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The Unit Manufacturing Process (UMP) Builder: User's Guide

David Lechevalier
William Z. Bernstein

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The Unit Manufacturing Process (UMP) Builder: User's Guide

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Engineering Laboratory*

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National Institute of Standards and Technology
Walter Copan, NIST Director and Undersecretary of Commerce for Standards and Technology

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Abstract

The ASTM E3012 Standard Guide for Characterizing Environmental Aspects of Manufacturing Processes provides guidelines for formally characterizing manufacturing processes. However, the difficulty that has arisen in the early use of the standard illustrates the need for intuitive tools for helping modeling experts to conform to the specified information model. The Unit Manufacturing Process (UMP) Builder was developed at the National Institute of Standards and Technology (NIST) to provide a visual interface for helping modeling experts to conform to the specified ASTM information model. The UMP Builder, a browser-based tool, integrates symbolic mathematical and guided textual inputs, helping to consistently record manufacturing process models for environmental sustainability into a repository. The Builder also serves as a curator by providing capabilities to explore and visualize models recorded in the Builder repository.

The UMP Builder is adapted from of an open source tool called the Configurable Data Curation System (CDCS) developed at NIST. The CDCS was originally developed to capture, share, and transform materials data, allowing users to upload an XML schema and create instances of that schema. In the UMP Builder, the schema used for creating the models is frozen. The schema follows the guidelines from the ASTM E3012 standard. The Builder also provides unique features that are specific in order to facilitate the modelling of UMPs. This user's guide aims to provide guidelines to use the UMP Builder. To obtain more information (especially on the architecture), please refer to the CDCS documentation.

Key words

ASTM E3012; Information Modeling; Smart Manufacturing; Sustainable Manufacturing; and Unit Manufacturing Processes.

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1. Introduction

The ASTM E3012 Standard Guide for Characterizing Environmental Aspects of Manufacturing Processes provides guidelines for formally characterizing manufacturing processes. However, in its current form, the standard itself is not sufficient to ensure the creation and curation of UMP models that can be shared between manufacturing enterprises. Users of the standard, specifically process modelers, require computer-supported toolkits to ease the conformance to the standard data representation. In response, the UMP Builder [1] was developed at the National Institute of Standards and Technology (NIST) to provide a visual interface for helping modeling experts to conform to the specified ASTM 3012 information model. The UMP Builder, a browser-based tool, integrates symbolic mathematical and guided textual inputs, helping to consistently record manufacturing process models for environmental sustainability into a repository [2]. This document describes the features of the Unit Manufacturing Process (UMP) Builder.

The UMP Builder was developed as part of the Smart Manufacturing Systems Design and Analysis Program [3] at NIST. The tool provides a web interface to create a model, a repository to curate the models, and an interactive visualization of the models. These features provide an initial layer of governance and verification with respect to the conformance to ASTM 3012 and are widely described in this user's guide.

The UMP Builder is adapted from of an open source tool called the Configurable Data Curation System (CDCS) developed at NIST [4]. The CDCS was originally developed to capture, share, and transform materials data, allowing users to upload an XML schema and create instances of that schema. In the UMP Builder, the schema used for creating the models is frozen. The schema follows the guidelines from the ASTM E3012 standard. The Builder also provides unique features that are specific to facilitate the modelling of UMPs. This user's guide is not intended to describe the CDCS architecture or functions but to provide guidelines to use the UMP Builder's functions that might be slightly different than the CDCS functions. To obtain more information about the CDCS architecture and technology, please contact the team in charge of the CDCS or refer to the documentation¹.

The remainder of this document presents the different UMP Builder features and how to use them.

2. User Interface

This section describes the UMP Builder user interface and its basic operations including:

- curating UMP models
- visualizing UMP models
- exploring the UMP repository
- accessing the dashboard
- administrating the UMP Builder

¹<https://www.nist.gov/itl/ssd/information-systems-group/configurable-data-curation-system-cdcs>

The home page provides the necessary access to these operations depending on the user's credentials.

2.1 Home Page

The home page provides generic information about the UMP Builder as shown in Figure 1.

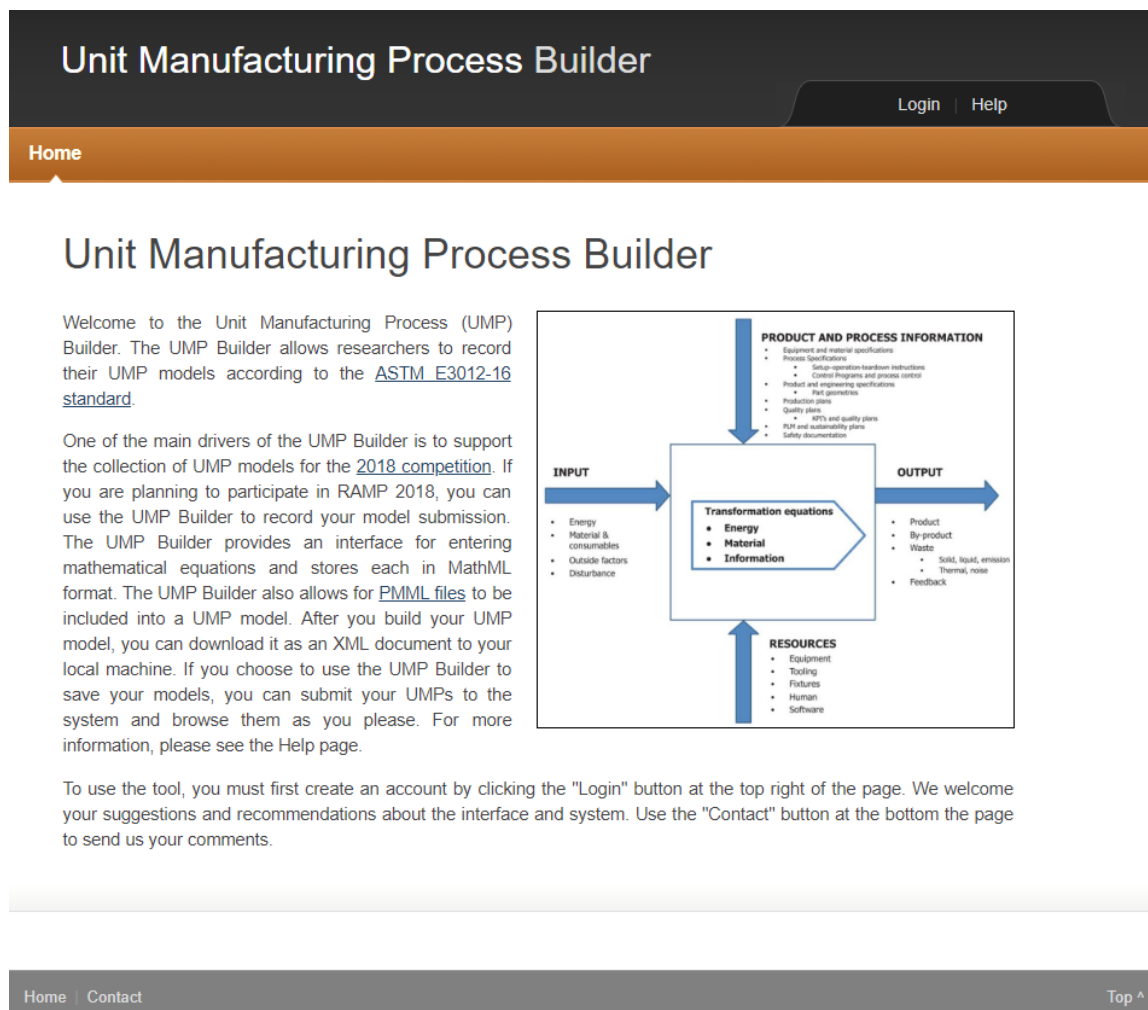


Fig. 1. Home Page as an Anonymous User

As an anonymous user, you cannot access any of the feature of the tool. You first need to login or to request a new account.

2.1.1 Request a New Account

You first need to request a new account. Click on the login tab and click on the *Request an Account* button to be redirected to the required form shown in Figure 2. Provide the

necessary information. A specific policy must be followed for the password. The password:

Unit Manufacturing Process Builder

Login | Help

Home Request New Account

Request New Account

Use the following form to request a user account on the Unit Manufacturing Process Builder.

Username:

Password:

Confirm Password:

First Name:

Last Name:

Email Address:

Home | Contact Top ^

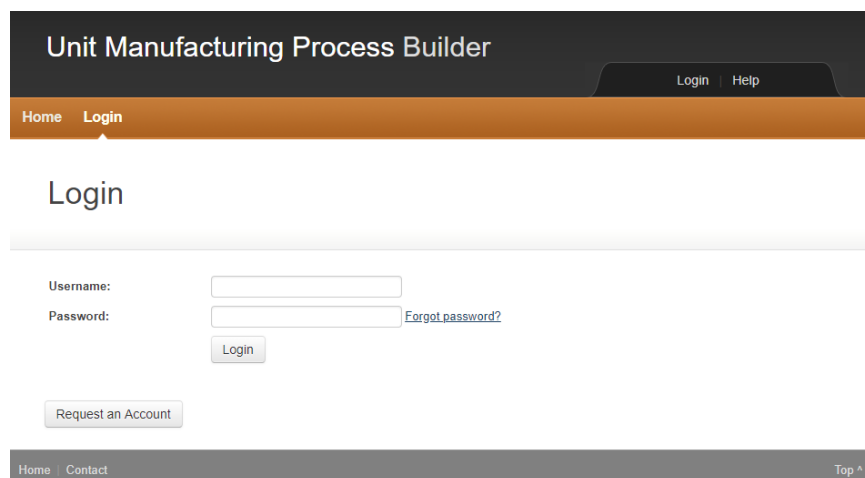
Fig. 2. Request a New Account

- must be at least 12 characters
- must contain 3 or more letters
- must contain 1 or more number
- must contain 1 or more symbol
- must contain 1 or more uppercase letter

Once requested, your account must be approved by an administrator. An email confirmation will be sent to the provided email address to confirm the request submission, and the account approval or rejection.

