IoT UI Development with ThingWorx Exercise Workbook

M3:10. Create Style Definitions

1. Open the ThingWorx Composer.

2. In the upper left corner of the ThingWorx Composer, in the Set Project Context field, type**/**select **MarsInterstellarShipyardProject**.

3. In the left pane, select the folder icon which opens the **Browse** menu.

4. In the VISUALIZATION section, click **Style Definitions**.

5. Click **+ New** at the top of the entities list area to create a new Style Definition.

6. In the Name field, type **PwrSys_HeaderTextStyle**.

   Note: Your username will be appended automatically to the name you type in. Example: PwrSys_HeaderTextStyle_jsmith

7. In the Description field, type **Text**.

8. In the Project field, verify that **MarsInterstellarShipyardProject** is selected. If not, then type **m** in the Project field and select **MarsInterstellarShipyardProject**.

   Note: If the project is not selected, then make sure that the Set Project Context field in the upper left contains MarsInterstellarShipyardProject. This will ensure that all entities you create are a part of this project.

9. At the top, click **Style Information**.

10. In the Display String field, type **Text**.

11. Click the **Text Color** square to make it white.

12. Type **#FFFFFF** replacing the #5bb73b text color.

13. Click **Save the color**.

14. Click **Select**.

15. Select the **Font Bold** check box.

16. In the Text Size field, select **28px**.

17. Leave all other default settings.

18. Click **Save**.

19. In the left pane, select the **Browse** tab.

20. From the entities list area, select the **PwrSys_HeaderTextStyle** check box.

21. At the top of the entities list area, click **Duplicate**.

22. In the Name field, type **PwrSys_TopNavTextStyle**.

23. At the top, click **Style Information**.

24. Uncheck the **Font Bold** check box.

25. In the Text Size field, select **20px**.

26. Leave all other default settings.

27. Click **Save**.

28. From the top header, click NEW and type/select **Style Definition** to create a new style definition.

29. In the Name field, type **PwrSys_HeaderFillStyle**.

30. In the description field, type **Background color**.

31. At the top, click **Style Information**.

32. Click the **Background color** square.

33. Update the R field to **94**.

34. Update the B field to **94**.

35. Update the G field to **94**.

36. Click Save the color.

37. Click **Select**.

38. Click **Save**.

39. In the left pane, select the **Browse** tab.

40. From the entities list area, select the **PwrSys_HeaderFillStyle** check box.

41. At the top of the entities list area, click **Duplicate**.

42. In the Name field, type **PwrSys_TopNavFillStyle**.

43. At the top, click **Style Information**.

44. Click the **Background Color** square.

45. In the R field, type **130**.

46. In the B field, type **130**.

47. In the G field, type **130**.

48. Click Save the color.

49. Click **Select**.

50. Click **Save**.

You have just created the following four styles:

Name	Property	Value
PwrSys_HeaderTextStyle	Text Color	#FFFFFF
	Font Bold	Checked
	Text Size	28px
PwrSys_TopNavTextStyle	Text Color	#FFFFFF
	Text Size	20px
PwrSys_HeaderFillStyle	Background Color	#5e5e5e
PwrSys_TopNavFillStyle	Background Color	#828282

M3:11. Set Style Definition Visibility

1. From the left pane, select the Permissions tab.

2. Select Entities.

3. Click Date Modified to sort the Entities list with the most recently edited entities at the top of the list.

4. Select the check boxes for the four Style Definitions you just created:

- PwrSys_TopNavFillStyle
- PwrSys_HeaderFillStyle
- PwrSys_TopNavTextStyle
- PwrSys_HeaderTextStyle

5. Click the **Edit Permissions** button.

6. In the Search Organizations field, type/select **MarsInterstellarShipyardOrg**.

7. Click **Save**.

M4:6. Constructing a Layout for a Mashup

1. Create a new Mashup. From the top header, click **+NEW**, then type/select **Mashup**.

2. Click **OK**.

3. In the Name field, type **PwrSys_HomeMashup**.

4. In the Description field, type **Monitoring Page for Power Admins**.

5. In the Project field, verify that MarsInterstellarShipyardProject is selected. If not, then type **m** in the Project field and select **MarsInterstellarShipyardProject**.

6. Click **Save**.

7. At the top, click **Design**.

8. Verify that the Widgets tab is selected. If necessary, select the **Widgets** tab.

9. In the Filter Widgets field, type **La**.

10. Drag-and-drop a **layout** widget from the Widgets Library to the canvas area.

11. Select the **Vertical** option.

12. Select the **Header** check box.

13. In the Rows field, verify that 2 is selected. If necessary, select **2** from the Rows field.

14. Click **Done**.

15. Drag another layout widget into the header area of the first layout.

16. Select the **Vertical** option.

17. Select the **Header** check box.

18. In the Rows field, select **1**.

19. Click **Done**.

20. Hover over the upper-left corner of the selected layout and select the **Select Parent Layout** option from the drop-down list.

