2023

Automated Label Plate Generation Final Report

2019-483-05

ROBERT PARKER

Category B: Data developed partially with funding from project participants that was not charged to a government contract and partially with government funding.

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Table of Contents

Project Overview 3
Executive Summary of Results 3
Project Returns 5
Project Results 6
Discovery and Analysis 6
Excel Proof of Concept 8
PublisherLT Data Export: 8
Definitions: 8
Default Template Tabs: 9
Generated Output 11
Engineering USA Application 12
Label Plate Process 12
Adding/Editing a UDA Value in ShipConstructor 13
Copy Attributes 14
Edit Assignments 14
Edit Assigned Attributes 15
Delete an Attribute 15
Delete an Assigned Attribute 15
Import / Export Attributes 16
Import / Export Assigned Attributes 16
PublisherLT Operation 16
Label Plate Application 18
Managing Existing Templates 19
Creating New Templates 20
Special Bindings 21
Label Items 22
Item Bindings 22

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Associating Templates to data 23
Filtering ShipConstructor Data 23
Exporting Labels 23
Importing Changes Back into ShipConstructor 24
Post Workshop Changes 24
Technology Transfer and Implementation 25
Conclusions and Recommendations 26
Project Returns 26
Next Steps 27

FINAL REPORT
AUTOMATED LABEL PLATE GENERATION
2019-483-05

June 8, 2023

Project Overview

This NSRP Panel Project will explore the workflow and technical requirements to automatically generate label plates from an existing 3D detail design / production model. The primary object is to provide an efficient method to generate label plate data from the 3D model during the detail design effort through the marine designer. Then provide usable digital data of the label plate information from the same 3D model to a supplier for direct usage in their system thereby eliminating manual data entry that can induce potential errors. The efficiencies this project offers are tremendous in that no longer will the Label Plate effort be an afterthought but occur simultaneously with the detailed design.

Even though the vast majority of label plates onboard vessels are small in physical size, the label plate effort is extremely expensive. The expense comes not from the actual cost of the label plate, but rather due to label plate errors which are typically identified during the final throws of delivery. This requires an expediated 'fix' through many shipyard departments (technical engineering, detail design, field engineering, ILS, production, purchasing, warehousing, QA, planning, scheduling, paint, carpenters, etc…) in order to maintain the vessel's contractual delivery schedule.

The intention is for this project to provide a process to eliminate the inaccurate procurement of label plates since the label plate data is aligned with the configured 3D design model and to eliminate as much manual data entry as possible for label plate information with the supplier. Soon the need for 'Tiger Teams' to react to inaccurate label plates during compartment closeout on new construction projects or on repair projects, hours prior to redelivery, will be a relic.

Executive Summary of Results

The project team brought together a wide variety of stakeholders with different perspectives on the Label Plate process. Each stakeholder provided specific expertise and information regarding each of their individual aspects of the problem. SSI

worked with the project team to identify the data available within the existing 3D model and developed methods to export the information using EnterprisePlatform to generate label plates. Where information did not exist inside the model, the project team identified processes to add additional information through User Defined Attributes (UDAs) to populate label plates. Initial attempts to utilize MS Excel to manage label data were too inflexible to reasonably support the range of use cases which were identified. A third-party software developer was added to the team late in the project to develop a proof-of-concept Label Plates Application which ingests the data from ShipConstructor and allows the user to assign Label Plate templates for each type of label and subsequently export the information into MS Excel to assist in generating the labels with the label plate vendor. The process and proof of concept application were demonstrated during a final hands-on workshop where potential future opportunities were defined to improve the process further and potentially expand into a management application to support the entire process.

Overall, the project has been viewed as successful and an initial step toward addressing this problem fully. While the application is currently proof-of-concept, it can be used with any organization that is using ShipConstructor 2023 R2.1 or later. The application and documentation have been made available to all project participants. Conceptually, the project team would like to expand the project to automatically add more information such as a basic locator number (BLN) and to add service areas to equipment within the model to reduce the manual entry required on the front end of the process. In addition to enhancements to the label plate application, the project team would also like to expand the scope of the Label Plate process to overall management by the shipyard to facilitate procurement, installation, and change management.

We would like to thank all the participants in this project.

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Project Returns

1. Investigated a variety of label plate use cases for both commercial and government shipyards
2. Documented a process for printing label plates by the label plate vendor
3. Developed a process and export operation for getting label plate data from the 3D product model
4. Developed a flexible proof of concept application for assigning label plate data to label templates and exporting the information to MS Excel
5. Developed a process for getting any changes back into ShipConstructor
6. Successfully demonstrated the proof of concept process and application for the project participants
7. Provided the application and documentation to project participants for additional testing and potential production use

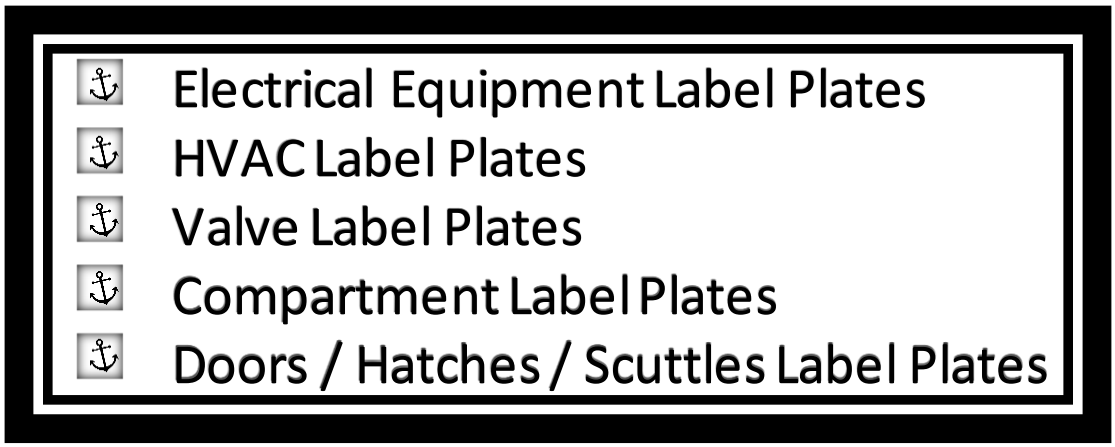
8. Generated a set of recommendations and next steps for further research and development

Project Results

Discovery and Analysis

The label plate project included three different shipyards with different requirements for label plates. Two shipyards, FMM and Austal, primarily build military ships while Conrad Industries primarily builds commercial ships and barges. Having this diverse group of participants resulted in a variety of label types and use cases. The project team worked with the shipyards to document their processes, types of labels, and application methods. The project team then developed a Label Plate Matrix which included a full range of variables that are used to define labels. It was clear from the discovery process that each shipyard had different requirements and there were even differences between programs and specifically differences for different types of equipment.

The project team also looked at the specific data elements needed to populate the label plates. The label plate specific data elements were included in the team's analysis. The project team divided the labels into five separate equipment groups. Each of the five equipment groups represents a set of similar use cases. Even within these use cases there were differences in data requirements but generally these five subdivide the entire population of label plates in a way which makes them easier to analyze and determine the best method to produce the label plates.



These five (5) Label Plate types represent a broad spectrum of common Label Plates onboard new construction and ship repair projects. These Use Cases support the various needs at the project shipyards.

The team evaluated the information needed to support each use case. The team also evaluated differences between each shipyard on the way that label plate information is provided to their respective manufacturers. Austal USA provides a visual representation of each label to their vendor which allows the vendor to copy/paste the label into a graphics software to create photo etched labels. Conrad produces a simple spreadsheet which includes valve descriptions and the type of label that needs to be printed or manufactured. Fincantieri Marinette Marine uses a large spreadsheet with many columns which not only contains the information to be printed on the label but is also used to manage the overall label printing process. This lack of consistency in the process adds complexity to the overall solution and makes a one size fits all approach much harder to achieve.