2.1.2 Login

To login, click on the *Login* tab at the top of the home page. You are redirected to the login page in which you can either log in or request a new account as shown in Figure 3. To login, use the credentials you have requested originally. Once logged in, the home page



The screenshot shows the 'Unit Manufacturing Process Builder' website. The header is dark grey with the title 'Unit Manufacturing Process Builder' in white. To the right of the title are links for 'Login' and 'Help'. Below the header is an orange navigation bar with 'Home' and 'Login' links. The 'Login' link is active, and the page title 'Login' is displayed below it. The main content area is white and contains a login form. The form has two input fields: 'Username:' and 'Password:'. To the right of the 'Password:' field is a link for 'Forgot password?'. Below the input fields is a 'Login' button. Below the 'Login' button is a 'Request an Account' button. At the bottom of the page is a dark grey footer with links for 'Home' and 'Contact' on the left, and a 'Top ^' link on the right.

Fig. 3. Login

provides additional options, depending on the user credentials as shown in Figure 4. The available features are described in the following sections.

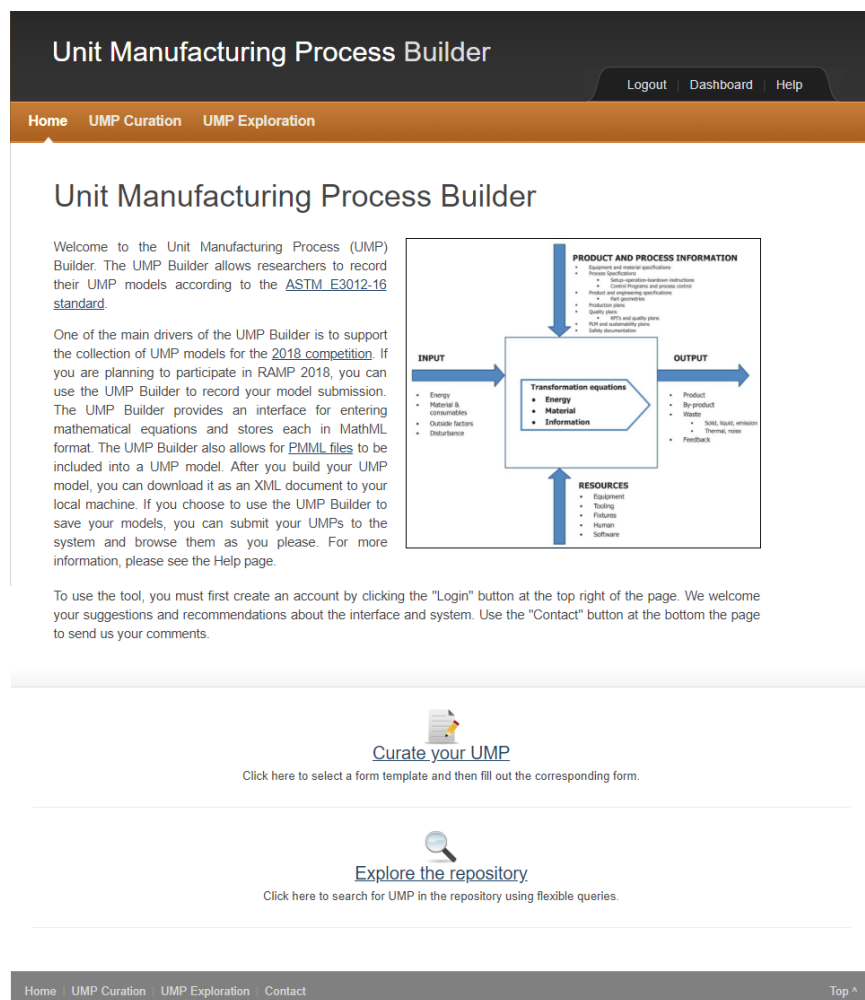


Fig. 4. Home Page as a Logged User

2.2 Curation

To create a new model and curate information about a UMP, you need to click on the *UMP Curation* tab in the home page. Three options are available as shown in Figure 5:

- Start a new UMP model
- Open a work-in-progress
- Upload a local UMP model

These options are described in the following sub-sections.

2.2.1 Start a New Model

When you want to start a new model in the UMP Builder, you should select the option *Start a new UMP model*. You will be provided with an empty form to start creating a new model. Before clicking on the *Start* button, you need to provide a name to your model such

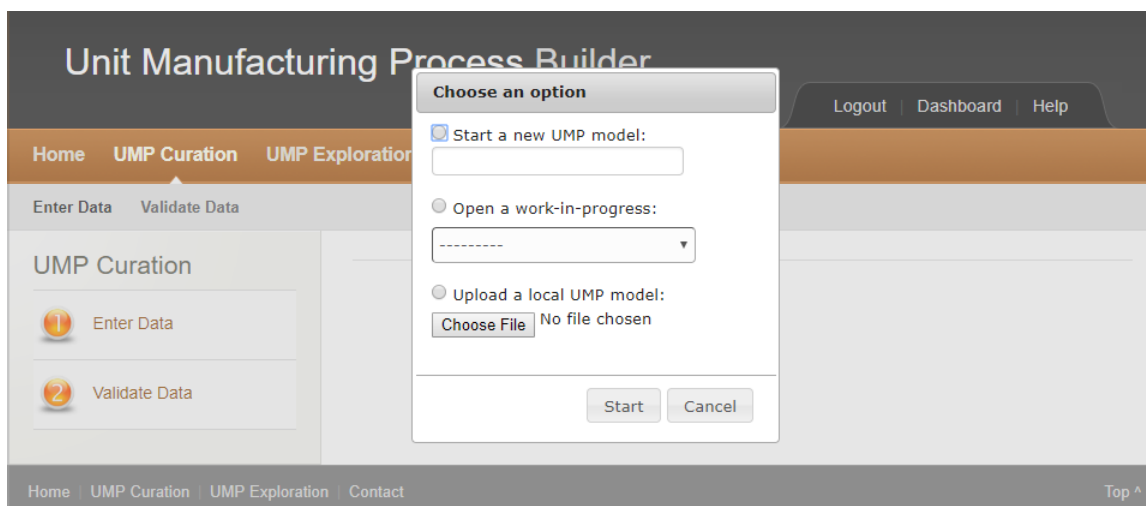


Fig. 5. UMP Curation

as “My new model” in Figure 6. Once you provided a name, you can press *Start*. You will be redirected to a new page with an empty form.

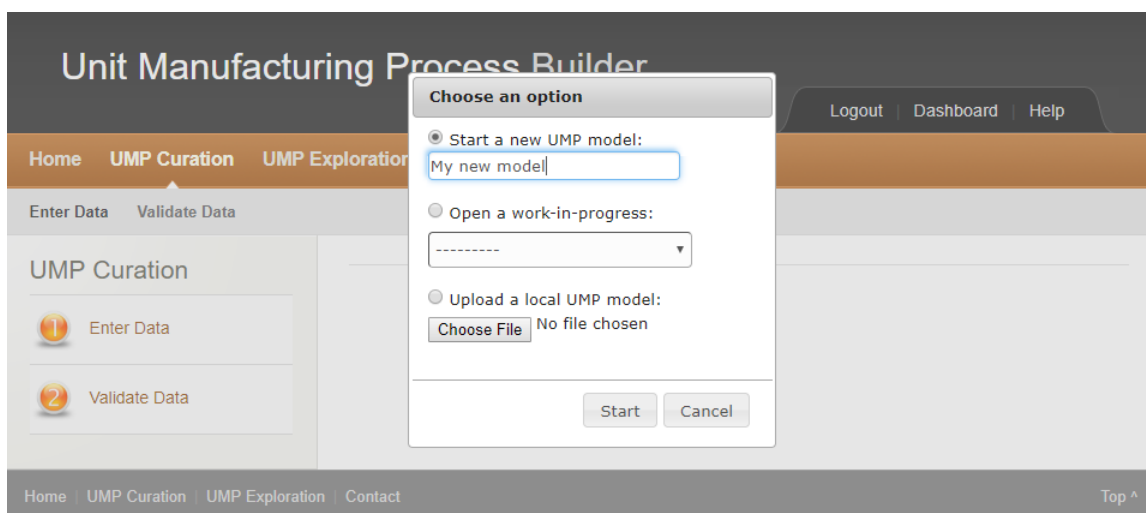


Fig. 6. Start a New Model

2.2.2 Open a Work-in-Progress

A model is periodically saved when you work on it. You also have the option to manually save progress. The option *Open a work-in-progress* allows you to reopen a model that needs additional work before being submitted to the repository. In Figure 7, you can see that “My model in progress” is available and can be reopened to provide additional information.

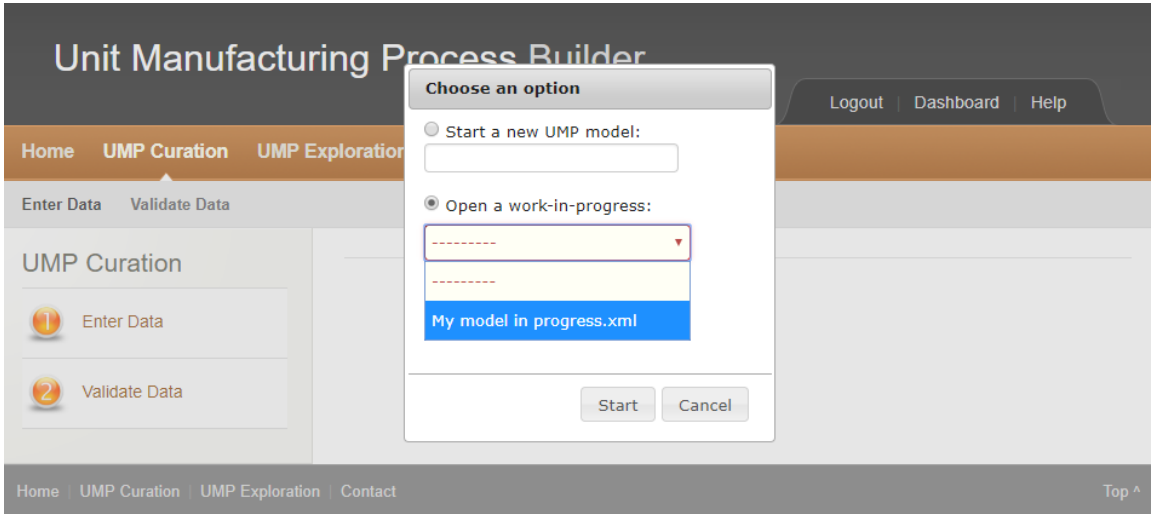


Fig. 7. Open a Work-in-Progress

2.2.3 Upload a Local UMP Model

The option *Upload a local UMP model* allows you to import a model you might have built locally with your own XML tool. The model that you import must be compliant with the schema used in the tool. The schema is available online [5]. To import your file, click on *Choose file*, select your UMP model and click *Open* in the new window shown in Figure 8, and click on start to be redirected to the new page.