21. In the lower-left corner in the Widget Properties panel, update the HeaderHeight field to **110**.

22. Select the **Workspace** tab.

23. In the Workspace tab, under the first header, select the **child** layout (second layout).

24. In the Widget Properties panel, update the HeaderHeight field to **80**.

25. Select **none** in the Spacing field.
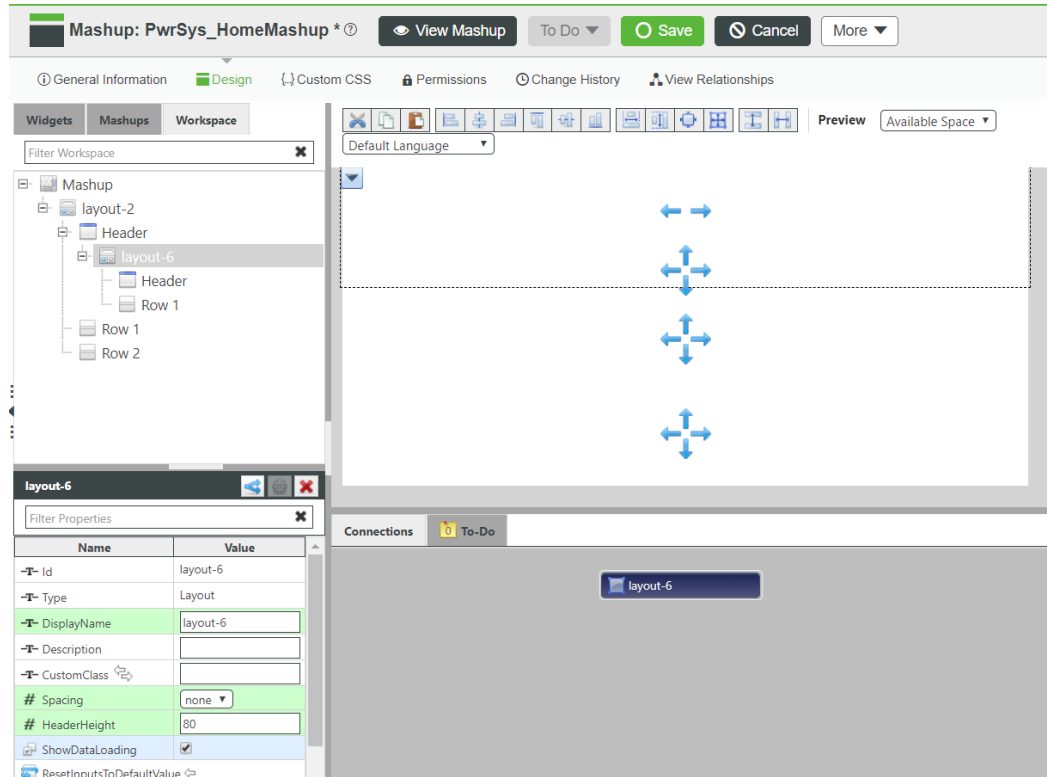
26. Select the **Widgets** tab.

27. Drag a layout widget into the first row (the data area row).

28. Click **Done**.

29. Drag a layout widget into the second row (the graphical data area).

30. Click **Done**.
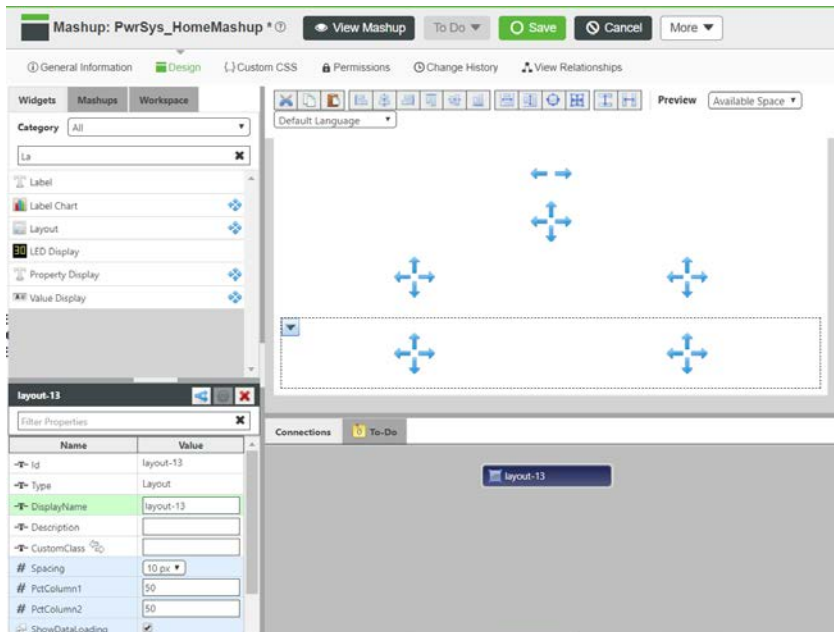
31. Select the **Workspace** tab.

32. Select the second **Header** from the Workspace tab.

33. In the Widget Properties panel, update the Style property to PwrSys_HeaderFillStyle.

34. Click **Row 1** (navigation bar area) just below the second Header.

35. In the Widget Properties panel, update the Style property to PwrSys_TopNavFillStyle.

36. Click **View Mashup** at the top to view the mashup.

> *Note*: *It is likely that you will need to disable your pop-up blocker to view your finished mashup.*
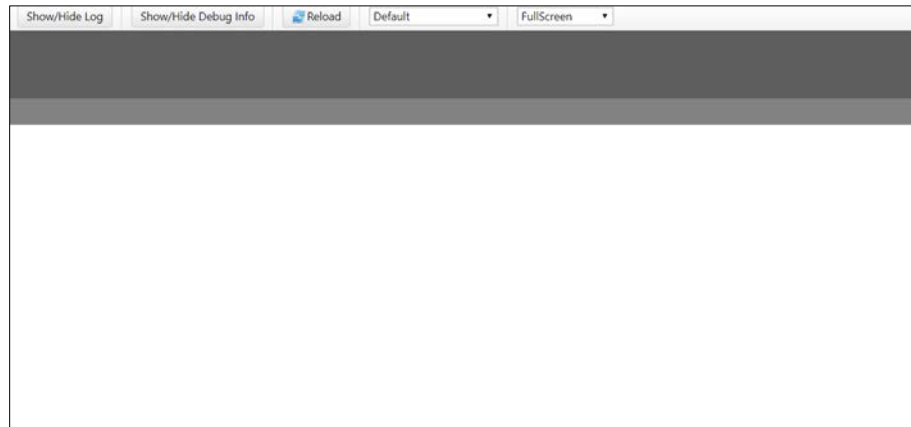
M4:8. Adding Page Content to a Layout

1. If necessary, open the PwrSys_HomeMashup mashup.

2. In the left pane, select the **Widgets** tab.

3. Drag the Label widget from the Widgets Library to the top Header row.

4. In the Add a Panel dialog box, click **Yes** to add a panel.

5. For the Label widget, update the following widget properties:

Property	Value
Text	Shipyard Power System
Style	PwrSys_HeaderTextStyle
Alignment	Center Aligned
Width	500
Height	28

6. With the Label widget selected, from the top toolbar of the workspace, click the **Cut** button.

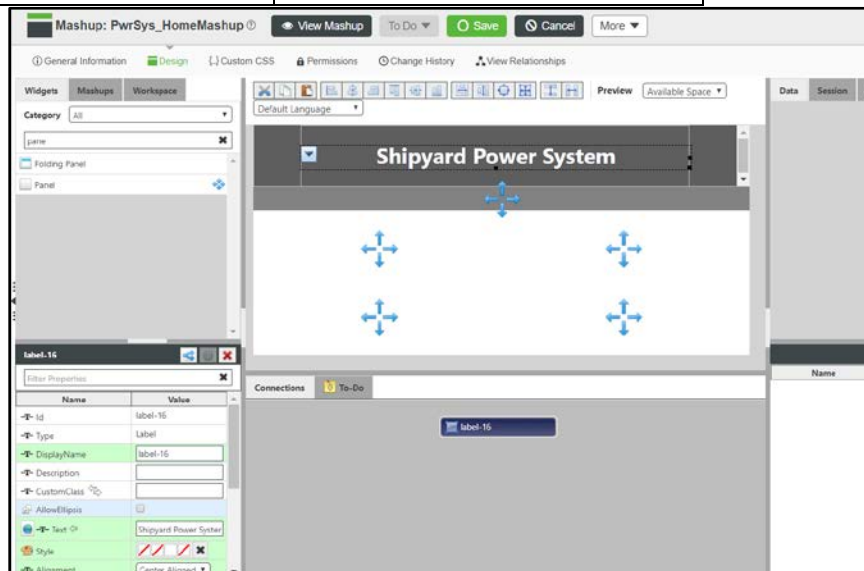7. From the Widgets Library, drag the Panel widget onto the top panel.

8. For the Panel widget, update the following widget properties:

Property	Value
HorizontalAnchor	Center
VerticalAnchor	Top
Top	0
Left	0
Width	500
Height	80

9. At the top of the canvas, click the **Paste** icon.

10. For the Label widget, update the following widget properties:

Property	Value
Top	26
Left	0

11. Click the **inner** panel in which the Label is placed.

12. For the Panel widget, update the following widget property:

Property	Value
Style	DefaultContainerStyle

13. Click the **external** panel in the header area.

14. For the Panel widget, update the following widget property:

Property	Value
Style	DefaultContainerStyle

15. From the Widgets Library, drag a label widget into the top-left quadrant (top-left column below the navigation bar area) of the canvas.

16. Click **Yes** to add the Panel.

17. For the Label widget, update the following widget properties:

Property	Value
Text	SYSTEM STATUS
Style	PwrSys_LabelStyle
Top	10
Left	10
Width	130
Height	22

18. Click the **Copy** button.

19. Select the **panel** of the SYSTEM STATUS label.

20. Click the **Paste** button.

21. For the Label widget, update the following widget properties:

Property	Value
Text	No Low Power State Until
Top	55
Width	195

22. Again, select the **panel** of the SYSTEM STATUS label.

23. Click the **Paste** button.

24. For the Label widget, update the following widget properties:

Property	Value
Text	Estimated Hours to Power Outage
Top	85
Width	260

25. Again, select the **panel** of the SYSTEM STATUS label.

26. Click the **Paste** button.

27. For the Label widget, update the following widget properties:

Property	Value
Text	Low Power State
Style	PwrSys_StatusStyle
Left	160
Width	260

28. Set the Preview drop-down list from Available Space to **1024 x 768**.

29. Drag a Value Display widget from the Widget Library onto the canvas to the right of the label widget for "No Low Power State Until".