The project team also discussed at great length the ability to generate the data needed to populate the label plates from the product data model. Each of the shipyards included in this project use a common tool for detail design, however, not all information needed is actually contained in the 3D model. Several fields include information that reflects the functional design information such as service areas for HVAC and pipe systems. This information is not currently available in the 3D model and is collected in functional drawings in a prior step in the process. SSI had several internal discussions with its product development group and adding additional functional information into the 3D model has been added as roadmap item for a future ShipConstructor release. In the interim, additional data can be added to the 3D model through the use of User Defined Attributes (UDAs).

The project team also discussed the process for creating a Basic Locator Number which is a common attribute for several types of labels. The basic locator number is a three number code with each number separated by hyphens (X-YY-Z) that specifies the location of the piece of equipment. The first number is the deck number, the second number is the frame, and the third number is based off of other similar sequential types of equipment. Automating the creation of a basic locator number was deemed as not feasible given the scope of the panel project but the basic information has been communicated to the development team as part of the future roadmap and may be feasible in a subsequent phase of the project. For the purposes

of this effort, a separate UDA was added to the training project to support the basic locator number.

Once the project team understood the data and different types of labels, they developed an initial methodology to get the data out and into a format that was useful to the label plate manufacturer. PublisherLT would be used to export the information to a raw .CSV data dump into a formatted Excel spreadsheet to generate the information for the label plate vendor. Since the Austal process produced a visual representation of the label, it was used as the first iteration of the proof of concept. The project team developed an initial prototype application to display Austal's compartment labels. Subsequently, they added a second iteration to address Conrad's valve labels.

Excel Proof of Concept

PUBLISHERLT DATA EXPORT:

- **Part GUID:** this is a ShipConstructor attribute used in finding a specific instance of any given part.
- **Basic Locator Number:** this is a ShipConstructor User defined attribute.
- **Compartment Name:** This is a ShipConstructor Attribute inherited from the Compartment Manager.
- **UDA #1:** in the example we used this for Austal's Unique ID or "UID".
- **UDA #2:** in the example we mapped this to "Austal Drawing Number" or "ADN".
- **Label Component:** User Defined Attribute.
- **Label Type:** User Defined Attribute.
- **System:** Shipconstructor Attribute
- **Description:**

DEFINITIONS:

- **User Defined Attribute:** is a User Created Attribute that is manually populated. These can exist at the Stock or Part levels in ShipConstructor also referred to as a "UDA"
- **ShipConstructor Attribute:** An Attribute created and populated by ShipConstructor through proper use.

DEFAULT TEMPLATE TABS:

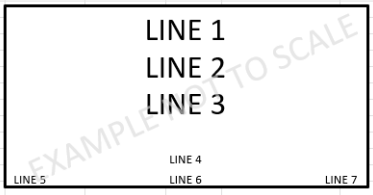
Settings

Data Mapping provides the ability to map a line of text on a label with a given column number found on the "RawData" tab. The current Map can be found on the Settings tab in the "Compartment Label Settings" box.

General Settings TO CONTROL THE FOLLOWING PARAMETERS

- ***Pixel scaling:*** How many Pixels per inch.
- ***Printed page width:*** width of the canvas used when generating visual labels.
- ***Printed Page Height:*** Height of the canvas used when generating visual labels.
- ***Item Type Data Column:*** Data mapping for the ItemType column in RawData.
- ***Output Type:*** Visual, List or Both.

	A	B	C	D	E	F	G	H
1								
2	General Settings							
3	Name	Value	Description					
4	pixel per inch	72	how many pixels per inch for scaling					
5	print width	20						
6	print height	24						
7	Type Column	10						
8								
9	Output Type:	Both						
10								
11								
12								
13	compartment label settings							
14	Line:	Data:	Font:	Size:	Horizontal Alignment	Vertical Alignment	x	y
15								
16	Line 1	3	Monospac821	25	center	center	0	0
17	Line 2	6	Monospac821	25	center	center	0	25
18	Line 3	5	Monospac821	25	center	center	0	50
19	Line 4	2	Monospac821	10	center	center	0	120
20	Line 5	1	Monospac821	10	left	center	0	132
21	Line 6	4	Monospac821	10	center	center	mid	132
22	Line 7	7	Monospac821	10	right	center	max	132



Settings Tab

RawData TAB IS POPULATED BY THE PUBLISHERLT OPERATION.

	A	B	C	D	E	F	G	H	I
1	Part Guid	Label #	BLN	UID	ADN	CMPT	SpoolGUID	PRIMARY AssemblyGUID	ParentAssemblyGUID
2	1114465e-9cf0-4deb-8d06-f31a0dd2692d		6516519	504-03-D	ADN-01-504-03	01-1620-02_MAIN MACHINERY RM, 01-1720-02_GALLEY	NULL	7750d9dd-79a0-4346-9a01-e543081373d8	7750d9dd-79a0-4346-9a01-e543081373d8
3	6339e41b-9d29-42bc-a6d5-f31a0f7dc264		6545851	504-04-D	ADN-01-504-04	01-1720-02_GALLEY, 01-1820-02_PASSAGE WAY	NULL	7750d9dd-79a0-4346-9a01-e543081373d8	7750d9dd-79a0-4346-9a01-e543081373d8
4	8ce304a3-b1c6-4f6a-b6c6-f31a113cdacb		6516851	504-05-D	ADN-01-504-05	01-1820-02_PASSAGE WAY, 01-1920-02_MISSION CONTROL RM	NULL	7750d9dd-79a0-4346-9a01-e543081373d8	7750d9dd-79a0-4346-9a01-e543081373d8
5	9348d6ae-6f09-4f2a-9842-f31a127ac320		5165819	504-06-D	ADN-01-504-06	01-1920-02_MISSION CONTROL RM, 01-2120-02_BRIDGE	NULL	7750d9dd-79a0-4346-9a01-e543081373d8	7750d9dd-79a0-4346-9a01-e543081373d8
6	9f30ef16-b924-42fc-a684-845e4e2d6d59		654651	504-02-D	ADN-01-504-02	01-1620-02_AUX MACH RM, 01-1620-02_MAIN MACHINERY RM	NULL	7750d9dd-79a0-4346-9a01-e543081373d8	7750d9dd-79a0-4346-9a01-e543081373d8

RawData Tab

FormattedData TAB IS POPULATED WHEN THE USER PRESSES "FORMAT DATA" ON THE START TAB. THIS PARSES THE RAW DATA INTO SOMETHING USABLE.

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	F	G	H	I	J	K	L	M	N
1	Compartment Name Entering	Compartment Number	Label Height	Label Width	Label component	Label Type	System	Description	Notes
2	GALLEY	01-1620-02	2	4	Compartment	A	MISC	AIR HORN SUPPLY	
3	GALLEY	01-1820-02	2	4	Compartment	A	MISC	AIR RCVR DISCH ISO	
4	PASSAGE WAY	01-1720-02	2	4	Compartment	A	Comp Air	PRESS REGULATING	
5	PASSAGE WAY	01-1920-02	2	4	Compartment	A	Comp Air	SEACHEST BLOW DOWN	
6	BRIDGE	01-1920-02	2	4	Compartment	A	Comp Air	MAIN ENG START AIR SUPPLY	
7	AUX MACH RM	01-1620-02	2	4	Compartment	A	Comp Air	AIR BY-PASS	
8	MAIN MACHINERY RM	01-1720-02	2	6	Compartment	B	Comp Air	COMP. AIR STATION	
9	MISSION CONTROL RM	01-1820-02	2	6	Compartment	B	Comp Air	AIR HORN SUPPLY	
10	MISSION CONTROL RM	01-2120-02	2	6	Compartment	B	Comp Air	AIR RCVR DISCH ISO	
11	MAIN MACHINERY RM	01-1520-02	2	6	Compartment	A	Comp Air	PRESS REGULATING	
12	MAIN MACHINERY RM	01-1520-02	2	6	Valve	B	Comp Air	SEACHEST BLOW DOWN	
13									