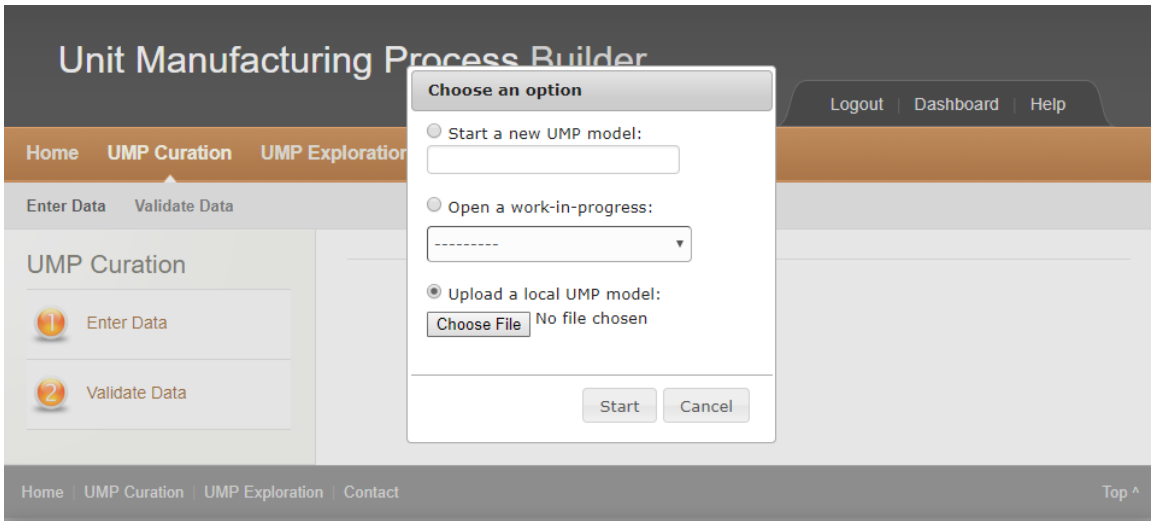


Fig. 8. Open a Local UMP Model





Once you selected one of the three options and pressed *Start*, you will be redirected to the new page that provides either an empty form (if you start a new model) or a form

pre-populated with information (if you open a work-in-progress or upload a local UMP model). The new page is described in the next section.

2.2.4 Curate the Information

The UMP Builder provides a form to create a UMP model. Shown in Figure 9, tooltips will appear when the mouse hovers over the different fields composing the form to help you understand what kind of information is expected in the different fields.

At any moment, you can either clear all the fields, save your work-in-progress (although there is an auto-save feature included), or download the current model in an XML format. The following sub-sections will describe the different fields to build a UMP model.

In this form, you can add an attribute or an element of a given type by clicking on . You can delete an attribute or an element by clicking on . You can expand or collapse an element by clicking on  or .

Please refer to the UMP schema documentation [6] to know what type of information you should provide for each field while creating an UMP model.

Unit Manufacturing Process Builder

Logout | Dashboard | Help

Home | UMP Curation | UMP Exploration | Composer

Enter Data | Validate Data

UMP Curation

1 Enter Data

2 Validate Data

Data Entry

Fill out the form below to describe your UMP model. At any time, you can save your progress by clicking on "Save Work-in-Progress". Once you log back into the UMP Curation tab, you will be able to re-load your progress.

Once you have completed your UMP model, you can click "Validate Data" located on the left pane. After the model is validated according to the UMP schema, you will be able to submit your UMP model to your repository.

For every input field, a tooltip provides an explanation and examples about the required values. You can also find the [full schema documentation here](#).

Clear Fields | Save Work-in-Progress | Download XML

UnitManufacturingProcess

- id: 5c57e70e3f009e002b5b8273
- name:
- creationDate:
- version:
- reviewed: false
- type:
- description:
- Author:
- Keyword:
- Input:
- Output:
- ProductProcessInformation:
- Resource:
- Transformation:
- ModelBound:
- Review:

What is required?
Specifies the date of the model creation. The date is specified in the following form "YYYY-MM-DD" where YYYY indicates the year, MM indicates the month, DD indicates the day. (Type: xs:date)
Examples:
2018-02-25

Home | UMP Curation | UMP Exploration | Composer | Contact | Top ^

Fig. 9. Curate the Information with Tooltip Help

2.2.5 Curate the Meta-Information

The first section of the form allows you to provide model meta-information. The tooltips will provide information about the appropriate format, especially for dates. An example is provided in the Figure 10. The *id* field is automatically populated.

Unit Manufacturing Process Builder

Logout | Dashboard | Help

Home UMP Curation UMP Exploration

Enter Data Validate Data

UMP Curation

1 Enter Data

2 Validate Data

Data Entry

Fill out the form below to describe your UMP model. At any time, you can save your progress by clicking on "Save Work-in-Progress". Once you log back into the UMP Curation tab, you will be able to re-load your progress.

Once you have completed your UMP model, you can click "Validate Data" located on the left pane. After the model is validated according to the UMP schema, you will be able to submit your UMP model to your repository.

For every input field, a tooltip provides an explanation and examples about the required values. You can also find the [full schema documentation here](#).

Clear Fields

Save Work-in-Progress

Download XML

UnitManufacturingProcess

id 5c19075af39cba002b0ce4de

name Milling model

creationDate 12/18/2018

version

reviewed false

type Milling

description This is my milling model

Author

FirstName David

LastName Lechevalier

Organization Engisis LLC

Email

Keyword milling

Keyword demonstration

Input

Output

ProductProcessInformation

Resource

Transformation

ModelBound

Review

Home | UMP Curation | UMP Exploration | Contact

Top ^

Fig. 10. Curate the Meta-information


2.2.6 Curate the Inputs and the Outputs

The second and third sections of the form enables the creation of inputs and outputs. Inputs and outputs follow the same schema. An example of an *Input* called “Electricity” is shown in Figure 11. In a UMP model, *Symbols* and *Bounds* are always represented in a specific format called Mathematical Markup Language (MathML) [7]. To facilitate the representation of the information in this format, we used the trial version of a tool called MathType².

The screenshot shows a web form titled "Curate an Input". The form is organized into a tree-like structure with expandable sections. The "Input" section is expanded, showing the following fields:

- category**: A dropdown menu with a green plus icon.
- hyperlink**: A dropdown menu with a green plus icon.
- Name**: A text input field containing the word "Electricity".
- Symbol**: A section containing a text input field labeled "Type your MathML formula" with the text "Electricity" entered below it.
- Choice**: A dropdown menu currently set to "Unit".
- Unit**: A section containing four text input fields:
 - list_ID**: "UN/ECE Rec 20 Rev 3"
 - listAgency_ID**: "6"
 - listVersion_ID**: "3"
 - UnitCodeContent**: "KWH"
- InputOutputBound**: A section containing:
 - MathMLEquation**: A text input field labeled "Type your MathML formula" with the text "Electricity > 10" entered below it.
 - Description**: A text input field with a green plus icon.
 - Description**: A text input field with a green plus icon.

Fig. 11. Curate an Input

Figure 12 shows how the MathType interface looks like. The only requirement to properly add information in the MathML formats is to check the button  when you add a variable name and unchecked it when you anything else. The variable name is then boxed in blue.

²<http://www.wiris.com/en/mathtype>

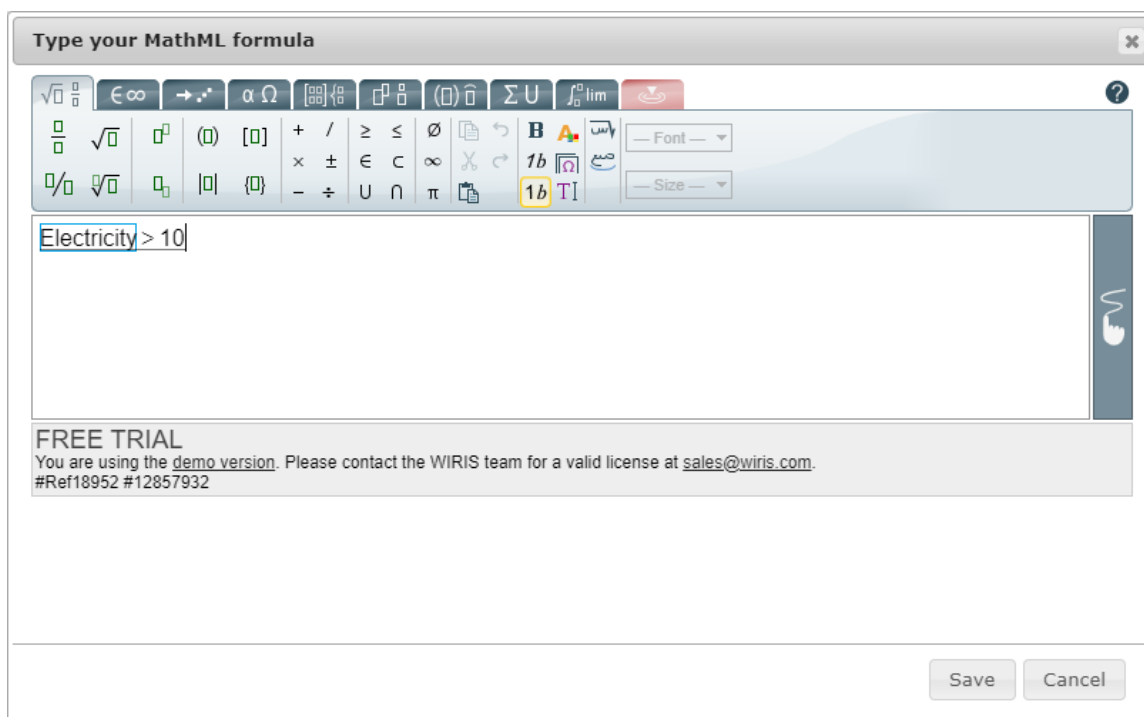


Fig. 12. MathType Interface

2.2.7 Curate the Product and Process Information

ProductandProcessInformation is the fourth section of the form and currently includes 5 sub sections:

- *ControlParameter*
- *FixedParameter*
- *IntermediateVariable*
- *MetricofInterest*
- *SupportingInformation*

ControlParameter, *IntermediateVariable* and *MetricofInterest* follow the same schema. *FixedParameter* includes an additional element called *Value*. Like the inputs and outputs, *ControlParameter*, *FixedParameter*, *IntermediateVariable* and *MetricofInterest* includes *Symbols* and *Bounds* in the MathML format. The MathType interface is also provided to include the necessary values. Figure 13 shows an example for a *ControlParameter* called “Depth of cut”.