30. For the Value Display widget, update the following widget properties:

Property	Value
ValueDisplayStyle	PwrSys_ValueStyle
Top	55
Left	230
Width	220

31. Drag the Value Display widget from the widget panel onto the canvas to the right of the label widget for "Estimated Hours to Power Outage".

32. For the Value Display widget, update the following widget properties:

Property	Value
ValueDisplayStyle	PwrSys_ValueStyle
Top	85
Left	290
Width	160

33. In the upper left corner of the panel at the top of the mashup, drag an Image widget.

34. Click the magic wand icon in the SourceURL property of the image widget and select **OmegaLogo_Orange_Small.**

> Note: *You can also type OmegaLogo_Orange_Small in the SourceURL property of the image widget and select it.*

35. For the Image widget, update the following widget properties:

Property	Value
Top	0
Left	0
Width	100
Height	40

36. From the top of the Widgets tab in the Category field, select **Charts**.

37. Drag the Proportional Chart to the lower-left corner of the mashup (grid location in the content area).

38. For the Proportional Chart widget, update the following widget properties:

Property	Value
NumberOfSeries	2
ChartStyle	PwrSys_ChartStyle
ChartAreaStyle	PwrSys_ChartAreaStyle
ChartLegendStyle	PwrSys_ChartLegendStyle
ChartTitleStyle	PwrSys_ChartLabelStyle
ChartIndicatorStyle	PwrSys_ChartIndStyle
ChartTitle	Power - Generated vs Consumed
ShowLegend	Unchecked

Note: EnableHover property will display the values in our chart widget when the user cursors over it.

39. Drag the Gauge to the lower-right grid location in the content area next to the Proportional Chart widget (2nd column of 2nd row).

40. For the Gauge widget, update the following widget properties:

41. Property	42. Value
LegendStyle	PwrSys_ChartLabelStyle
LegendDisplayMode	Top
Legend	Power Stored (kWh)

43. Click **Save**.

M4:10. Adding Interaction Features to a Mashup

1. Open the **PwrSys_HomeMashup** mashup.

2. In the Widgets tab in the Category field, verify that All is selected and the Filter Widgets field is cleared.

3. In the Navigation Bar area under the top header, drag a **Navigation** widget.

4. Click **Yes** to add a panel.

5. For the Navigation widget, update the following widget properties:

Property	Value
Text	Generators
TargetWindow	Modal Popup
Style	PwrSys_TopNavTextStyle
NavigationHoverStyle	PwrSys_TopNavHoverStyle
NavigationFocusStyle	DefaultShapeStyle
NavigationActiveStyle	DefaultShapeStyle
PopupTitleStyle	DefaultShapeStyle
Top	0
Left	20
Width	120
Height	28

6. Click the **Copy** button at the top of the canvas area.

7. Select the **Navigation Bar** panel area.

8. Click **Paste** at the top of the canvas area.

9. For the Navigation widget, update the following widget properties:

Property	Value
Text	Consumers
Top	0
Left	160

10. Select the **Navigation Bar** panel area.

11. Click the **Paste** button.

12. For the Navigation widget, update the following widget properties:

Property	Value
Text	Storage
Top	0
Left	300

13. From the Widgets Library, drag the Button widget to the upper-right quadrant of the Mashup content area.

14. Click **Yes** to insert a Panel.

15. For the Button widget, update the following widget properties:

Property	Value
Label	Enter Low Power
Style	PwrSys_ButtonStyle
HoverStyle	PwrSys_ButtonHoverStyle
ActiveStyle	PwrSys_ButtonActiveStyle
FocusStyle	PwrSys_ButtonFocusStyle
DisabledStyle	PwrSys_ButtonDisabledStyle
Top	25
Left	25
Width	155
Height	50

16. Click the **Copy** button.

17. Select the upper-right content panel (the Enter Low Power button panel).

18. Click the **Paste** button.

19. For the Button widget, update the following widget properties:

Property	Value
Label	Exit Low Power
Top	100
Left	25

20. From the widgets library, drag the Numeric Entry widget from the Widgets Library to the right of the Exit Low Power button.

21. For the Numeric Entry widget, update the following widget properties:

Property	Value
FixedDigits	2
Style	PwrSys_TextboxStyle
NumericEntryFocusStyle	PwrSys_ButtonFocusStyle
Left	215

22. Select the **Numeric Entry** widget.

23. Press CTRL and select the **Exit Low Power** button.

24. At the top of the canvas area, click **Make Same Height** .

25. Click **Make Same Width** .

> *Note: Notice that the Numeric Entry widget is deselected, make sure to select it again before aligning the tops.*

26. Press CTRL and select the **Numeric Entry** widget.

27. Click **Align Tops** .

28. Click **Save**.

29. Click **View Mashup**.

30. Set the resolution drop-down from FullScreen to **1024 x 768**.

M4:12. Adding, Binding, and Starting Entity Data

1. Open the **PwrSys_HomeMashup** mashup.

2. In the right pane, the Data tab of the Data Sources area, click the **Add entity** (Plus) button.

3. In the Select Entity field of the Add Data dialog box, type/select **Shipyard**.

4. In the Select Services (Filter) field, type **GetPropertyValues**.

5. Click the blue and white arrow icon for the GetPropertyValues service to add the GetPropertyValues service to the list of selected services for this entity.

6. Select the **Mashup Loaded**? check box.

7. Click **Done**.

8. Expand **All Data**.

9. From the Data Sources area, drag the **LowPowerState** value to the Low Power State **Label** widget.

10. Select the **Visible** option to bind the data so that the label is visible when the data is true.

11. In the right data pane under GetPropertyValues service, drag the **NoLowPowerStateUntil** property to the value display field to the right of the No Low Power State Until label.

12. Select the **Data** option.

13. From the Data Sources pane, under Returned Data, click the **All Data** arrow and drag it to the Proportional Chart widget in the lower-left corner of the content area.

14. Select the **Data** option.

> *Note: Notice that the Connections area, shows this connection between the data source and the chart widget. The Connections area will always show the connections from the most recently selected service, entity, or widget.*

15. For the Proportional Chart widget, update the following widget properties:

Property	Value
DataField1	PowerProduced
DataLabel1	Power Production
DataField2	PowerConsumed
DataLabel2	Power Consumption

16. From the Data Sources pane, drag the **PowerStored** property to the Gauge widget.

17. Select **Data**.

18. From the Data Sources pane, click the **Add entity** (Plus) button.

19. In the Select Entity field, type/select **PowerSystemServices**.

20. Select the **Uncategorized** service category.

21. Click the blue and white arrow for the **EnterLowPowerState** service.

22. Click the blue and white arrow for the **ExitLowPowerState** service.

23. Click the blue and white arrow for the **EstHrsToPowerOutage** service.

24. Click the **Mashup Loaded**? checkbox in the EstHrsToPowerOutage row.

25. Click **Done**.

26. In the Data Sources pane, under GetPropertyValues, collapse the Returned Data node.

27. Under the **EstHrsToPowerOutage** service, under the **Returned Data** node, expand the **All Data** node.

28. Drag # result to the value display to the right of the Estimated hours to Power Outage label.

29. Select the **Data** option.

30. Click the **Enter Low Power** button.

31. Hover-over the upper-left corner of the Enter Low Power button.

32. From the Enter Low Power button drop-down list, drag the Clicked event to the **EnterLowPowerState** service.

    Note: You may need to scroll down or scroll up to view the services in the Data Sources pane.