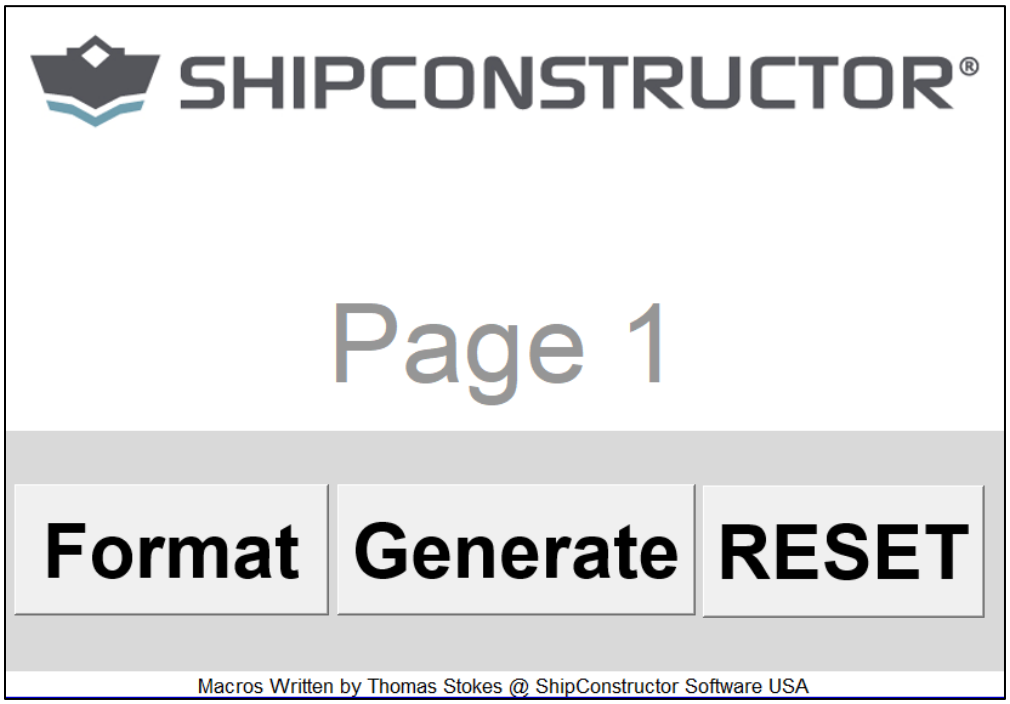
FormattedData Tab example

ListTemplate IS USED TO GENERATE THE LABEL LIST IF THE OUTPUT TYPE IS SET TO "LIST" OR "BOTH".

Template IS USED TO GENERATE THE CANVAS FOR THE VISUAL LABELS IF OUTPUT TYPE IS SET TO "VISUAL" OR "BOTH".

START HERE CONTAINS THE BUTTONS TO INTERACT WITH THE MACROS.

- Format — Takes the raw data and formats it into macro friendly data.
- Generate — Generates Labels based on the Output Type in settings.
- RESET — Removes any generated labels/list. Does not reset formatted data.



START HERE Tab.

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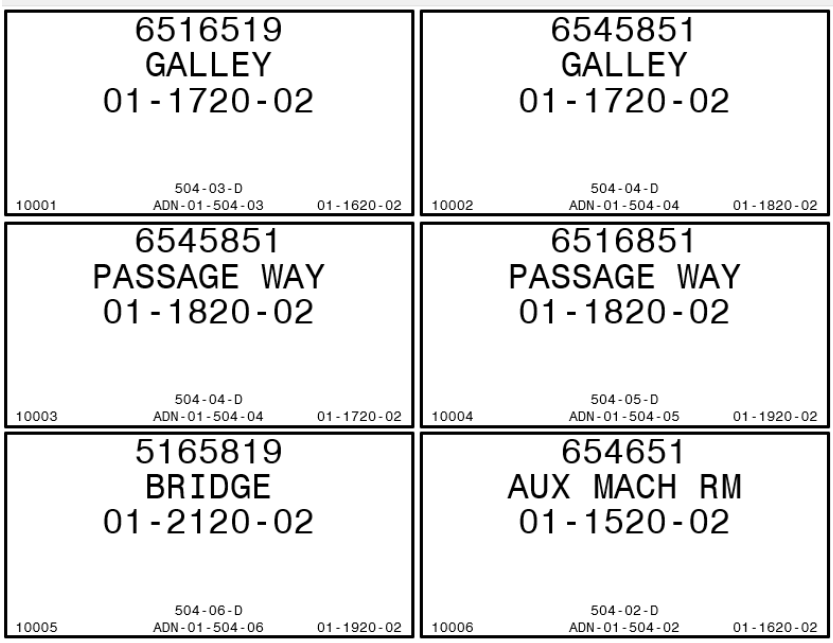
Generated Output

Visual Labels OutputType set to "Visual" or "Both"



Label List OutputType set to "List" or "Both"

44				
45	**Comp Air**			
46	Qty	Type	Description	Notes
47	1	A	AIR BY-PASS	
48	1	B	AIR HORN SUPPLY	
49	1	B	AIR RCVR DISCH ISO	
50	1	B	COMP. AIR STATION	
51	1	A	MAIN ENG START AIR SUPPLY	
52	2	A	PRESS REGULATING	
53	1	A	SEACHEST BLOW DOWN	
54	1	B	SEACHEST BLOW DOWN	
55				
56	**MISC**			
57	Qty	Type	Description	Notes
58	1	A	AIR HORN SUPPLY	
59	1	A	AIR RCVR DISCH ISO	
60				

ENGINEERING USA APPLICATION

After two iterations trying to address specific use cases (Austal and Conrad) the project team began to see the limited utility of Microsoft Excel as the development platform for this project. It was not flexible enough to support multiple use cases and provide robust results. The project team reached out to another partner to help mature the proof-of-concept application. Engineering USA had been engaged on another project and an opportunity arose to allow them to support this project. SSI has involved them in the last part of this development effort to maximize the value of the overall effort. Engineering USA was engaged in early March and will be working for 8 weeks to deliver a final version of the Label Plate Application in concert with the Final Report. Engineering USA created an initial mockup of the application user interface. The goal is to incorporate the findings from the prior proof of concept development efforts in a more flexible and reusable platform to add additional use cases that can be supported in a repeatable fashion.

