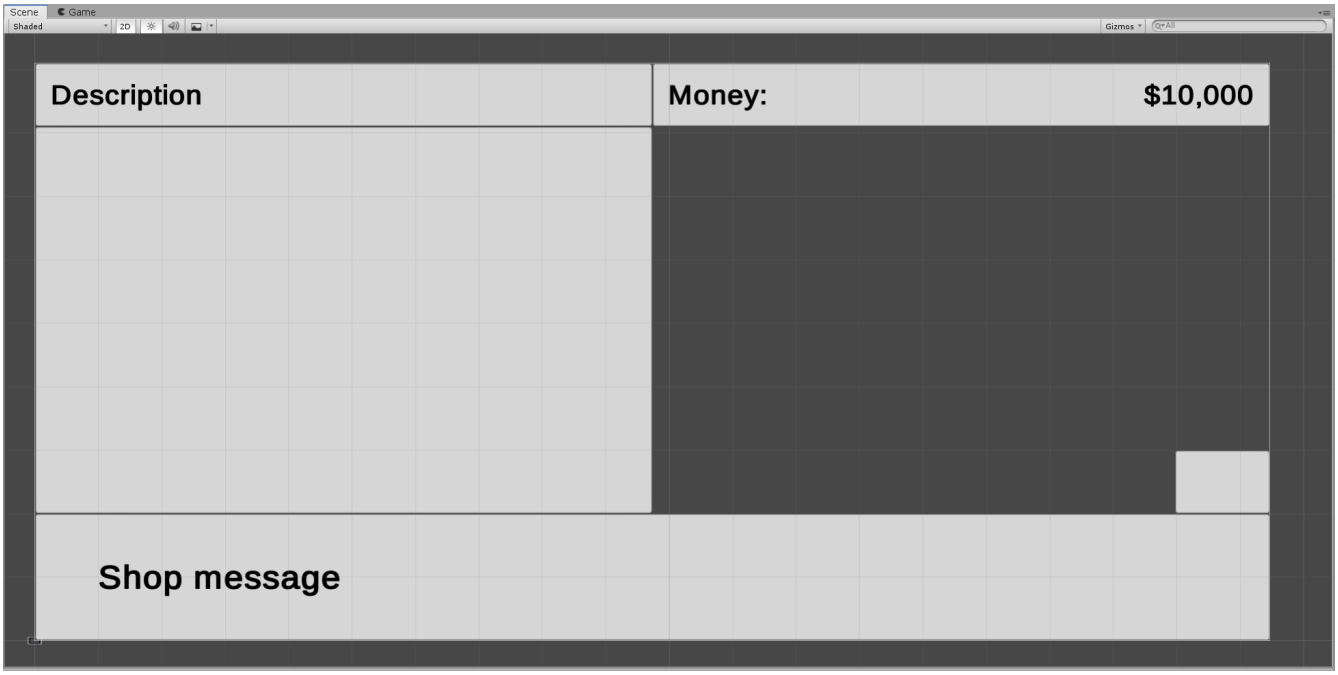
The interface system is used in conjunction with Unity's UI system make creating and interacting with common UI elements in a game much simpler. Interfaces work with graphs for sequencing things like dialogs, selections, menus, etc, without the need for extensive scripting. The main components of the interface system are Interface Controls. These are activated and deactivated from graphs and control the behaviour of UI elements in the scene. Messages and Selections are the two built in controls provided. Interface controls are designed with extensibility in mind; each can be customized for desired behaviour and other custom controls can be created.

# Workflow

The following is an example of a graph the defines a dialog sequence constructed almost entirely of Message Nodes and Selection Nodes to create a simple shop.




And the scene it references which has a Message controlling the text at the bottom, and Selection Controls controlling the selection boxes on the sides.




See the *"Shop"* scene in the Shop project to view this example.

# Topics

# Interface Controls

Interface Controls are a MonoBehaviour that acts as the base class for all controls in the interface system. They should be attached to objects in a UI scene that are to be shown and hidden by the composition system (like dialog boxes, and menus). When loaded an Interface Control always starts inactive until the `Activate()` method is called. This usually happens from a Show Control Node on a graph. Interface Controls also maintain a list of other GameObjects in a scene that should be activated and deactivate along with this control. To deactivate a control use a Hide Control Node or manually call the `Deactivate()` method from script.

Usually, an interface control is derived from to implement custom behaviour, such as a a Message Control a Selection Control, detailed in the next sections.