33. In the Data Sources pane, ensure that the **EnterLowPowerState** service is selected.

34. From the lower right pane, drag the ServiceInvokeCompleted event to the Things_Shipyard > GetPropertyValues service.

35. Under the **ExitLowPowerState** service, expand the **Parameters** node.

36. Next to the Exit Low Power button, click the **numeric entry** box.

37. Hover-over the upper-left corner of the numeric entry box.

38. From the drop-down list, drag # **Value** to under the ExitLowPowerState service's **hrsNoLowPowerState** input parameter.

39. Click the **Exit Low Power** button.

40. Hover-over the upper-left corner of the Exit Low Power button.

41. Drag the **Clicked** event to the **ExitLowPowerState** service.

42. In the Data Sources pane, ensure that the ExitLowPowerState service is selected.

43. From the lower right pane, drag the ServiceInvokeCompleted event to the Things_Shipyard > GetPropertyValues service in the upper right pane.

44. Click **Save**.

M4:14. Validating the Mashup

1. If necessary, open the **PwrSys_HomeMashup** mashup.

2. Click **View Mashup**.

   Note: Looking at the system status area, we see that the value display widget shows a date and time for no low power status as well as the other value display widget for the estimated hours to a power outage. These both are working as expected. The widget that isn't shown in this area is the label widget that indicates a low power state. This widget should only be visible if the shipyard power system had this critical status. This way, it'll draw the attention of our user Karen Lee.

3. Click the **Enter Low Power** button.

   Note: The Low Power State label does indeed display after we send the shipyard into a low power state. You may have also noticed the hover style that updated the visual design of the button when we cursored over it. This is part of a user-interaction design that lets the user know the button is clickable.

4. In the numeric entry widget, type **5000**.

5. Click the **Exit Low Power** button.

   Note: The low power state label disappears and the value display widgets update. The exit low power button also updated to let us know it's clickable.

6. Notice the chart widget shows the power generated versus the power used in the shipyard. Currently, the shipyard power system is operating as expected as it is not consuming more power than its producing.

7. Notice the gauge widget needle is exceeding the max value of 100 kWh. Recall that the power stored max value was 15000 kWh. So, now we must scale the gauge widget properly.

8. Select the tab for mashup builder from the browser to update the gauge widget.

9. Click the **gauge** widget.

10. Update the MaxValue property of the gauge widget to **15000**.

11. Click **Save**.

12. Click **View Mashup**. Notice the gauge widget now displays a readable value for the power stored.

    Note: We don't have to do this scaling update for the proportional chart widget because it has an autoscale property that is on by default; which means it changes its scale based on the incoming data.

M4:17. Creating the Mashup Page for Generator Assets

1. Create a new Mashup.

2. Click **OK** to accept the default Mashup Type of Page and the Responsive Layout Option.

3. In the Name field, type **SystemAssets_Generators**.

4. Click **Save**.

5. At the top, click **Design**.

6. Drag the Layout widget to the mashup canvas.

7. Select the **Vertical** Layout.

8. Select the **Header** checkbox.

9. Ensure that 2 Rows are created by default.

10. Click **Done**.

11. For the Layout widget, update the following widget properties:

Property	Value
HeaderHeight	80
PctRow1	12
PctRow2	88

Note: You won't need to fill in the value for PctRow2 as it is calculated after you enter PctRow1.

12. Select the **Header** area.

13. For the Header, update the following property:

Property	Value
Style	PwrSys_HeaderFillStyle

14. Click **Save**.

15. Open the **PwrSys_HomeMashup** mashup.

16. Select the **Workspace** tab in the widget panel.

17. Select the first panel in the second level header.

18. Click the **Copy** button.

19. In the Recent pane on the left, click **SystemAssets_Generators**.

20. Select the **Workspace** tab.

21. Select the **Header** area.

22. Click the **Paste** button.

23. Select the **Label** widget from the Workspace tab.

24. For the Label widget, update the following property:

Property	Value
Text	Power Generators

25. Select the **Widgets** tab.

26. Drag the **Grid** widget to the bottom row of the mashup layout.

27. For the Grid widget, update the following widget properties:

Property	Value
AutoSelectFirstRow	checked
GridBackgroundStyle	PwrSys_GridBckgnd_Style
GridHeaderStyle	PwrSys_GridHeader_Style
FocusStyle	PwrSys_GridBckgnd_Style
RowBackgroundStyle	PwrSys_GridRowBckgnd_Style
RowAlternateBackgroundStyle	PwrSys_GridRowAlternate_Style
RowHoverStyle	PwrSys_GridRowHover_Style
RowSelectedStyle	PwrSys_GridSelected_Style

28. Drag a **Label** widget from the Widgets Library to the 1st row below the header area.

29. Click **Yes** in the Add a Panel dialog box.

30. For the Label widget, update the following widget properties:

Property	Value
Style	PwrSys_LabelStyle
Top	0
Left	10
Width	200
Height	16

31. Click the **Copy** button.

32. Select the **Workspace** tab.

33. Select the same panel where the selected label widget resides.

34. Click the **Paste** button.

35. For the Label widget, update the following widget properties:

Property	Value
Top	25
Left	10

Note: You may want to change the Preview selection using the drop-down if you cannot see both labels in the current view.
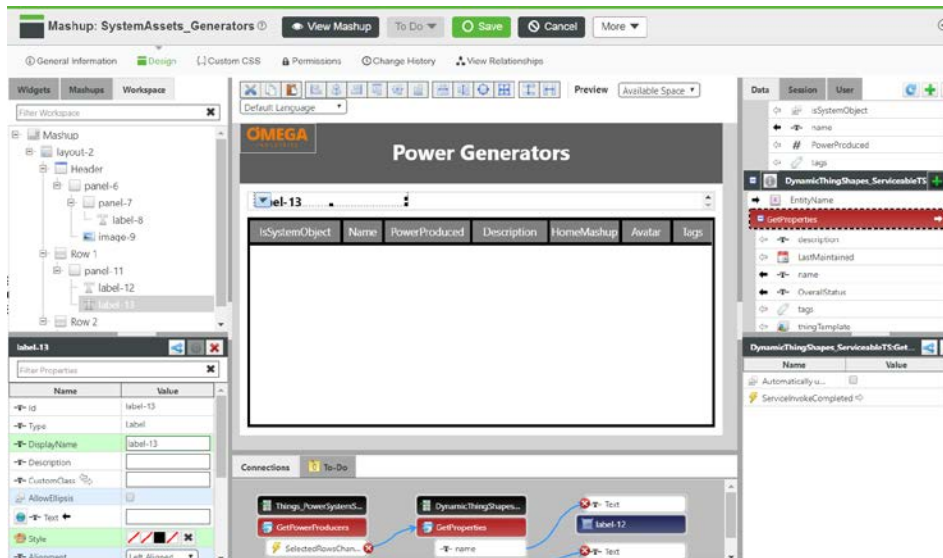
36. Click **Save**.