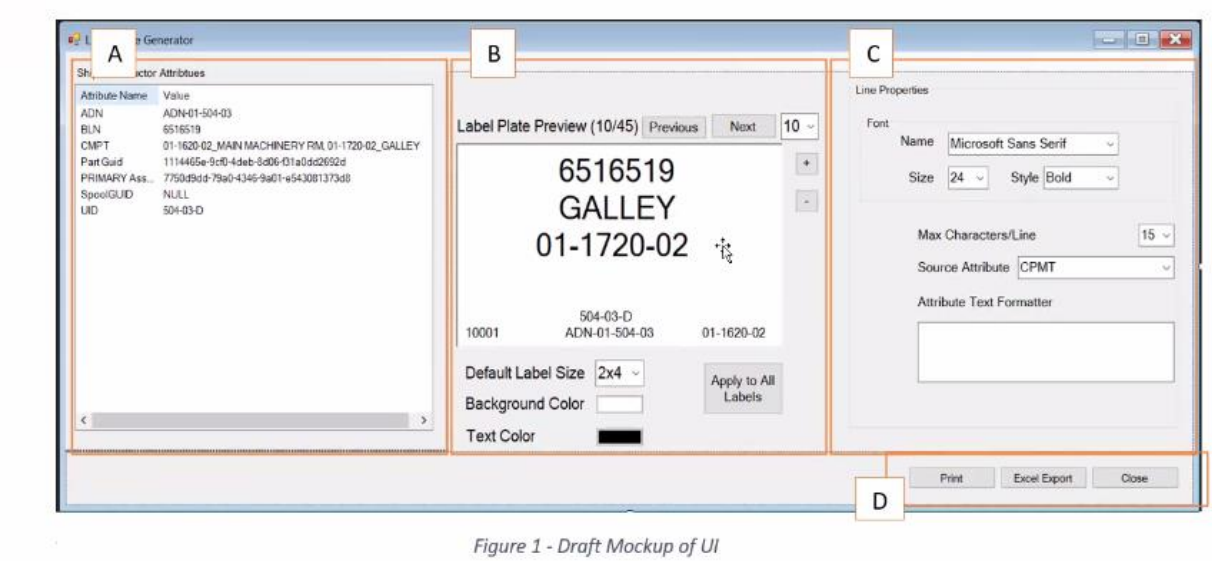


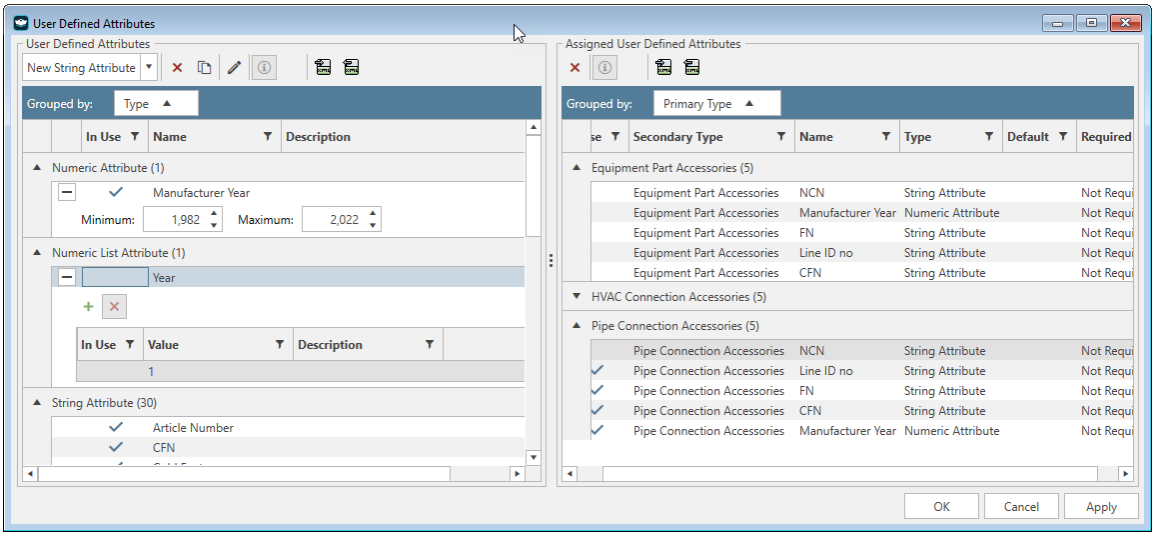
Figure 1 - Draft Mockup of UI

Label Plate Process

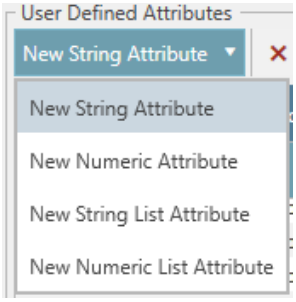
This process was developed based on the desire to exploit the ShipConstructor product data model to provide a means of producing the information needed to populate a label plate. The process includes adding a UDA value to the project, applying that UDA value to a part within ShipConstructor, and exporting these values to a separate label plate application designed to format labels. The sections below include information on the process and the proof-of-concept application to take export data from ShipConstructor and produce a label or set of labels.

ADDING/EDITING A UDA VALUE IN SHIPCONSTRUCTOR

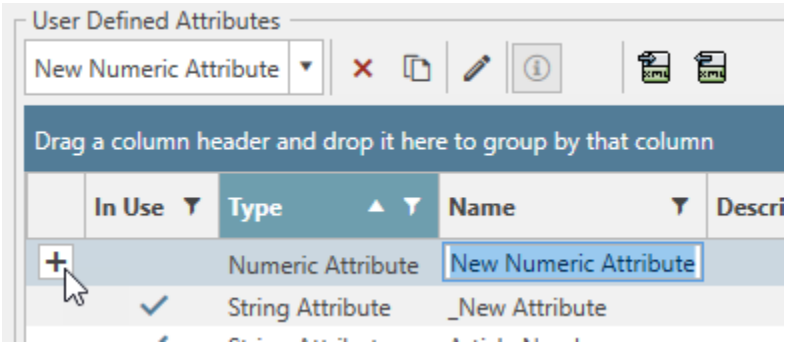
How To Create / Edit User Defined Attributes



Click on New String Attribute, or select which type to create from the drop-down list.



A new row will show up in the User Attributes grid for that type. If the type is not a String Attribute, there will be a + next to Name, to indicate other properties you can fill in.

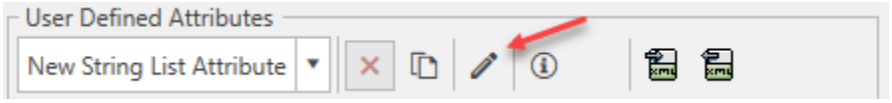


Copy Attributes

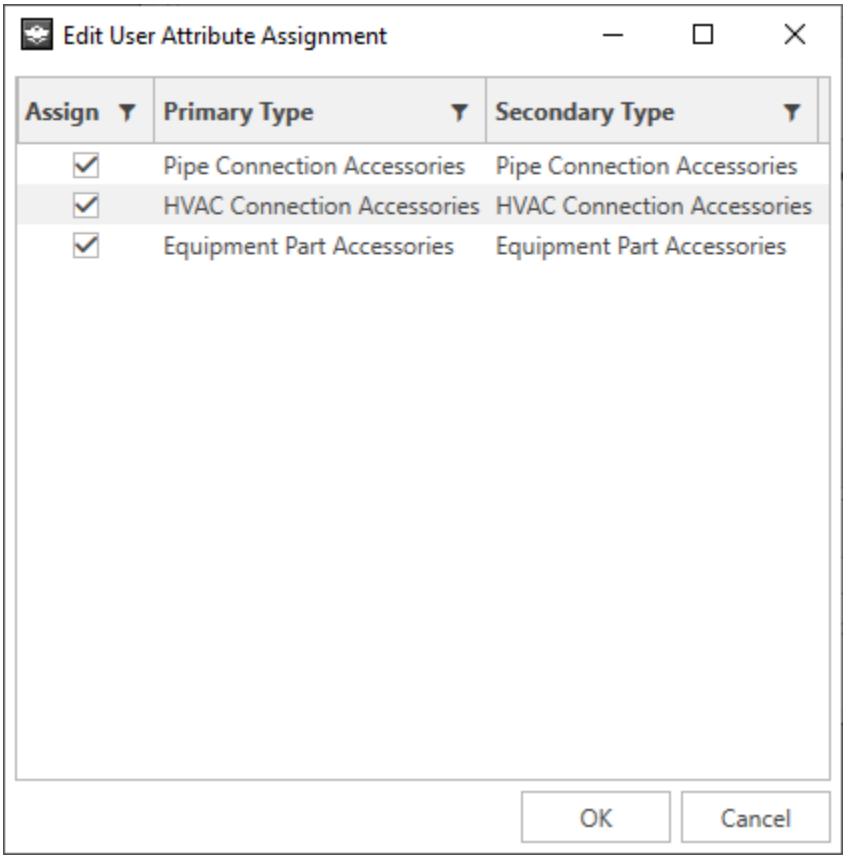
By selecting an Attribute and clicking on the Copy button, the selected Attribute will be copied to create a new Attribute with the same properties. Names of Attributes must still be unique.

Edit Assignments

1. Select all the Attributes you would like to assign to select part types.
2. Click Edit Assignments



3. This opens the Edit User Attribute Window



4. Select all type you would like assigned to the selected Attributes and click OK.
5. New assignments will now show up in the Assigned User Attribute section.

Edit Assigned Attributes

You can edit the Assigned Attributes default and required state fields.

Default

The default field for Assigned User Attributes can be null for any of the Required states. However, a default value can only exist if the Required state is set to Not Required.