# Message Controls

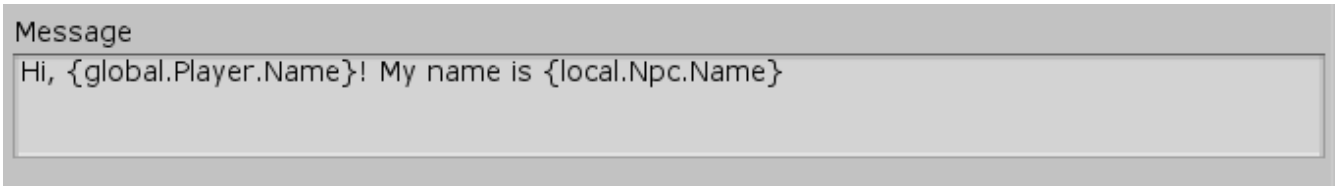
Message Controls are an Interface Control used to show a message, on a TextMeshPro component. Use a Message Node to activate a message control and a Message Input behaviour to advance the text with input. When shown a message controls starts a Coroutine that will run until the message is finished. Utilizing this coroutine, custom messages can be implemented to show certain pages that advance with input, scrolling, letter by letter typewniting, etc. A Message Node may also optionally wait for the message to complete before moving on to subsequent nodes. A message control's *IsRunning* flag will be set from when it is shown to when it is finished.

## Message Node

Create a Message Node in a graph using the **Create › Interface › Message** menu of the Instruction Graph Window. A Message Node will activate a message control, which enables the referenced TextMeshPro component and set its text to a resolved Message. The node can automacally deactivate message control when it is finished is complete if *AutoHide* is `true`. If *AutoHide* is `false` then a Hide Control Node must be used to deactivate it. Message nodes can also delay the amount of time to wait before they deactivate the message control with the *WaitTime* field.


## Message

A message is the string that will be displayed and can be dynamically formatted using variables. To add formatted variables insert a variable reference between braces ({}). For example in following message:




The variables `global.Player.Name` and `local.Npc.Name` will be resolved at runtime with the instruction store on the message node, and the message control will display the text accordingly (provided those variables exist). Variables that are not strings will have `.ToString()` called on them so numbers can be displayed as well.

## Input

In order to maintain modularity of behaviours, responding to input in message controls should be done with separate components. Use a Message Input component to wait for the specified button, *AcceptButton* to be pressed to finish a message.

## Custom Message Nodes

The Message Control provides basic functionality for displaying text, however, most games display messages with much more custom behaviour. Message controls are designed to be extensible desired behaviour can be achieved with little difficulty. The following example shows how to derive from Message Control to create a paged, typewriter-like effect that responds to two button presses - to fast forward, and to advance:

```
    public class TypewriterControl : MessageControl
    {
        public float CharactersPerSecond = 25.0f;

        [NonSerialized]
        public bool FastForward = false;

        protected override IEnumerator Run()
        {
            DisplayText.maxVisibleCharacters = 0;

            yield return null; // consume the press that opened the message

            for (var page = 0; page < DisplayText.textInfo.pageCount; page++)
            {
                yield return ShowPage(page);

                IsAdvancing = false;

                while (!IsAdvancing)
                    yield return null;
            }

            yield return null;
        }

        private IEnumerator ShowPage(int index)
        {
            var page = DisplayText.textInfo.pageInfo[index];
            var characterCount = page.lastCharacterIndex - page.firstCharacterIndex +
1;
            var characterDelay = CharactersPerSecond <= 0.0f ? 0.0f : 1.0f /
CharactersPerSecond;
            var delay = characterDelay;
```

```
            DisplayText.maxVisibleCharacters = page.firstCharacterIndex;
            DisplayText.pageToDisplay = index + 1;

            while (DisplayText.maxVisibleCharacters < characterCount)
            {
                if (FastForward)
                {
                    // fast forward to the end of the text (one character per frame)
                    characterDelay = 0.0f;
                    delay = 0.0f;
                }
                else if (IsAdvancing)
                {
                    // skip to the end of the page
                    DisplayText.maxVisibleCharacters = characterCount;
                }
                else if (delay <= 0.0f)
                {
                    delay += characterDelay;
                    DisplayText.maxVisibleCharacters++;
                }

                delay -= Time.deltaTime;

                yield return null;
            }
        }
    }

    public class TypewriterInput : MonoBehaviour
    {
        public string FastForwardButton = "Cancel";
        public string NextButton = "Submit";

        private TypewriterControl _typewriter;

        void Awake()
        {
            _typewriter = GetComponent<TypewriterControl>();
        }

        void Update()
        {
            _typewriter.FastForward = InputHelper.GetButtonDown(FastForwardButton);

            if (InputHelper.GetWasButtonPressed(NextButton))
                _typewriter.Advance();
        }
    }
```

Simply override the `Run()` method and implement your custom behaviour. Notice how `Run()` returns an IEnumerator. As mentioned before, this is because message controls are implemented as a Coroutine. When the method ends *IsRunning* will be set to `false`.

# Menus

Menus are MonoBehaviours that provide an interface for adding, removing, selecting, and focusing of child GameObjects. On their own, Menus are simply a container for child Menu Items which are created externally. The can be created manually in the editor or populated automatically using a List Binding or in conjunction with a Selection Control and a Selection Node.

## Selection Controls

Selection Controls are Interface Controls used to dynamically populate a menu with items to be selected from when promted. Selection Controls activated with the `Show()` method which takes a list of MenuItemTemplates. Each template contains the info needed to create items in the menu: a name, the variables to assign to the item, the prefab to instantiate, etc. Selection controls can optionally require a selection to made so they cannot be cancelled, and they can optionally maintain their focused index in case the selection is being returned to from a subsequent menu.