2.2.8 Curate the Resources

Resource is the fifth section of the form. Several resources can be included in the model. An example of a *Resource* called “Operator” is shown in Figure 14.

Fig. 13. Curate a Control Parameter

Fig. 14. Curate a Resource

2.2.9 Curate the Transformations

Transformation is the sixth section of the form and currently includes sub-sections:

- *Equation*
- *PMMLModel*
- *FeasibilityConstraint*
- *Description*

Equation, and *FeasibilityConstraint* follow the same schema. *PMMLModel* follows its own schema. Finally, *Description* provides a field to record information in a text format about the transformation represented in the model. *Equation*, and *FeasibilityConstraint* include a MathML representation. The MathType interface is also provided to include the necessary values. Figure 15 shows an example for an *Equation* called “Feed rate”.

Fig. 15. Curate an Equation

A *PMMLModel* element is slightly different and provides the possibility to include a data-driven model in an PMML format³ instead of a MathML format. The field containing the data-driven model is automatically verifying that proper XML is added as shown in Figure 16.

Fig. 16. Curate a PMML Model

³<http://dmg.org/pmml/v4-3/GeneralStructure.html>

2.2.10 Curate the Model Bounds

A model can be valid under specific conditions. The section *ModelBound* enables the recording of these conditions. An example of model bound equation is provided in Figure 17. The equation is represented in the MathML format using the MathType interface.

The screenshot shows a form titled "ModelBound" with a red "X" icon. It contains several fields: "UseBoundDescription" with a green plus icon, "UseBoundEquation" with a green plus icon and a red "X" icon, "MathMLEquation" with a text input field containing "Type your MathML formula" and the equation $T > 0$, and "Description" with a text input field containing "When temperature is above 0°F" and a red "X" icon.

Fig. 17. Curate a Model Bound

2.2.11 Curate the Reviews

The last section of the forms is the *Review* section that enables recordings of external feedbacks about a model. An example of a *Review* is provided in Figure 18.

The screenshot shows a form titled "Review" with a green plus icon and a red "X" icon. It contains several fields: "creationDate" with a text input field containing "2019-02-04", "Reviewer" with sub-fields "FirstName" (David), "LastName" (Lechevalier), and "Organization" (Engisis LLC), "Email" with a green plus icon, and "Feedback" with a text input field containing "This model is pretty accurate!".

Fig. 18. Curate a Review

2.2.12 Validate and Submit the Model

Once you curated all the information, you can validate your model by clicking on the *Validate data* link on the left. This will automatically validate the information against the schema and redirect you to the visualization page if the model is correct. If the model is incorrect or values are missing, you will be notified by an error message.

You can interactively visualize your model before submitting it to the repository. Information about the visualization features are provided in Section 2.4. When you are ready to

submit the model, click on the *Submit to repository* button at the top of the page. A message will confirm the submission and you will be redirected to the home page. Figure 19 shows how the visualization page looks like when the model is ready for submission.

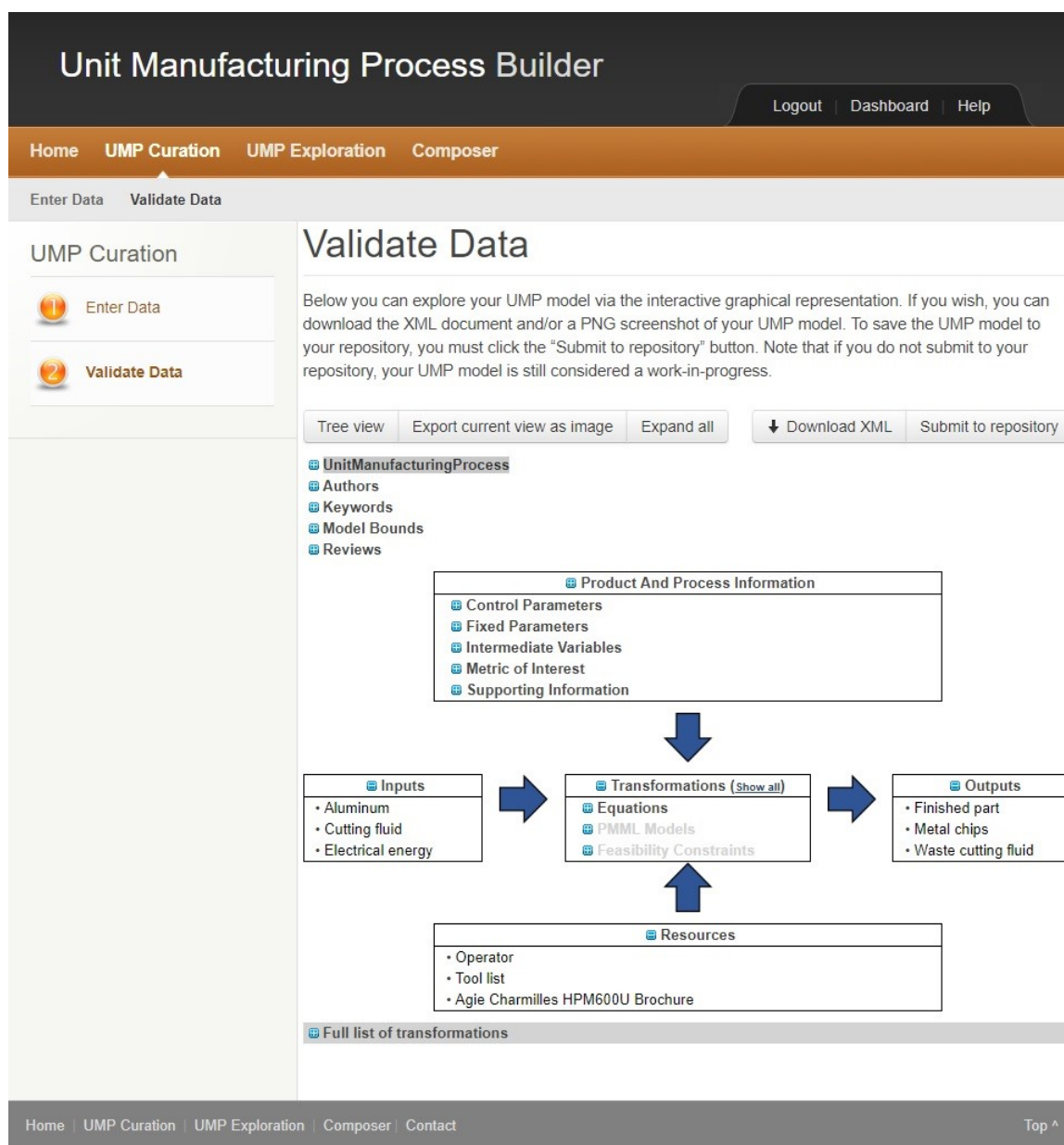


Fig. 19. Model Ready to Be Submitted

2.3 Exploration

To explore the UMP repository and discover the available UMP models, you need to click on the *UMP Exploration* tab from the home page.

2.3.1 List of the Available Models

This will redirect you to a page that provides a list of all the available models as shown in Figure 20.