The default value column cells for editing will be different depending on the type of data the Attribute Type is. For example, the list type Attributes, will show up as a drop-down list, so you can select one of the values.

To set back the default to null, simply either Select <None> in the drop-down list, or select the contents of the cell, and hit delete depending on the Attribute Type.

Required

You can set the required state of the Assigned User Attribute to one of 4 different options:

- Not Required
- Required and Deferrable
- Required not Deferrable
- Required and Deferred by Default

Delete an Attribute

Select all the Attributes you wish to delete, and press the Delete button, or Delete key on your keyboard.

Delete an Assigned Attribute

Select all the Assigned Attributes you wish to delete, and press the Delete button, or Delete key on your keyboard. Alternatively, you can use the Edit Assignments dialog. You will need to select the associated Attributes, then uncheck which part types you no longer want to be assigned to those Attributes.

Show Usage Log for In Use Attributes

Select all the In Use Attributes you wish to see usage for, then click the Usage Log button. A text file will pop up for each Attribute selected showing where it is In Use.

Show Locked Item Information for Attributes used in Locked Items

Select all the Attributes you wish to see the locked items for, then click the Locked Items Information button. The List of Locked Items dialog opens with a list of all locked items of the current type that have values for the selected Attributes.

Show Usage Log for In Use Assigned Attributes

Select all the In Use Assigned Attributes you wish to see usage for, then click the Usage Log button. A text file will pop up for each Assigned Attribute selected showing where it is In Use.

Show Locked Item Information for Attributes Assigned to Locked Items

Select all the Assigned Attributes you wish to see the locked items for, then click the Locked Items Information button. The List of Locked Items dialog opens with a list of all locked items that have values for the selected Attribute Assignments.

IMPORT / EXPORT ATTRIBUTES

To Import Attributes, click the Import button in the User Attributes area. If you have unsaved changes, you will be prompted to save before continuing.

To Export Attributes, select all the attributes you wish to Export, then click the Export button in the User Attributes area. If you have unsaved changes, you will be prompted to save before continuing.

IMPORT / EXPORT ASSIGNED ATTRIBUTES

To Import Assigned Attributes, click the Import button in the Assigned User Attributes area. If you have unsaved changes, you will be prompted to save before continuing.

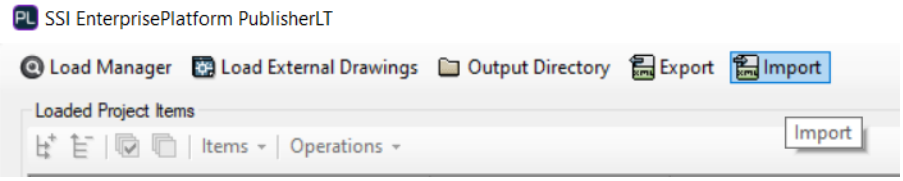
To Export Assigned Attributes, select all the assigned attributes you wish to Export, then click the Export button in the Assigned User Attributes area. If you have unsaved changes, you will be prompted to save before continuing.

PUBLISHERLT OPERATION

Import the Label Plates Operation

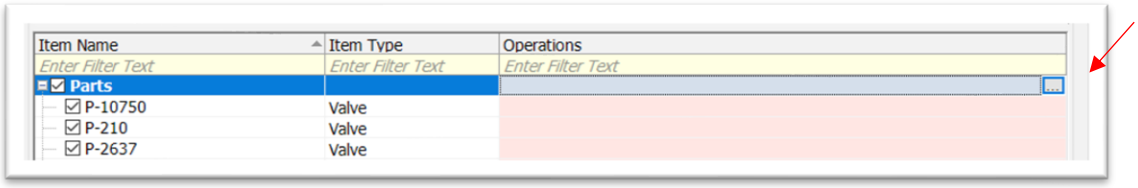
The custom Label Plates operation will export attributes from the Ship Constructor database and pass them directly to the Label Plates application. The “EnterprisePlatform Parts” and “EnterprisePlatform Label Plates” BOM Definitions will be used for this operation.

Import the operation into PublisherLT by selecting Import and then navigating to the EP-Labels-OP-WIP.xml file. Select the file and then click Open.

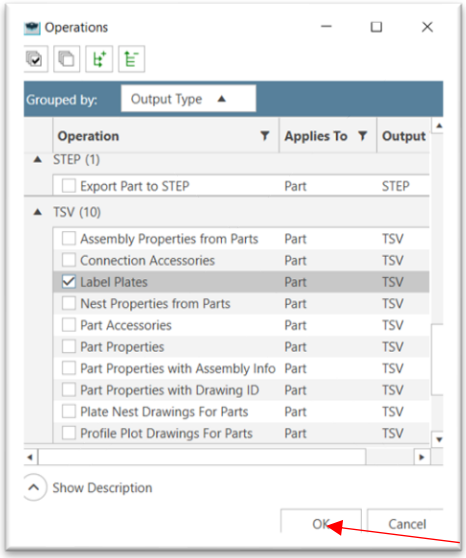


Running the Label Plates Operation

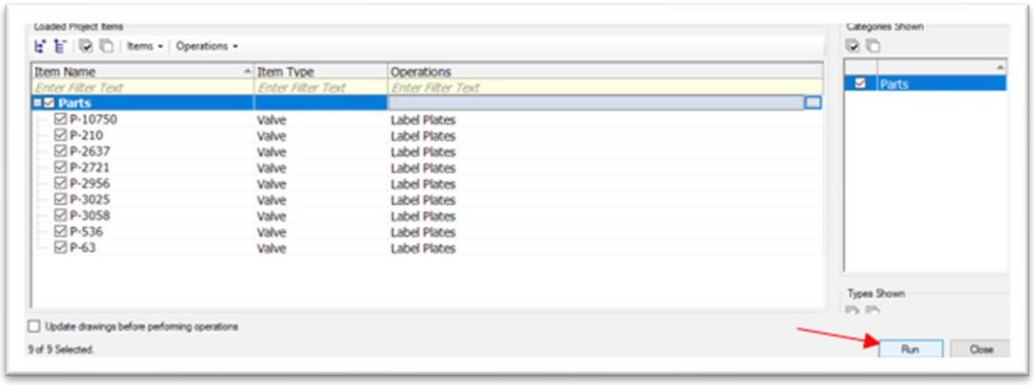
1. Use the Load Manager to select the objects that need label plates generated.
2. Select the ellipses at the highest level to apply the operation to all Parts.



3. Select the "Label Plates" operation the click OK



4. Select Run to execute the Label Plates operations



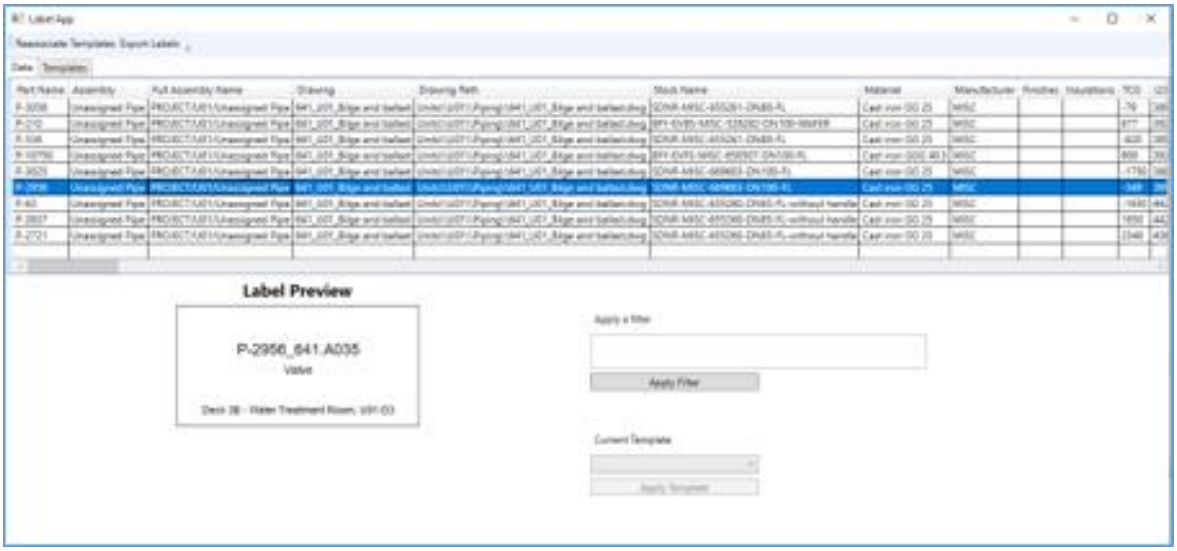
PublisherLT will automatically open the Label Plates Application after the data has been exported from the database.