37. On the right, in the Data Sources pane, click ➕, the **Add entity** button.

38. In the Select Entity field, type and select the **PowerSystemServices** Thing.

39. In the Select Services (Filter) field, type **GetPowerProducers**.

40. Click the blue and white arrow next to the **GetPowerProducers** service to add it to the Selected Services field.

41. Click the **Mashup Loaded?** check box.

42. In the Select Entity field, clear the current selection.

43. In the Select Entity field, type/select **ServiceableTS**.

44. Select the **Dynamic** check box.

45. In the Select Services field, type **GetProperties**.

46. Click the blue-and white arrow next to the **GetProperties** service.

47. Click **Done**.

48. From the Data Sources pane, under GetPowerProducers, drag the **All Data** arrow to the grid.

49. Select **Data** as the Binding target.

50. From the Data Sources pane, under GetPowerProducers, expand the **Selected Row(s)** node.

51. Drag the name field to the Entity **Name** field of the DynamicThingShapes_ServiceableTS entity.

52. Expand the **GetProperties** service.

53. Drag the **name** property of the GetProperties service to the top label of the first row of the layout.

54. Select **Text** as the binding target.

55. View the bottom label in the panel with the labels.

56. Under the GetProperties service, drag OverallStatus to the bottom label.

57. Select **Text** as the binding target.

58. In the Data pane, scroll up to select the **GetPowerProducers** service.

59. From the bottom right pane, drag the **SelectedRowsChanged** event to the upper right Data pane **GetProperties** service (you may need to scroll down in the Data pane to view it).

60. Click **Save**.

61. Click **View Mashup**.

62. Set the resolution from FullScreen to **1024 x 768**.

63. Select various rows of the Grid and notice that the labels update according to the selected row.

64. Close the browser tab.

M4:18. Creating the Mashup Page for Storage Assets

1. In the left pane, select the **Browse** tab.

2. If necessary, click Mashups in the VISUALIZATION section.

3. Select the checkbox for **SystemAssets_Generators** mashup.

4. Click Duplicate.

5. In the Name field, type **SystemAssets_Storage**.

6. Click **Save**.

7. At the top, click **Design**.

8. In the Header area, select the **Power Generators** label.

9. For the Label widget, update the following widget property:

Property	Value
Text	Power Storage

10. In the Data tab of the Data Sources area, select **Things_PowerSystemServices**.

11. In the Data Sources area, click ✖, the **Remove the selected entity** button.

12. Click **Yes**.

13. In the Data tab of the Data Sources area, select **DynamicThingShapes_ServiceableTS**.

14. Click the **Remove the selected entity** button.

15. Click **Yes**.

16. In the Data Sources panel, click the **Add entity** button to add a data source.

17. In the Select Entity field, type/select **PowerStorage**.

18. In the Select Services field, type **GetPropertyValues**.

19. Click the blue-and white arrow next to the GetPropertyValues service.

20. Click the **Mashup Loaded?** checkbox.

21. Click **Done**.

22. From GetPropertyValues > Returned Data, drag **All Data** to the **Grid** widget.

23. Select **Data** to bind the service output to the Data target in the grid.

24. In the Data pane, expand **Selected Row(s)**.

25. Drag **name** to the top **label** of the first row of the layout.

26. Select **Text** as the binding target.

> *Note: You may want to change the Preview selection using the drop-down if you cannot see both labels in the current view.*

27. In the panel with the labels, view the bottom label.

28. From the GetPropertyValues service > Returned Data, drag **OverallStatus** to the bottom **label** of the first row of the layout.

29. Select **Text** as the binding target.

30. Click **Save**.

31. Click **View Mashup**.

32. Set the resolution from FullScreen to **1024 x 768**.
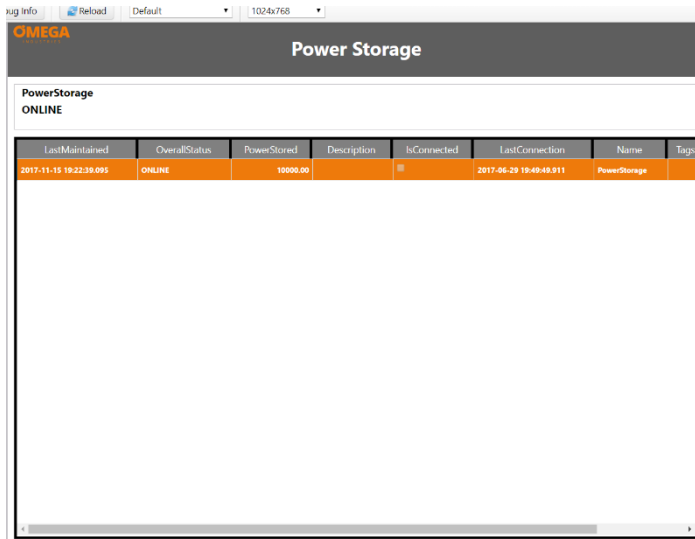
33. Close the browser tab.

M4:19. Creating the Mashup Page for Consumer Assets

1. Duplicate the SystemAssets_Generators mashup.

2. In the Name field of the duplicated mashup, type **SystemAssets_Consumers**.

3. Click **Save**.

4. At the top, click **Design**.

5. In the Header area, select the **Power Generators** label.

6. For the Label widget, update the following widget property:

Property	Value
Text	Power Consumers

7. Open the PwrSys_HomeMashup mashup.

8. Select the **Enter Low Power** button.

9. Click the **Copy** button.

10. Click the **SystemAssets_Consumers** mashup from the Recent panel.

11. Select the panel in the first row of the mashup layout.

12. Click the **Paste** button.

13. For the Button widget, update the following widget properties:

Property	Value
Label	Shutdown
Top	0
Left	220

14. On the Things_PowerSystemServices, click the **Plus** icon to add another service from this entity.

15. In the Select Services field, type **GetPowerConsumers**.

16. Click the blue and white button to add the GetPowerConsumers service to the Selected Services table.

17. Select the **Mashup Loaded?** check box.

18. Click **Done**.

19. From Things_PowerSystemServices > GetPowerConsumers > Returned Data, drag **All Data** to the **Grid** widget.

20. Select **Data** as the binding target.

21. Click **OK**.

22. Select the **GetPowerProducers** service.

23. Click the **Remove the selected entity** (red cross) button of the Data Sources area.

24. Click **Yes**.

25. From GetPowerConsumers, expand the **Selected Row(s)** node.

26. From Selected Row(s), drag the **name** property to the **EntityName** parameter for the DynamicThingShapes_ServiceableTS ThingShape.

27. Click the **Add entity** button of the Data Sources panel to add a data source.

28. In the Select Entity field, type/select **PowerConsumerTS**.

29. Select the **Dynamic** check box.

30. In the Select Services field, type **Shutdown**.

31. Click the blue and white arrow next to the Shutdown service.

32. Click **Done**.

33. From GetPowerConsumers > Returned Data > Selected Row(s), drag the **name** property to the EntityName parameter for the DynamicThingShapes_PowerConsumerTS ThingShape.

34. Select the **GetPowerConsumers** service.

35. From the bottom right pane, drag the **SelectedRowsChanged** event to the DynamicThingShapes_ServiceableTS > **GetProperties** service in the Data pane.

36. Scroll down in the Data Sources list so that the Shutdown service is in view.

37. Click the **Shutdown** button.

38. Hover-over the top-left arrow of the **Shutdown** button.

39. Drag the **Clicked** event to the **Shutdown** service.

40. Select the **Shutdown** service.

41. Drag the **ServiceInvokeCompleted** event from the lower-right panel to the **GetProperties** service.

42. Select the **Shutdown** service.

43. Drag the **ServiceInvokeCompleted** event to the **GetPowerConsumers** service in the Data pane (you may need to scroll up).