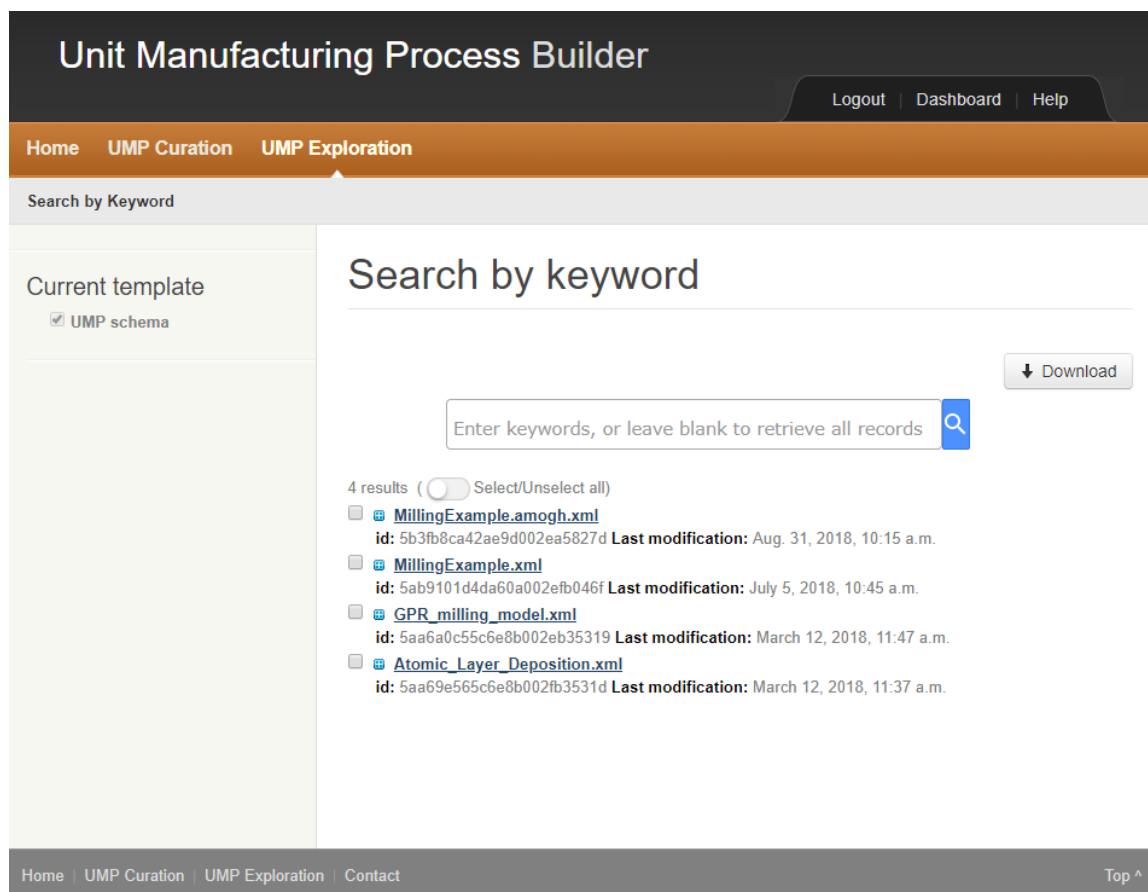


Fig. 20. List of Available Models

2.3.2 Keyword Search through the Model List

If you look for specific models, you can enter keywords in the input field and click on the magnifying glass button. The UMP Builder will then look for models including this keyword and refresh the list with the models matching this request. An example with the keyword “GPR” is provided in Figure 21.

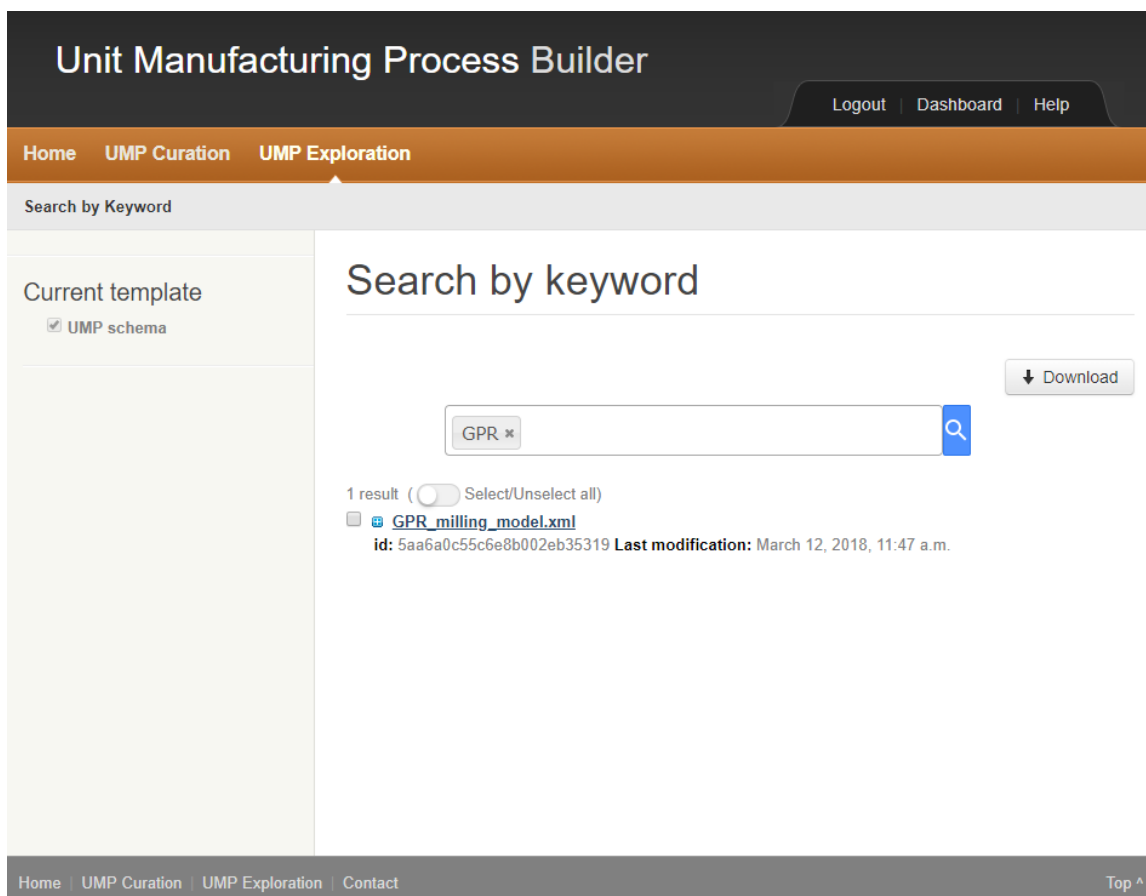


Fig. 21. Result of a Keyword Search

2.4 Visualization

After the validation of your model, or when you select a model from the validation page, you are redirected to the visualization page. This page provides an interactive visualization of the UMP model as shown in Figure 22. The graphical representation is similar to the graphical representation proposed in the ASTM E3012 standard.

2.4.1 Meta-Information

The graphical representation first includes all the meta-information of the UMP, the authors, the keywords, the model bounds and the possible reviews. Each section is expandable by clicking on the name of the section.

2.4.2 Main Information

The five boxes include the information about the inputs, product and process information, resources, transformations and outputs of the model. Each box is expandable by clicking on

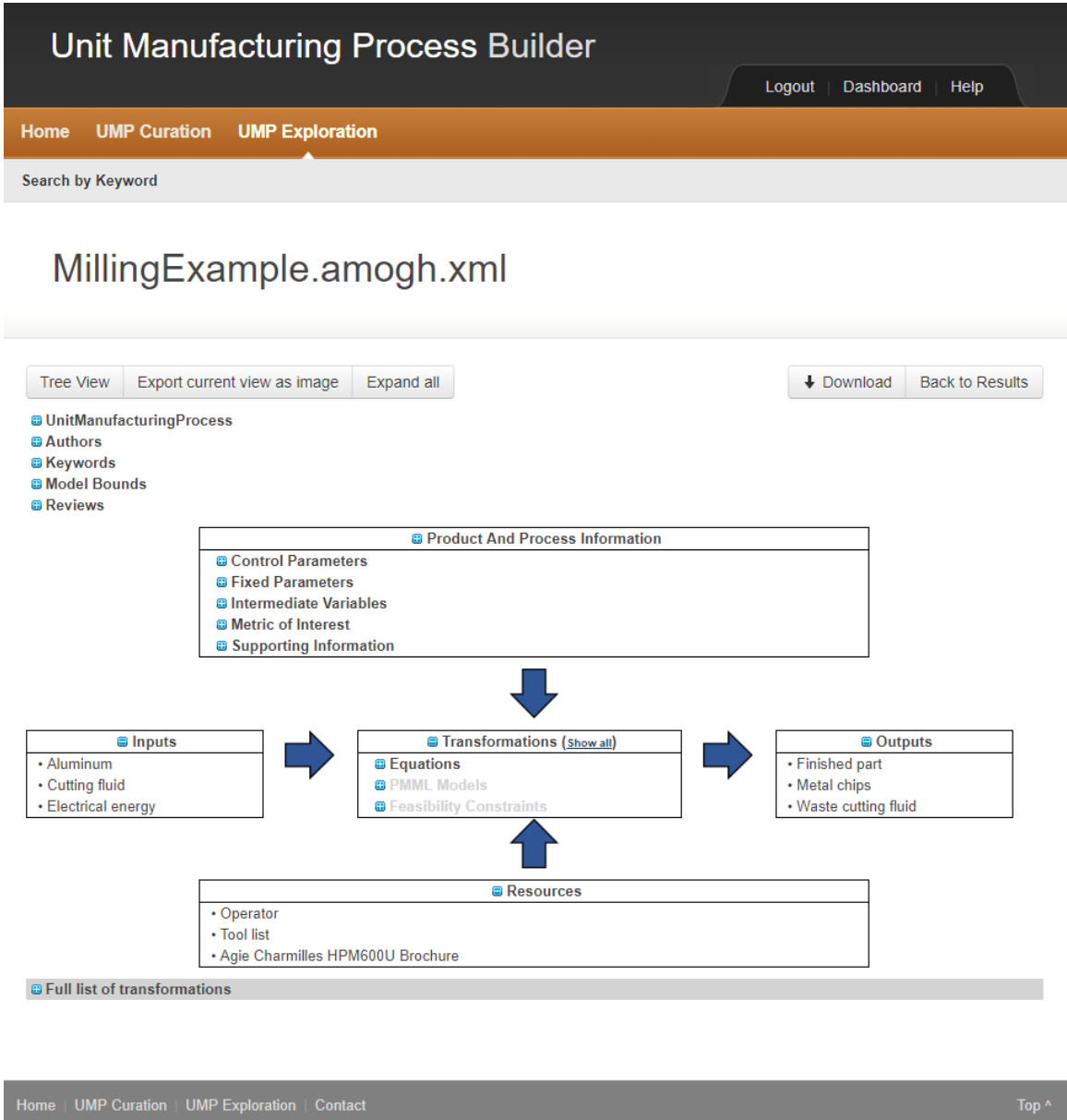


Fig. 22. Visualization Page

the name of the sub-sections of the boxes. When you click on elements inside the boxes, a pop-up appears and provides any additional information about the given element as shown in Figure 23.

2.4.3 Full List of Transformations

At the bottom of the graphical representation, you can obtain the list of all equations included as transformations in the model.