## Menu Items

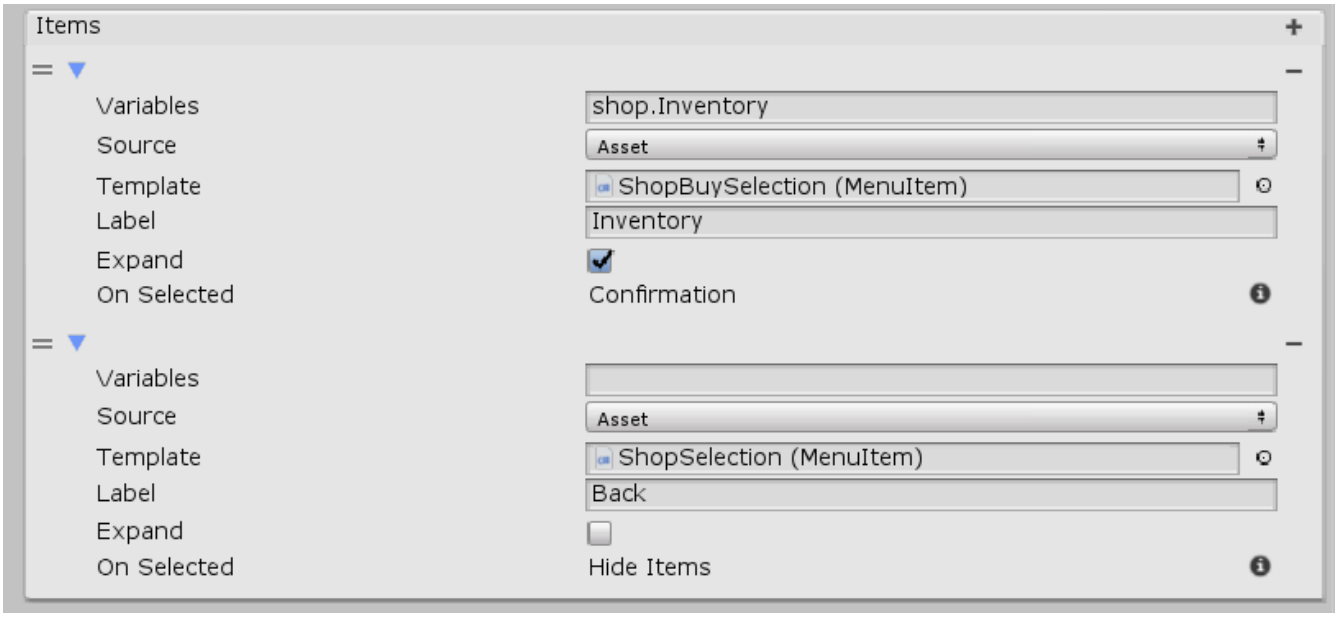
A Menu Item component must be attached to each object in a menu, whether it be a prefab to be instantiated or an existing item in the scene. They are a binding root which exposes an *ItemName* field which gives access to the data of the Menu Item itself. Variables that can be accessed by child bindings through *ItemName* are: *Index*, *Column*, *Row*, *Label*, and *Focused*. The *ValueName* field on a menu item expossed the variables specified by the menu item template used to create the menu item.

## Selection Nodes

Create a Selection Node in a graph using the **Create › Interface › Selection** menu of the Instruction Graph Window. A Selection Node will activate a selection control and give it a list of MenuItemTemplates to create. A Selection Node will deactivate the control once a selection has been made if *AutoHide* is `true`. If *AutoHide* is `false` then a Hide Control Node must be used to deactivate it. When a selection is made the selected item and index will be assigned to variables specified by *SelectedItem* and *SelectedIndex*. The graph will then branch to the corresponding node of the selected item. Selection Nodes tell the selection control via the *IsSelectionRequired* flag whether it can be cancelled or not. If this is the first iteration of the selection node then it will also tell the selection control to reset its focus.

## Menu Item Templates

Each item will be created from a Menu Item Template which has the following properties:




| Name | Description |
|---|---|
| Variables | The variable that should be used as the Binding Root *Value* for the menu item. |
| Source | Specifies whether the menu item should be looked up in the scene using *Name* (`Scene`) or created from a prefab using *Template* (`Asset`) |
| Name | When *Source* is `Name`, the name of the GameObject containing the menu item in the loaded scenes. |
| Template | When *Source* is `Asset`, the prefab to create the menu item from. |
| Label | When *Source* is `Asset`, the label to assign to the menu item |
| Expand | When *Source* is `Asset`, this is `true`, and *Variables* references a List, a menu item will be created from *Template* for each item in the list |

# Other Helpful Behaviours

### Menu Input

In order to maintain modularity of behaviours, responding to input in menus should be done with separate components. Use a Menu Input component to handle the behaviour of input, focusing, selecting, and scrolling, through menu items.

### Focus Binding Root

Use a Focus Binding Root to bind data to the currently focused menu item in a menu. This can be useful for displaying information like a description of an item in separate UI objects that are not actually part of the selection. See the *"Shop"* scene for an example.