44. Click **Save**.

45. Click **View Mashup**.

46. Set the resolution from FullScreen to **1024 x 768**.

47. Select various rows of the grid and notice that the labels update according to the selected row.

48. Select one of the Hull Robots in the grid that is ONLINE.

49. Click **Shutdown**.

   Note: The robot status updates to POWER OFF when the shutdown is complete.

50. Close the browser tab.

M4:20. Setting Mashup Visibility Permissions

1. From the left pane, select the **Permissions** tab.

2. Select **Entities**.

3. Click **Date Modified** to sort the Entities list with the most recently edited entities at the top of the list.

4. Select the check boxes for the four mashups you just created:

    - PwrSys_HomeMashup

    - SystemAssets_Generators

    - SystemAssets_Storage

    - SystemAssets_Consumers

5. Click the **Edit Permissions** button.

6. In the Search Organizations field, type/select **MarsInterstellarShipyardOrg**.

7. Click **Save**.

M4:21. Validating the Mashup Pages

1. Open the **PwrSys_HomeMashup** mashup.

2. Click the **Generators** navigation widget.

3. For the Navigation widget, update the following widget property:

Property	Value
MashupName	SystemAssets_Generators

4. Click the **Consumers** navigation widget.

5. For the Navigation widget, update the following widget property:

Property	Value
MashupName	SystemAssets_Consumers

6. Click the **Storage** navigation widget.

7. For the Navigation widget, update the following widget property:

Property	Value
MashupName	SystemAssets_Storage

8. Click **Save**.

9. Click **View Mashup**.

10. Set the resolution from FullScreen to **1024 x 768**.

11. Click the **Generators** navigation link.

12. The Power Generators mashup will open in a modal pop-up window. Click the close (X) icon to close the Modal Pop-up window.

13. Click the **Consumers** navigation link.

14. The Power Consumers mashup will open in a modal popup window. Close the modal window.

15. Click the **Storage** navigation link.

16. The Power Storage mashup will open in a modal popup window. Close the modal window.

> *Note: Verify that the data is pulled into the mashups correctly and displayed or updated with the appropriate widgets.*

M5:5. Spacing the Mashup Page

1. Analyze low-level design for the Shipyard Power System application.
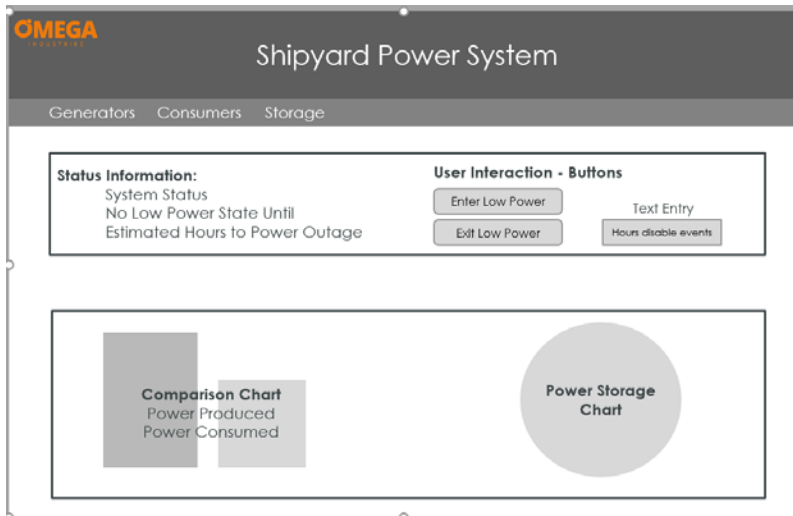
Note: If you recall, we chose a layout that included a header and a horizontal Navigation Bar. We also chose a layout where our content is organized into two rows: one for overall shipyard status and one for aggregate information about the assets. And then there is also a subtle break that sub-divides those rows into two evenly-spaced columns.
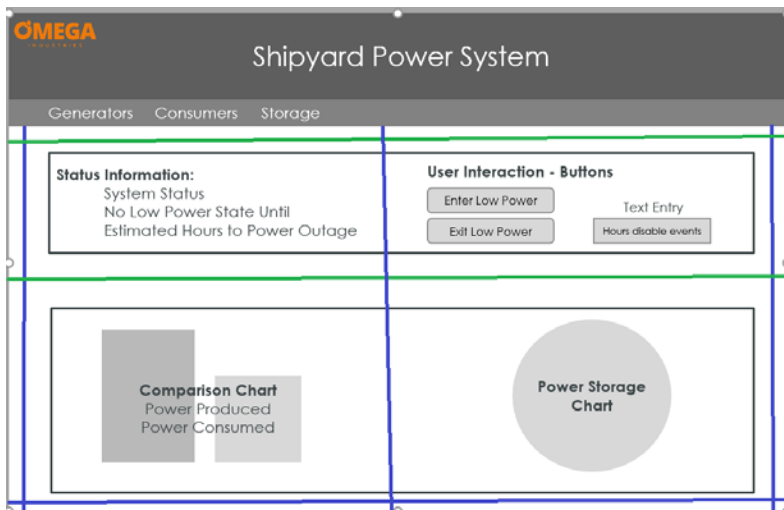
2. Open the **PwrSys_HomeMashup** mashup in Edit mode.

3. Click **View Mashup**.

   Note: Notice that the rows and columns exist, but that the spacing in the left and right panels in the upper row are larger than they need to be.

4. Close the browser tab.

5. Select the **Workspace** tab of the widget panel.

6. From the Workspace tab, select the 1st row of the top-most layout (the status area row i.e. the area below the navigation bar area). See image on right for reference.

7. Hover over the upper-left corner of the selected row in the Canvas and select **Add Row Above**.

8. Click away, and again select the previously selected row (the status area row) from the Workspace tab.

9. Hover over the upper-left corner of the selected row in the Canvas and select **Add Row Below**.

10. Select the row containing the Proportional Chart from the Workspace tab.

11. Hover over top-left arrow of the selected row in the Canvas and select **Add Row Below**.

12. Select the top most layout from the Workspace tab under Mashup.

13. For the Layout widget, update the following widget properties:

Property	Value
Spacing	20px
PctRow1	5
PctRow2	30
PctRow3	5
PctRow4	55
PctRow5	5

14. Click **View Mashup**.

15. Reset the resolution of the mashup to **1024 x 768**.

16. Close the browser tab.

17. In the PwrSys_HomeMashup mashup, select the **Proportional chart** widget from the canvas.

18. Hover over the upper-left corner of the Proportional chart widget and select **Add Column Left**.

19. Select the **Gauge** widget from the Canvas.

20. Hover over the top-left arrow of the Gauge widget and select **Add Column Right**.

21. Select the **Proportional chart** and then hover over the top-left arrow of the Proportional chart.

22. Select the **Select Parent Layout** option.
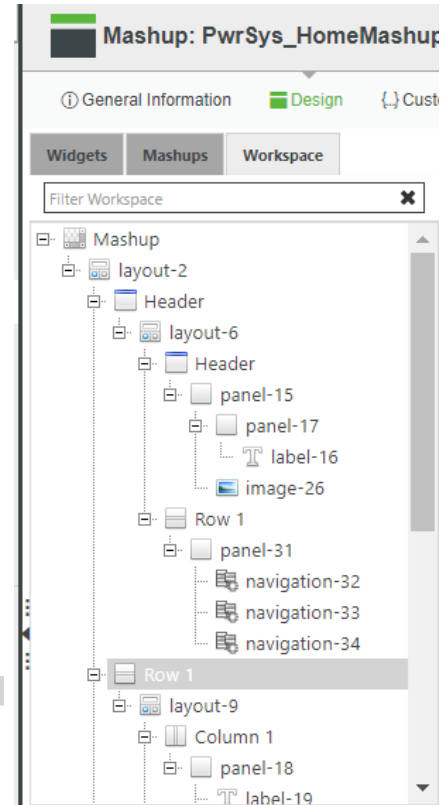
23. For the Layout widget, update the following widget properties:

Property	Value
Spacing	none
PctColumn1	5
PctColumn2	55
PctColumn3	35
PctColumn4	5

24. Click **View Mashup**.

25. Set the resolution from FullScreen to **1024 x 768**.

26. Close the browser tab.

27. In the PwrSys_HomeMashup mashup, select the **Gauge** widget from Canvas.

28. Click the **Cut** button.

29. Select the **Widgets** tab.

30. Drag a **Layout** widget to the space where the gauge was (the column next to the Proportional chart).

31. Select the **Vertical** layout type.

32. Set Rows to **3**.

33. Click **Done**.

34. For the Layout widget, update the following widget properties:

Property	Value
Spacing	none
PctRow1	5
PctRow2	90
PctRow3	5

35. Select the middle row of the new layout.

36. Click the **paste** button to paste the gauge widget into the middle row of the new layout.

37. Click **View Mashup**.

38. Set the resolution from FullScreen to **1024 x 768**.

39. Close the browser tab.

40. In the PwrSys_HomeMashup mashup, select the panel that contains the System Status data.

41. Hover over the top-left arrow of the selected panel and select the **Select Parent Layout** option.

42. For the Layout widget, update the following widget properties:

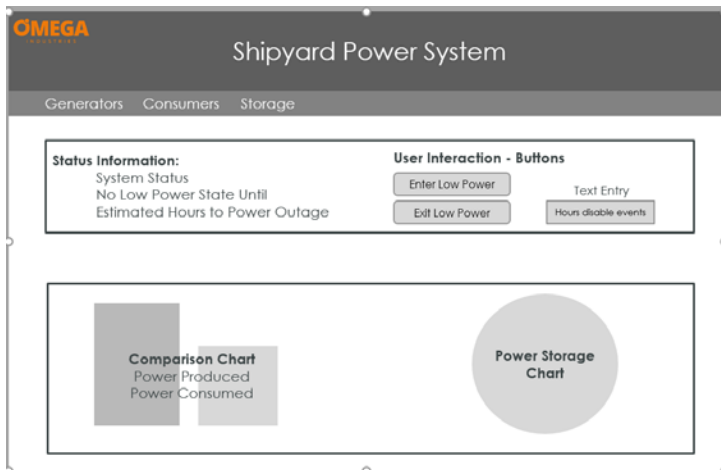| Property	Value
Spacing	none

43. Click **Save**.

44. Click **View Mashup**.

45. Set the resolution from FullScreen to **1024 x 768.**

46. Close the browser tab.

M5:6. Updating Style Definitions

1. Our goal is to enhance our layout by using color, contrast, and lines to frame and highlight features and data. So, we will analyze low-level design for the Shipyard Power System application.

Note: When we created a few style definitions to help us define the look of our mashup pages. We used the Omega Industries color palette to define the background and label styles for both our header and Navigation Bar. We selected darker colors for the backgrounds. This enabled us to use a white font color for the text in the label and navigation widgets. This worked well because there was a significant contrast between the darker background and the text. It also worked well because the contrast in color between the charcoal and medium gray colors was significant enough to differentiate the header background from the Navigation Bar.

2. Open the PwrSys_HomeMashup mashup in Edit mode from the ThingWorx Composer.

3. Click **View Mashup** and compare this with low-level design of the Shipyard Power System application.

Note: We want to emphasize the critical data and interaction area as a single row and the charts in a second row but want both areas to stand out. Notice that the status row has very thin lines surrounding the panels that contain the data and interaction widgets. The chart row has been reformatted to have ample white space, but the widgets just blend into the background. We want both rows to stand out and for the break between columns to remain implied but not separated by lines. An easy way to accomplish this is to add an accent background color to make these elements stand out.

4. Close the browser tab.

5. Select the **Workspace** tab.

6. Select the **Panel** containing the System Status information.

7. For the Panel widget, update the following widget property:

Property	Value
Style	DefaultContainerStyle

8. Select the **Panel** for the interaction buttons.

9. For the Panel widget, update the following widget property:

Property	Value
Style	DefaultContainerStyle

10. Select the **System Status** row.

11. For the Row, update the following property:

Property	Value
Style	PwrSys_PanelWithOutline

12. Select the **Chart** row.

13. For the Row, update the following property:

Property	Value
Style	PwrSys_PanelNoOutline

14. Click **Save**.

15. Click **View Mashup**.

16. Reset the resolution from FullScreen to **1024 x 768**.

17. Close the browser tab.

18. Select the **Low Power State** label.

19. In the Widget Properties pane, in the Style field, click the **PwrSys_StatusStyle** style definition.

20. Click **Edit**.

> *Note: This indicator should stand out because it is the single most important status indicator. Being in a low power state affects how one thinks about the rest of the data on the page. Thus, the label will use an inverted color scheme so that it stands out from the other Data Display widget information.*

21. If necessary, click **Style Information**.

22. Click the **Background Color** square.

23. In the opened dialog box, update the following fields:

Field Label	Value
R	143
G	0
B	0
A	1

24. Click **Select**.

25. Click the **Secondary Background Color** square.

26. In the opened dialog box, update the following fields:

Field Label	Value
R	255
G	0
B	0
A	1

27. Click **Select**.

28. Click the **Text Color** square.

29. In the opened dialog box, select the **White** option.

30. Click **Select**.

31. Select the **Font Bold** check box.

32. If necessary, set Text Size to **16px**.

33. Click **Save**.

34. Open the PwrSys_HomeMashup mashup.

35. If necessary, select the **Low Power State** label.

36. For the Label widget, update the following widget properties:

Property	Value
Alignment	Center Aligned
Width	200

37. Click **Save**.

38. Click **View Mashup**.

39. Set resolution to **1024 x 768**.

M5:8. Updating a Mashup for User Feedback and Error Prevention

Add Confirmation Prompt to Buttons

1. Open the PwrSys_HomeMashup mashup.

2. Click **View Mashup**.

   Note: Our goal is to enhance our mashup by telling our user the results of an interaction or by preventing the user from making a mistake. We begin by reviewing our current mashup for the Shipyard Power System and then consider what feedback our user Karen Lee might need. The "Enter Low Power" and "Exit Low Power" buttons should clearly show the results of their actions.

3. Close the browser tab.

4. Select the **Enter Low Power** button.

5. For the Button widget, update the following widget properties:

Property	Value
ConfirmationRequired	Checked
ConfirmationPrompt	Enter Low Power State?

6. Select the **Exit Low Power** button.

7. For the Button widget, update the following widget properties:

Property	Value
ConfirmationRequired	Checked
ConfirmationPrompt	Exit Low Power State?