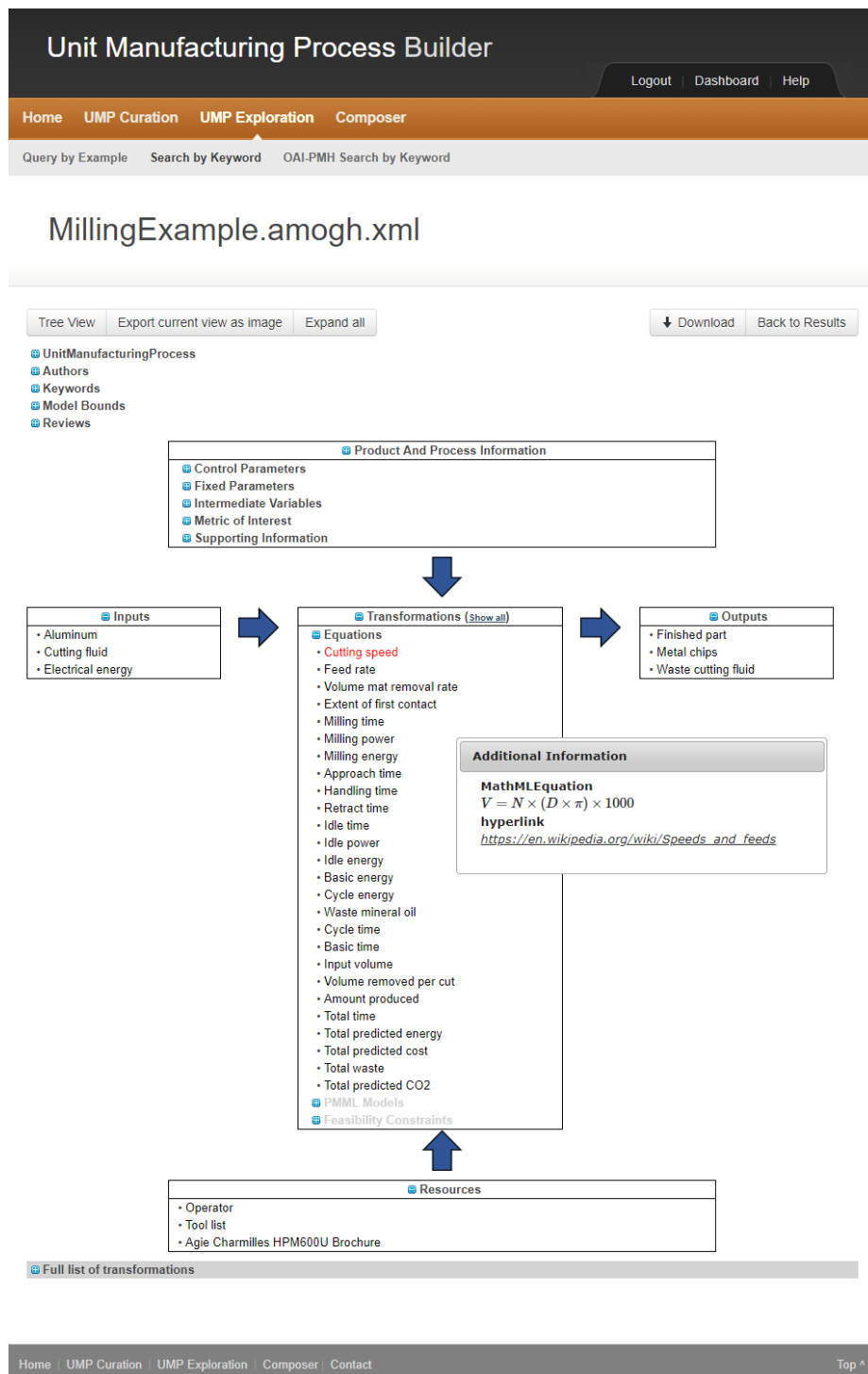


Fig. 23. Additional Information

2.4.4 Additional Features

The page provides capabilities to visualize the model in a tree view, export the current state of the view as an image, expand all the sections of the representation, and download the model in an xml format by clicking on the buttons on the top of the graphical representation.

2.5 Dashboard

The dashboard allows you to edit your profile, change your password, and see the list of submitted models and work-in-progress. To reach the dashboard, press the *Dashboard* tab from any page.

2.5.1 My Profile

When you click on the tab, you are redirected to the *My Profile* section of the dashboard where you can edit your profile and change your password as shown in Figure 24.

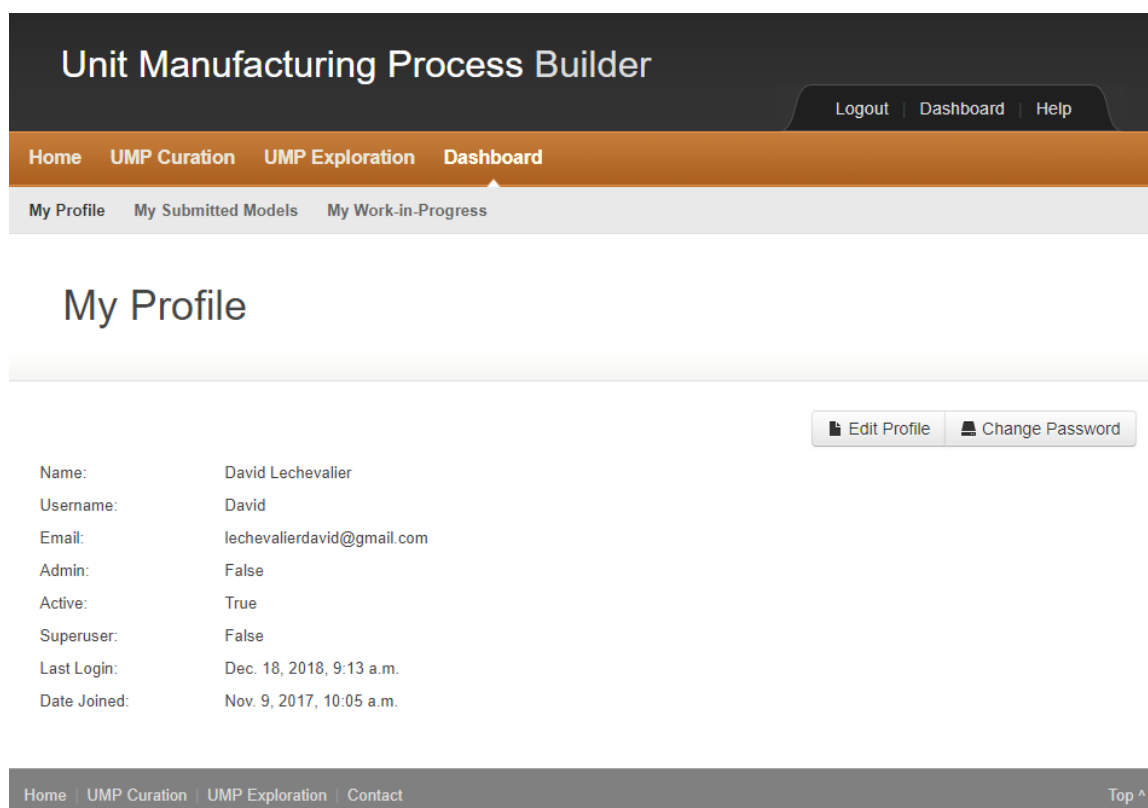


Fig. 24. Profile Page

2.5.2 My Submitted Models

You can also consult the models you have submitted by clicking on the *My Submitted Models* tab. Figure 25 shows the page displayed to consult the models. You can decide to view a submitted model, change the model name, modify the model, delete the model or change the ownership of the model by clicking on the appropriate buttons.

The screenshot shows the 'Unit Manufacturing Process Builder' interface. At the top, there is a dark header with the title 'Unit Manufacturing Process Builder' and links for 'Logout', 'Dashboard', and 'Help'. Below this is an orange navigation bar with 'Home', 'UMP Curation', 'UMP Exploration', and 'Dashboard'. Underneath is a grey bar with 'My Profile', 'My Submitted Models' (which is highlighted with a mouse cursor), and 'My Work-in-Progress'. The main content area is titled 'My submitted models'. It contains a table with the following data:

Resource name	Published	Last Publication date	Actions
MillingExample	Yes	Aug. 31, 2018, 10:15 a.m.	View Delete Change name Change Owner Edit

At the bottom of the page, there is a dark footer with links for 'Home', 'UMP Curation', 'UMP Exploration', and 'Contact', and a 'Top ^' link on the right.

Fig. 25. Submitted Models Page

2.5.3 My Work-in-Progress

Your work-in-progress are available by clicking on the *My Work-in-Progress* tab. You can decide to view a work-in-progress, change the name, continue working on the model, delete the work-in-progress or change the ownership of the work-in-progress by clicking on the appropriate buttons. Figure 26 show the page that displays the different options.

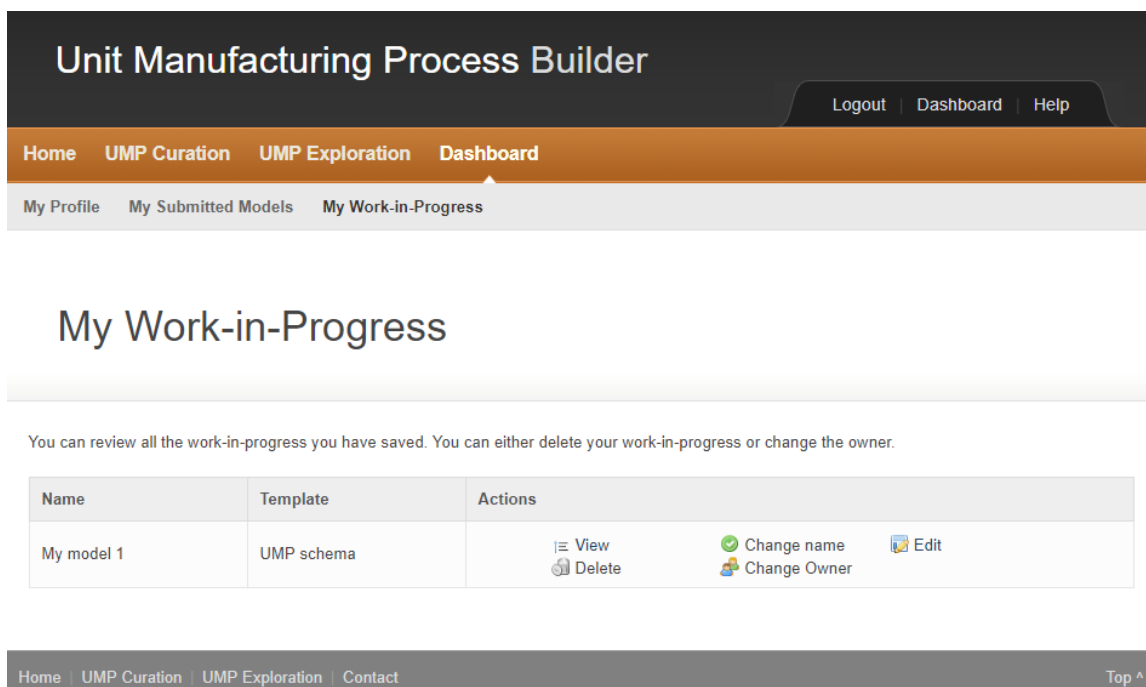


Fig. 26. Work-in-Progress Page

2.6 Administration

If you have been providing administration credentials, you have access to the administration section. To reach this section, you need to click on the *Administration* tab located at the bottom of the home page. You will be redirected to the *User Management* section of the administration page as shown in Figure 27.