Loading ShipConstructor data into the program

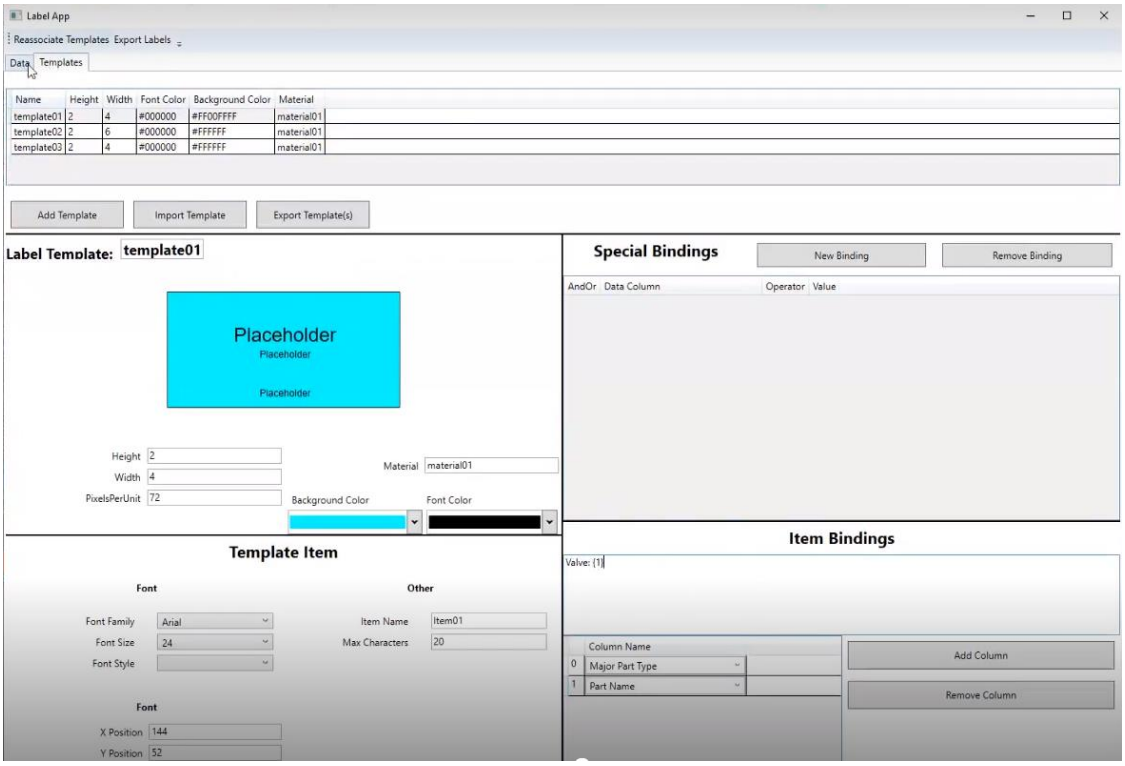
ShipConstructor Data is loaded at program launch looking in the same folder the program is running for a data.csv. This is loaded in the MainViewModels constructor.

Label Plate Application

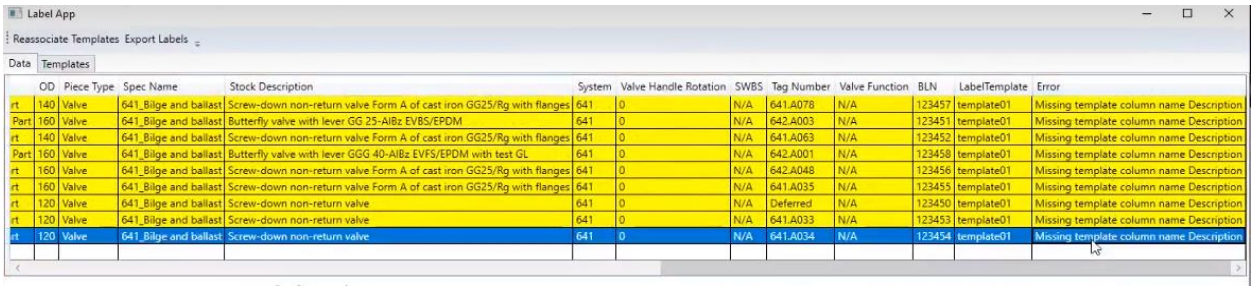
The label plate application was designed to display the data coming from the PublisherLT operation. The columns are generated based on the output from ShipConstructor dynamically meaning that adding an additional UDA value will result in an additional column. The data in these columns can be edited so that the user can curate the data as needed prior to generating the label plate export. The application allows the user to assign templates to a particular data element and generate a provider of the label based on the template selected.



The label plate application also allows the user to design and modify existing templates using the template tab. The template tab will allow the user to add, import, and export templates. It also provides a UI to support the user to define the label size, colors, fonts, and the maximum number of characters for a given entry.



If the data does not fit within a template, then the application will identify errors and will provide an indication by color of which rows have issues.



Managing Existing Templates

Templates are loaded on program launch if they are located in the templates folder that is within the same directory as the program. Adding additional templates folder during runtime will not load them into the program. In order to add additional

templates during runtime use the Import Templates button on the Template tab. You can export a template(s) by selecting the templates you wish to export and then pressing the export templates button, which will zip the selected templates.

Creating New Templates

Pressing the Add Template button will create a new blank template, with a generated name.

Currently there is no button to add new template items. They must be added through the .json files

Below is an example of the template01 .json file, which can be opened in any text editor. It contains all of the information related to the template.

```
{
  "NId": "template01",
  "Height": 2,
  "Width": 4,
  "DisplayHeight": 144,
  "DisplayWidth": 288,
  "Unit": "In",
  "PixelsPerUnit": 72,
  "BackgroundColor": "#FFFFFF",
  "FontColor": "#000000",
  "Material": "material01",
  "TemplateItems": [],
  "TemplateItemBindings": [],
  "TemplateSpecialBindings": []

}
```

TemplateItems, and **TemplateItemBindings** are needed for each new line item.

An Example **TemplateItem:**

```
{
    "LabelItemId": "Item01", -Name of the item, needs to be unique
    "FontFamily": "Arial", - the font
    "FontSize": 18, -the font size
    "FontStyle": "Regular", -the font style, Regular,Italic,Oblique
    "MaxCharacters": 20, -Maximum characters allowed in the line item
    "X": 144, -its x position in pixels
    "Y": 52, - its y position in pixels
    "IsSelectedColor": "#FFFFFF" -used for internal ui leave as is.

 }
```

TemplateItemBindings:

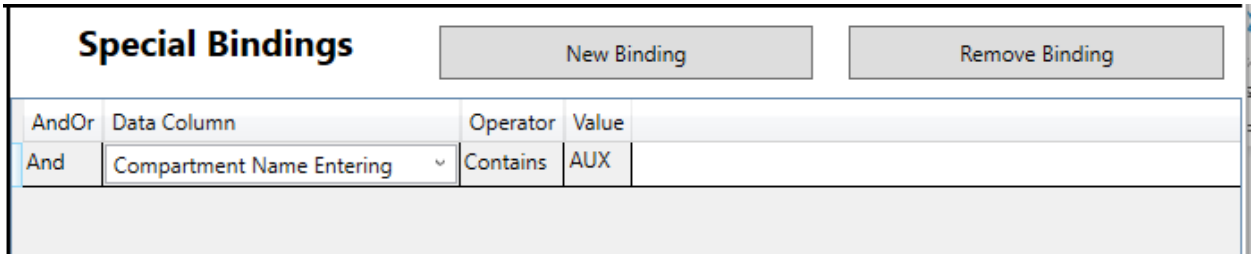
```
{
    "ColumnNames": [ -the list of all columns used in the format string
     {
       "Name": "UID", -the column name
       "Index": 0 -the number used to reference the column name, should increment
from 0
     },
     {
       "Name": "BLN",
       "Index": 1
     }
    ],
    "TextFormatString": "{0}_{1}", -the Format Text string
    "ItemId": "Item01" -the name of the line item, this needs to match the TemplateItems LabelItemId

}
```

The ItemId and LabelItemId, need to be matching values, unique from any other line items. While a template is selected you can edit its properties under the preview of the template.