8. Click **View Mashup**.

9. Click **Enter Low Power**.

10. In the dialog box, click **Yes**.

11. Click **Exit Low Power**.

12. In the dialog box, click **Yes**.

13. Close the browser tab.

14. Select the **Widgets** tab of the widget panel.

15. Drag the **Validator** widget to the right of the Enter Low Power button.

16. Hover over the upper-left corner of the Validator widget in the Canvas.

17. Select **Configure Validator**.

18. In the Configure Widget dialog box, click **Add Parameter**.

19. In the Name field, Type **timehorizon**

20. In the Base Type field, Select **DATETIME**.

21. In the Configure Widget dialog box, click **Add Parameter**.

22. In the Name field, type **LowPowerState**.

23. In the Base Type field, select **BOOLEAN**.

24. Click **Done**.

25. For the Validator widget, update the following widget property:

Property	Value
Expression	`if ((new Date().getTime() <= timehorizon) || (LowPowerState == true)) { result = true; } else { result = false; }`

26. In the Data Source panel, from the Things_Shipyard data source, expand the GetPropertyValues node.

27. Under Returned Data, expand All Data.

28. Drag the **NoLowPowerStateUntil** property to the validator widget.

29. Select **timehorizon**.

30. Drag the **LowPowerState** property to the validator widget.

31. Select **LowPowerState**.

32. Hover over the upper-left corner of the Validator widget in the Canvas.

33. Drag the **Output** option to the **Enter Low Power** button.

34. Select the **Disabled** option.

35. Select the **GetPropertyValues** service.

36. Drag the **ServiceInvokeCompleted** event in the Service Events (lower-right) panel to the **Validator** widget.

37. Select the **Evaluate** option as the target Service.

38. Click **Save**.

39. Click **View Mashup**.

40. Click **Enter Low Power**.

41. Click **Yes** to confirm.

42. Set the numeric entry value to **100.00**.

43. Click **Exit Low Power**.

44. Click **Yes** to confirm.

> *Note: If you entered a long-time horizon into the 'No Low Power State Until' field, the "Enter Low Power State" function will not work. A low power state cannot be generated until the time horizon expires. If you set a time horizon too far in the future, you can reset it to 'one hour ago from now' by entering "-1" into the field.*

M6:4. Assigning a Home Mashup to a User

1. Select the **Browse** tab.

2. Scroll down the Entity Collection navigation bar in the Composer and click **Users** under the SECURITY section to filter the entity list to show all users.

3. Click the link for **klee**.

4. In the Home Mashup field, type/select **PwrSys_HomeMashup**.

5. Click **Save**.

> *Note: This setting will automatically redirect a user who logs into the hostname slash Thingworx URL to their assigned home mashup. This home mashup will be the user's initial starting page with the ThingWorx runtime platform.*

M6:5. Verifying the User's Permissions

Verify Visibility and Run Time Permissions for Specific Entities

Now, let's quickly review the Data Sources and Services that are needed for our Power System Application. We identified them during the Experience stage. According to the information below, we also need visibility specifically to the PowerSystemServices Thing, the Shipyard Thing, the PowerStorage Thing, and the Shipyard Value Stream to log properties whenever the user makes changes. In addition to visibility to these entities, the Shipyard Power System application user needs Runtime Execute access to the Get Power Consumers and Get Power Producers services from the Power System Services Thing. The user also needs runtime execute permission to GetPropertyValues for both the Shipyard and Power Storage thing.

Entities Requiring Visibility	Services Requiring Runtime Execute Access
PowerSystemServices	• GetPowerConsumers • GetPowerProducers • EnterLowPowerState • ExitLowPowerState • EstHrsToPowerOutage
Shipyard	• RollUp • GetPropertyValues
PowerStorage	• GetPropertyValues
PowerConsumersTS	• Shutdown

1. Open the **Shipyard** thing in edit mode.

2. At the top, click **Permissions** and verify that you are in the Visibility page.

> *Note: Notice that both the Power organization unit and the whole shipyard are in the list of organizations that can view the Shipyard Thing.*

3. At the top, click **Run Time**.

Note: Notice that the Power Administrator group does not have specific permissions to run the GetPropertyValues service. This will likely be an issue since we use that service in the mashup.

4. Open the **PowerSystemServices** thing in edit mode.

5. At the top, click **Permissions** and verify that you are in the Visibility page.

   Note: Notice that the Power organizational unit has visibility.

6. At the top, click **Run Time**.

   Note: Notice that the Power Administrator Group has override permissions to execute the following services: Enter Low Power State, Exit Lower Power State, Get Power Producers, Estimate Hours to Power Outage, and Get Power Consumers.

7. Open the **PowerStorage** thing in edit mode.

8. At the top, click **Permissions** and verify that you are in the Visibility page.

   Note: The entire organization of the Mars Interstellar Shipyard has visibility.

9. At the top, click **Run Time**.

   Note: Notice that the Power Admin Group has Property Read access enabling users of this group to view all the properties, but again not to run the Get Property Values service. This will be an issue, but we will make updates after we test the mashup using Karen Lee's userid.

10. Copy the ThingWorx URL up to and including "/Thingworx" from the address field of the browser.

11. Now open another browser tab and paste the copied URL in the address field. Then append "/FormLogin/MarsInterstellarShipyardOrg_<*username*>" after "/Thingworx" in the address field of the browser.

12. Press ENTER.

13. Log on with the following credentials:

    Name: **klee_*username***

    Password: **ptcuniversity**

14. Click **Submit**.

15. Click the **Generators** Link.

16. Select the second row of the Grid to ensure that the fields update correctly.

17. Close the Modal Pop-up window.

18. Click the **Consumers** Link.

19. Select the second row to ensure that the fields update correctly.

20. Click the **Shutdown** button.

21. Close the Modal Pop-up window.

22. Click the **Storage** Link.

23. Close the Modal Pop-up window.

24. Now go the ThingWorx Composer where you logged in as the Developer.

25. Select the **Browse** tab.

26. Click **Things** under in the MODELING section.

27. Click the **Shipyard** Thing.

28. At the top, click **Permissions**.

29. At the top, click **Run Time**.

30. In the Property, Service, or Event Overrides field, type **GetPropertyValues**.

31. Click the **>** sign next to Services to expand.

32. Select **GetPropertyValues**.

33. In the Search Users or Groups field of the GetPropertyValues service, type/select **Power.Admin**.

> *Note: You may need to scroll down to see the GetPropertyValues service.*

34. Select **Allow** (✓) for the Service Execute field.

35. Click **Save**.

36. Select the **Browse** tab.

37. Click the **PowerStorage** thing.

38. At the top, click **Permissions**.

39. At the top, click **Run Time**.

40. In the Property, Service, or Event Overrides field, type **GetPropertyValues**.

41. Click the **>** sign next to Services to expand.

42. Select **GetPropertyValues**.

43. In the Search Users or Groups field, type and select **Power.Admin**.

44. Select **Allow** for the Service Execute field.

45. Click **Save**.

46. Select the **Browse** tab.

47. In the MODELING section, click **Thing Shapes**.

48. Click the **PowerConsumerTS** Thing Shape.

49. At the top, click **Permissions**.

50. At the top, click **Run Time**.

51. Select the **Instance of Entity** (🛰) tab next to Run Time just below PowerConsumerTS.

52. In the Search Users or Groups field of All Properties, Services, and Events, type/select **Power.Admin_username**.

53. Select **Allow** for the Service Execute field.

54. Click **Save**.

55. Now, go to the other browser where you tested the PwrSys_HomeMashup logged in as the klee_username. Then select the PwrSys_HomeMashup mashup from the browser and refresh the mashup.

56. Click the **Generators** Link.

57. Select another row of the Grid to ensure that the fields update correctly.

58. Close the Modal Pop-up window.

59. Click the **Consumers** Link.

60. Select the **Beta** row to ensure that the fields update correctly.

61. Click **Shutdown**.

> ***Note:*** *Notice that the Shutdown button does shut down the asset.*

62. Close the Modal Pop-up window.

63. Click the **Storage** Link.

64. Close the Modal Pop-up window.