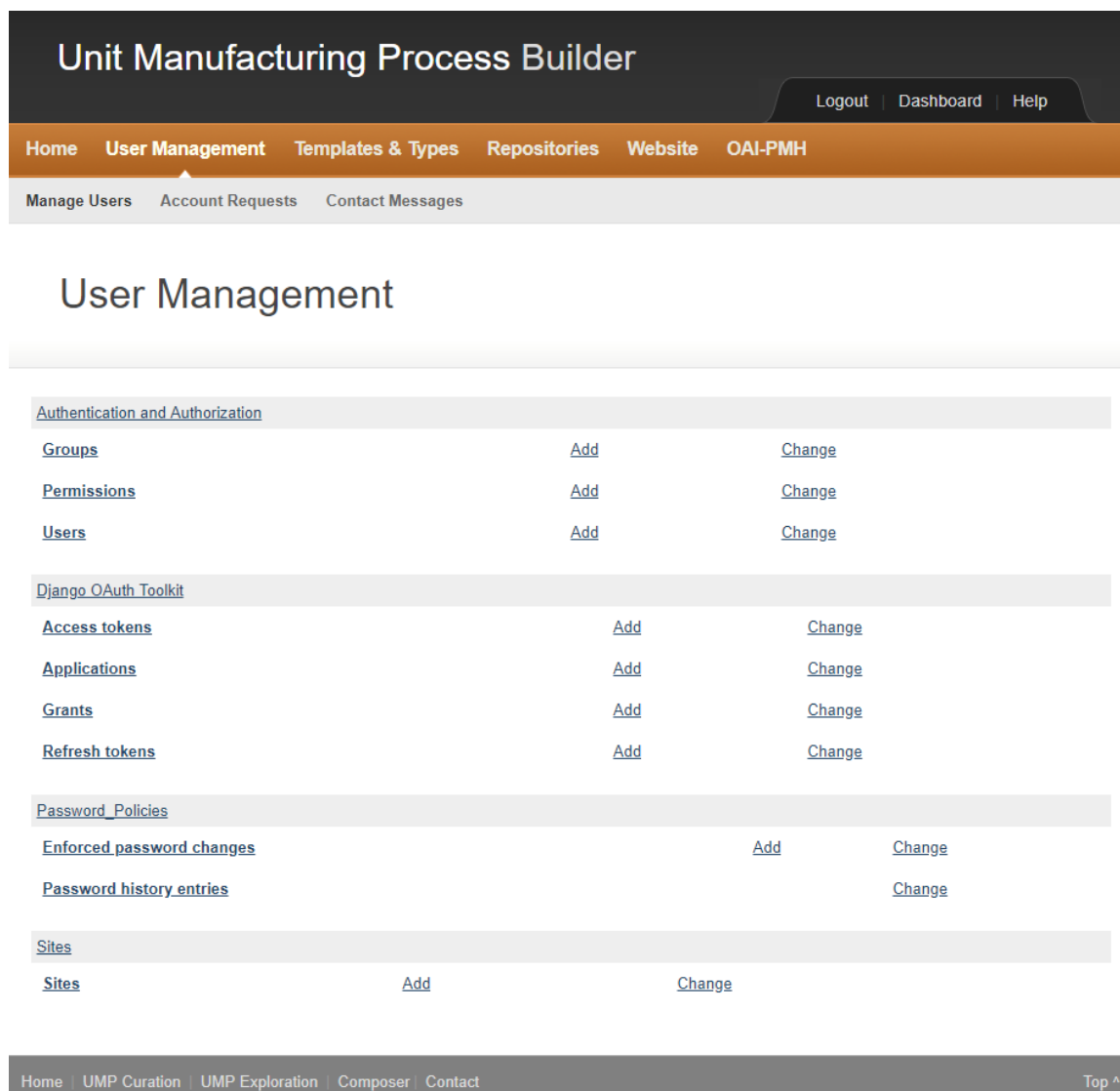


Fig. 27. User Management Page

2.6.1 Manage Users

You can manage the users and modify their permissions by clicking on the *Change* link for *Users*. You will be redirected to the list of users shown in Figure 28 and you can click on the users you wish to modify.

Once you have selected the user to change, you are redirected to page to make the necessary modification on the user name, personal info, permissions as shown in Figure 29.

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Manage Users Account Requests Contact Messages

Select user to change

• [Add user](#)

Q Search

Action: Go 0 of 55 selected

<input type="checkbox"/>	Username	Email address	First name	Last name	Staff status	Password
<input type="checkbox"/>	DSOSU	harperd@oregonstate.edu	Dustin	Harper	✖	147
<input type="checkbox"/>	David	lechevalierdavid@gmail.com	David	Lechevalier	✖	0
<input type="checkbox"/>	Dina	mn892@msstate.edu	Mehmaz	Noroozi Esfahani	✖	249
<input type="checkbox"/>	FaFlores	fflores321@gmail.com	Fabio	Flores	✖	277
<input type="checkbox"/>	Floreid	freid.tcr@gmail.com	Florence	Peart-Reid	✖	189
<input type="checkbox"/>	Patrick Thall	patrickthallxc@gmail.com	Patrick	Thall	✖	250
<input type="checkbox"/>	RAMP	weihaohuang13@gmail.com	Weihaoh	Huang	✖	255
<input type="checkbox"/>	SharonTorres	shtorres11@hotmail.com	Sharon	Torres	✖	225
<input type="checkbox"/>	Yiran Yang	yyang223@uic.edu	Yiran	Yang	✖	269
<input type="checkbox"/>	a_alrashed	aealrash@asu.edu	Abdulaziz	Alrashed	✖	295
<input type="checkbox"/>	admin	sbannon@nist.gov	Steve	Bannon	✔	326
<input type="checkbox"/>	ahalqah2	ahmq.1993@gmail.com	Abdulazeez	Alqahtani	✖	277

Fig. 28. User List

2.6.2 Manage Groups

Similarly, you can modify or create a new group by clicking the *add* or *change* link for *Groups*. Groups are used to automatically assign a set of permissions. If you click on the *change* link, you can then select the group to modify as shown in Figure 30.

You will be redirected to the page to select which permissions to provide to the group you are creating or modifying as shown in Figure 31.

These are the two main features you should manage in the *Manage Users* section.

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Manage UsersAccount RequestsContact Messages

Change user

HomeAuthUsersDavid

History

Username:David

Required: 150 characters or fewer. Letters, digits and @/./+/_ only.

Password:

algorithm: pbkdf2_sha256 iterations: 36000 salt: V2tu7Da***** hash: Yufj9C*****

Raw passwords are not stored, so there is no way to see this user's password, but you can change the password using [this form](#).

Personal info

First name:David

Last name:Lechevallier

Email address:lechevalierdavid@gmail.com

Permissions

☒ Active

Designates whether this user should be treated as active. Unselect this instead of deleting accounts.

☐ Staff status

Designates whether the user can log into this admin site.

☐ Superuser status

Designates that this user has all permissions without explicitly assigning them.

Groups:

Available groups

Filter

anonymouscreateAndExplore

Choose all

The groups this user belongs to. A user will get all permissions granted to each of their groups. Hold down "Control", or "Command" on a Mac, to select more than one.

Chosen groups

default

Remove all

User permissions:

Available user permissions

Filter

admin | log entry | Can add log entry
admin | log entry | Can change log entry
admin | log entry | Can delete log entry
api | api | Can api access
auth | group | Can add group
auth | group | Can change group
auth | group | Can delete group
auth | permission | Can add permission
auth | permission | Can change permission
auth | permission | Can delete permission
auth | user | Can add user
auth | user | Can change user
auth | user | Can delete user

Choose all

Specific permissions for this user: Hold down "Control", or "Command" on a Mac, to select more than one.

Chosen user permissions

Remove all

Important dates

Last login:

Date: 2018-12-18

Time: 10:30:58

Is this?

Date joined:

Date: 2017-11-09

Time: 10:06:25

Is this?