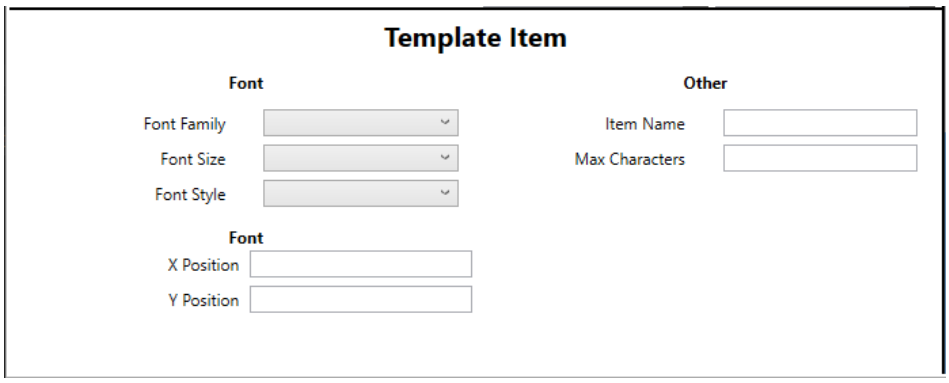
Special Bindings

While a template is selected you can also edit the Special Bindings of the template. A special binding allows you to set a logic on when to prioritize the system to automatically select the template. Each special binding has a column from the ShipConstructor data, an operand, and the value to check against. Each one of these logical statements either is an "And", or an "Or", for the special binding to be true and the template should be prioritized all "And"s must be true, or one "Or" must be true.



Label Items

In order to edit the items of the template you can click them in the label preview, highlighting green to show they are selected. Once an Item is selected you can set its properties in the UI section labeled Template Item.

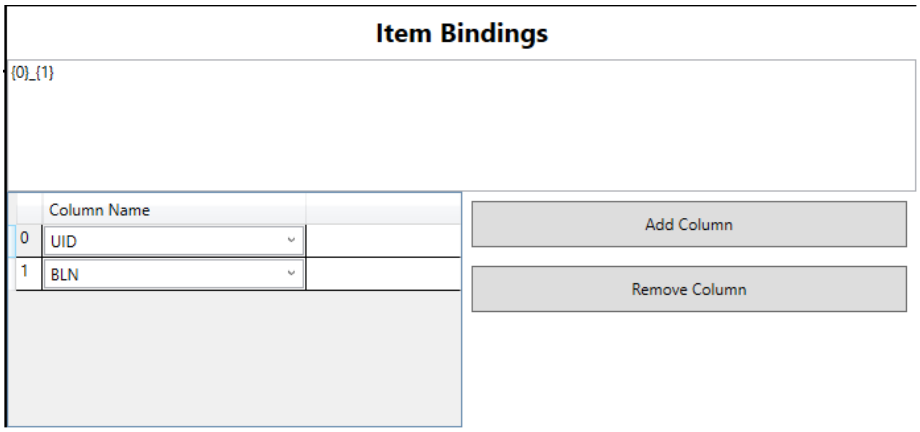


Item Bindings

Once an Item is selected you can set the Item Bindings properties in the Item Binding sections. The item binding is made up of a string text, and a list of column names which are used to fill in sections of the string. In the text formatting string, a set of curly brackets '{}' represents a place in which should be filled by data from a ShipConstructor column. Inside of the curly brackets should be the index of the column defined in the section below the text formatting string. For example, with a text formatting string of "{0}_{1}" With columns set as: |0|FOO| |1|BAR|

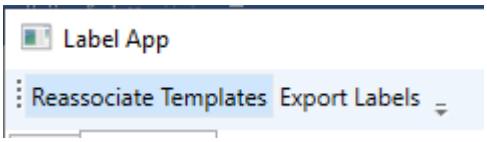
and data from ship constructor: |FOO|BAR| | A | B | | C | D |

When the first row is turned into an actual label the label item will have the text: "A_B". The second row would have the text "C_D"



Associating Templates to Data

When templates are already defined, and data is imported into the program it will automatically try to associate templates to the data upon start up. If you make changes to the templates and want to redo this process, you can click the Reassociate Templates in the tool bar at the top of the program. Once the process of associating templates is completed the rows will change color if there was an issue associating a template, along with providing an error message in the error column. You can manually associate a specific template to row(s) of data in the Data tab, Select the desired row(s) and selecting the desired template in the Current Template drop down and clicking Apply Template.



Filtering ShipConstructor Data

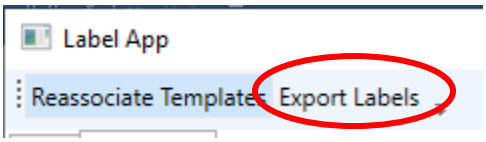
You can filter the table in the Data tab using the text box, and pressing apply filter. Filtering the ShipConstructor data uses DataView.RowFilter syntax: https://www.csharp-examples.net/dataview-rowfilter/

[Column name] = "SomeTextValue" | will filter the data to only show rows where the column: "Column name" has a value of "SomeTextValue" [Column name] = 100 | will filter the data to only show rows where the column: "Column name" has a value of 100 [Column name] > 100 | will filter the data to only show rows where the column: "Column name" has a value greater than 100 [Column name] > 100 AND [Column 2] = "SomeTextValue" | will filter the data to only show rows where both statements are true.

Exporting Labels

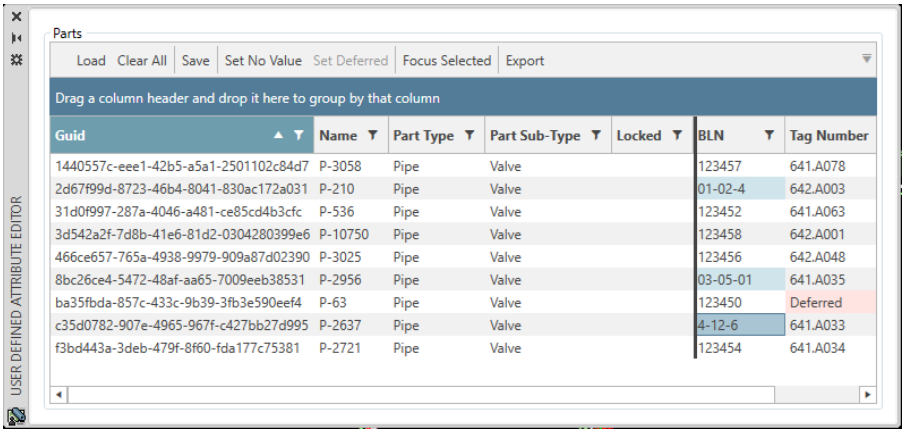
Once templates are associated to the data, pressing the Export Labels button in the toolbar will create an excel sheet representing each label based on the combination

of template and data from ship constructor. Data rows without a template associated are ignored in this export.