Delete

SAVE

Save and add another

Save and continue editing

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Administration

Fig. 29. User Modification

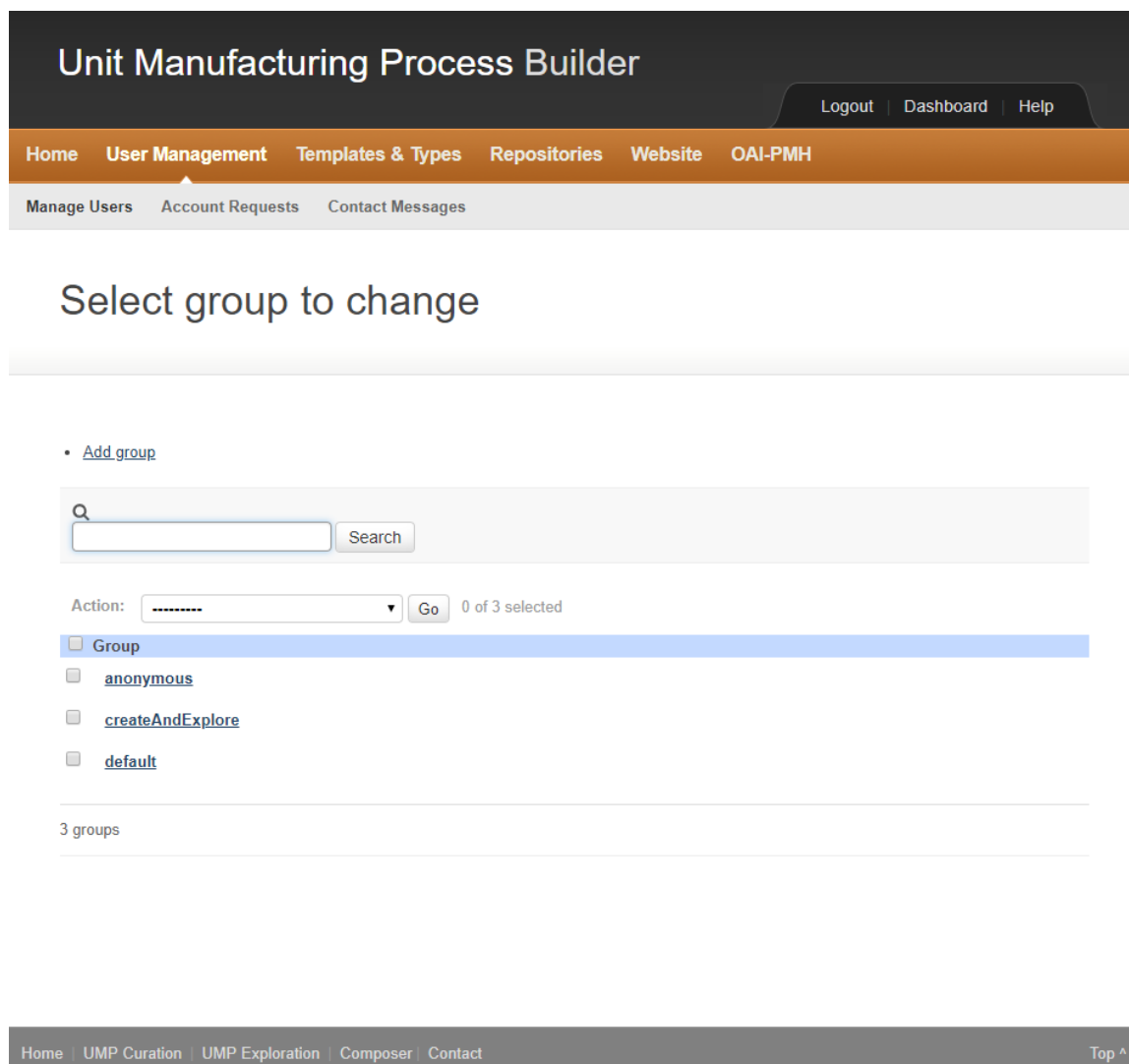


Fig. 30. Group List

2.6.3 Account Requests

To consult the pending account requests, you can click on the *Account Request* tab. Figure 32 shows how the requests are displayed. You are be able to *Accept* or *Deny* the requests pending for approval. The user who requested the account is notified of your decision by email.

2.6.4 Contact Messages

A user can send contact messages that available by clicking on the *Contact Messages* tab. The list of messages is displayed, and you can then answer to the user by email.

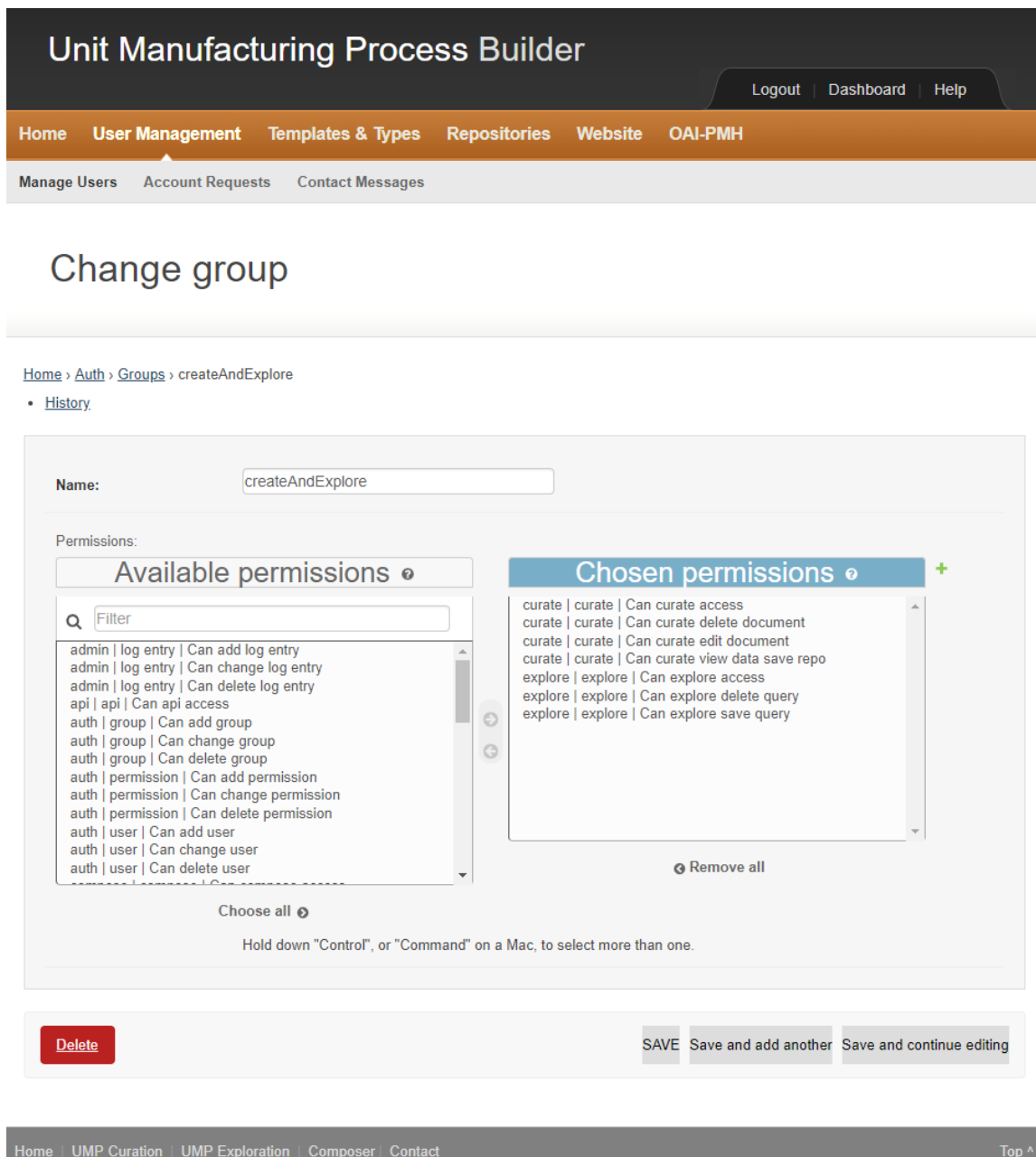


Fig. 31. Group Modification

3. Summary

In summary, this document described the features and functionality of the UMP Builder for curating and visualizing and querying unit manufacturing process (UMP) models. UMP models are captured in an XML format that is compliant to the ASTM E3012 standard.

The UMP Builder provides features to curate the UMP models into a repository. The

User	First Name	Last Name	Email Address	Actions
new_user	New	User	lechevalierdavid@gmail.com	✓ Accept ✗ Deny

Home | UMP Curation | UMP Exploration | Composer | Contact Top ^

Fig. 32. Account Request List

Name	Email Address	Message	Actions
David Lechevalier	lechevalierdavid@gmail.com	Hello, I have a question. David	✗

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Administration

Fig. 33. Contact Messages

tool also provides query capabilities in order to retrieve existing models. Interactive visualizations of the models are available in order to go through all the information collected in a model. The document describes how to build your model section by section, how to submit the models to the repository, and how to visualize models that are recorded in the repos-

itory. This work is an on-going process in order to facilitate the digitalization of UMPs. Defining a robust schema to represent the UMP is key to enabling this digitalization. A robust application is necessary to increase the adoption of such a process in the manufacturing area and will be the subject of future work and collaboration with partners involved in this area of research.

Disclaimer

Certain commercial products may have been identified in this paper. These products were used only for demonstration purposes. This use does not imply approval or endorsement by NIST, nor does it imply that these products are necessarily the best for the purpose.

References

- [1] Bernstein WZ, Lechevalier D, Libes D (2018) Ump builder: capturing and exchanging manufacturing models for sustainability. *ASME 2018 13th International Manufacturing Science and Engineering Conference* (American Society of Mechanical Engineers), , pp V001T05A022–V001T05A022.
- [2] Bernstein WZ, Mani M, Lyons KW, Morris K, Johansson B (2016) An open web-based repository for capturing manufacturing process information. *ASME 2016 international design engineering technical conferences and computers and information in engineering conference* (American Society of Mechanical Engineers), , pp V004T05A028–V004T05A028.
- [3] Frechette S (2019) Smart manufacturing systems design and analysis program. Available at <https://www.nist.gov/programs-projects/smart-manufacturing-systems-design-and-analysis-program>.
- [4] Dima A, Bhaskarla S, Becker C, Brady M, Campbell C, Dessauw P, Hanisch R, Kattner U, Kroenlein K, Newrock M, et al. (2016) Informatics infrastructure for the materials genome initiative. *Jom* 68(8):2053–2064.
- [5] Bernstein WZ (2019) A reference schema for the unit manufacturing process information model. Available at <https://doi.org/10.18434/M32027>.
- [6] Bernstein WZ, Lechevalier D (2019) A reference schema for the unit manufacturing process information model. *Journal of Research of the National Institute of Standards and Technology* 124:1–7.
- [7] Ausbrooks R, Buswell S, Carlisle D, Dalmas S, Devitt S, Diaz A, Froumentin M, Hunter R, Ion P, Kohlhasse M, et al. (2003) Mathematical markup language (mathml) version 2.0 . w3c recommendation. *World Wide Web Consortium* 2003.