IMPORTING CHANGES BACK INTO SHIPCONSTRUCTOR

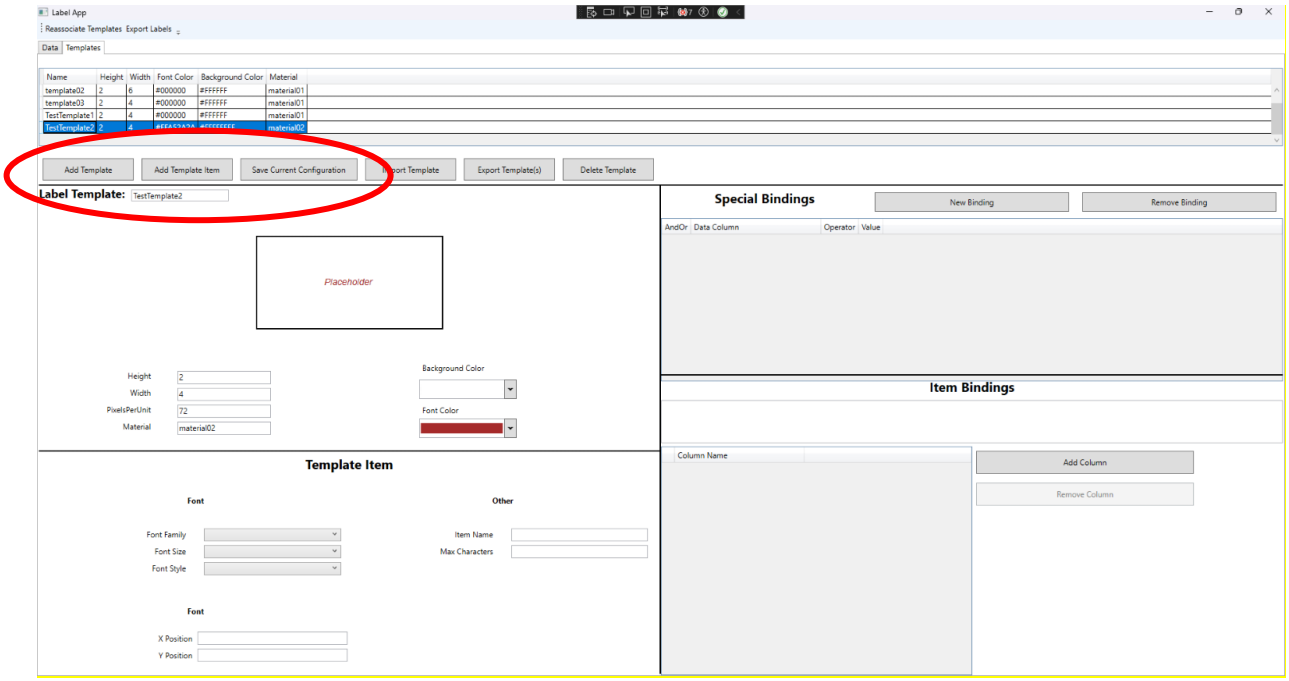
Once the data values have been modified in the label plates application, the project team demonstrated a method to import those changes back into ShipConstructor to store the information for the next time the information needs to be exported. This process uses the UDA Editor functionality to bulk edit values based on the part guid.



Guid	Name	Part Type	Part Sub-Type	Locked	BLN	Tag Number
1440557c-eee1-42b5-a5a1-2501102c84d7	P-3058	Pipe	Valve		123457	641.A078
2d67f99d-8723-46b4-8041-830ac172a031	P-210	Pipe	Valve		01-02-4	642.A003
31d0f997-287a-4046-a481-ce85cd4b3cfc	P-536	Pipe	Valve		123452	641.A063
3d542a2f-7d8b-41e6-81d2-0304280399e6	P-10750	Pipe	Valve		123458	642.A001
466ce657-765a-4938-9979-909a87d02390	P-3025	Pipe	Valve		123456	642.A048
8bc26ce4-5472-48af-aa65-7009eeb38531	P-2956	Pipe	Valve		03-05-01	641.A035
ba35fbda-857c-433c-9b39-3fb3e590eef4	P-63	Pipe	Valve		123450	Deferred
c35d0782-907e-4965-967f-c427bb27d995	P-2637	Pipe	Valve		4-12-6	641.A033
f3bd443a-3deb-479f-8f60-fda177c75381	P-2721	Pipe	Valve		123454	641.A034

POST WORKSHOP CHANGES

During the workshop, three primary features were identified and requested: 1) the ability to create new templates without modifying the .json document, 2) text wrapping within a template item to support a large string of text such as the service areas, 3) the ability to print labels from the application. Item 1 was addressed by the project team after the workshop to improve the overall useability of the application. Items 2 and 3 were deemed too difficult to accomplish given the limited time and budget remaining. The project team added the capability to create a new template, create a new item on a template, and save the configuration from within the application which improves the user experience.



Technology Transfer and Implementation

During the course of the project there were several opportunities to present the technical status to industry. The following technology transfer events were supported by the project team.

Sea Air and Space 2022 The project team provided a poster on the project pre-contract award	April 2022
NSRP Business Technologies and Ship Design and Materials Joint Panel Meeting Erik Bjorkner presented the project status during the Joint Panel Meeting in Honolulu, HI	September 2022
SSI World Shipbuilding Conference 2022 Erik Bjorkner presented the project concept and status during the bi-annual World Shipbuilding Conference in Mobile, AL	October 2022
NSRP All Panel Meeting 2023 Rob Parker presented the project status to both the Business Technologies and SDMT breakout sessions during the All Panel Meeting in Charleston, SC	March 2023
Final Demonstration and Training Session SSI hosted a final demonstration for all project participants as well as the PTR. SSI provided a virtual training lab environment and had personnel onsite at Fincantieri Marinette Marine to host the event.	May 2023

The functionality developed during the project including the PublisherLT export and Label Plate Application are designed to work with ShipConstructor 2023 R2.1 and later. These licenses must be EnterprisePlatform enabled to use the functionality. The software, operations, and a user guide have been provided to all project participants as part of the final deliverables. SSIUSA has plans to continue to refine the process and application subsequent to the conclusion of this project. Additionally, the project team plans to propose an RA project to expand the capabilities into additional areas of research.

Conclusions and Recommendations

The overall label plate project has been well received by the shipyards engaged in the project. The potential value associated with improving this process for the industry is readily apparent. This first effort to tackle the overall process has been a good initial step to eventually developing a robust process to improve this often overlooked but important part of the ship delivery process. Being that this project was limited in scope to generating label plates from the 3D model there are still a number of additional areas for further research and development.

Once each shipyard has been able to load the operation and application in their own production environment, we expect to get additional feedback as well as ideas for further development. The flexibility of the overall process should support a majority of use cases. Additional work is needed to continually reduce manual data entry and make the generation of label plates as automated as possible. There is significant additional opportunity to expand the effort to include Label Plates management and multiply the enterprise benefits from this initial effort.

Project Returns

1. Investigated a variety of label plate use cases for both commercial and government shipyards
2. Documented a process for printing label plates by the label plate vendor
3. Developed a process and export operation for getting label plate data from the 3D product model
4. Developed a flexible proof of concept application for assigning label plate data to label templates and exporting the information to MS Excel
5. Developed a process for getting any changes back into ShipConstructor

6. Successfully demonstrated the proof of concept process and application for the project participants
7. Provided the application and documentation to project participants for additional testing and potential production use
8. Generated a set of recommendations and next steps for further research and development

Next Steps

1. Additional Features in Label Plates Application
    1. Label Item to support wrapped text
    2. Additional capabilities for special bindings to automatically assign templates
    3. Ability to print labels or generate a custom export
2. Add service areas to product model for equipment
3. Create an algorithm to develop a Basic Locator Number
4. Develop a naming convention for label plate number
5. Label plate entity, unified UI across all entities/disciplines
    1. Labels across multiple disciplines
    2. Function to apply a label plate
6. Generate a standard process for label plates
7. Develop a database to manage the label plate process
    1. Procurement
    2. Configuration/Change Management
    3. Installation
    4. QA/Compartment Closeout
8. Generate custom export functions for label plate vendors
    1. Photo Etch
    2. Drawings
    3. CNC code for routers
    4. Allow the shipyard to produce their own label plates