

AIM Template Builder 2.0 User's Guide



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This guide explains how to use Annotation and Image Markup (AIM) to build templates that are compatible with the AIM information model. The intended audience for this guide is a biomedical researcher familiar with the AIM information model.

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Getting Started with AIM Template Builder

The ATB allows you to generate a set of well-defined questions and answer choices to facilitate collecting information for a particular purpose, such as The Cancer Genome Atlas Glioblastoma (TCGA GBM) study. These questions and answers are contained in an AIM XML template file that you can import into an AIM-enabled application, such as NCI's implementation of AIM on the ClearCanvas open source workstation. Aided by the information in the XML file, users of the AIM-enabled application can then annotate medical images using a controlled vocabulary and standard template. This results in simple and constrained annotations that are reproducible and consistent. The AIM-enabled application captures answers and exports them as an AIM XML document or AIM Digital Imaging and Communications in Medicine (DICOM) Structured Reporting (SR) document. Users can then send the document to the AIM Data Service or DICOM storage Service Class Provider (SCP), respectively.

You use the ATB to design templates based on lexicons of standard and user-definable terms. You add anatomic entities, imaging observations, inferences, calculations, and markups as components to a template. Adding tags to a template helps you make them easier to find. You combine multiple templates into template groups.

You can search for shared templates and template groups using the AIM Template Service and then modify them in the ATB.

AIM templates are based on the AIM template XML schema:
Version 2, Revision 13

When you open older AIM templates created using XML schema version 1, revisions 18, 19, and 23 in ATB 2.0, ATB 2.0 automatically converts them to the latest XML schema, which is version 2, revision 13.

AIM template XML schemas are based on the [AIM 3.0 model](#) and the AIM 4.0 model. XML schema version 2 collects more information than the AIM 3.0 model can store. Any information that the XML schema version 2 collects is saved to the AIM 4.0 model.

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Why Use the AIM Model?

Imaging reports contain both graphical drawings and medical knowledge in the form of annotations. These annotations are stored as unstructured text and separated from graphical drawings, which are typically in a proprietary format on an imaging system. Extracting this valuable medical information and combining it with drawings on another system is a time-consuming process that yields results that are cumbersome to filter and search. Also, existing vocabularies used to describe medical images contain thousands of terms. This makes it difficult for users to find these terms and then include them in their AIM annotations.

The AIM model begins to solve this problem by capturing the descriptive information of an image with user-generated graphical symbols placed on the image into a single common information source. AIM captures medical findings using standard vocabularies such as RadLex, SNOMED CT®, and DICOM, and user-defined terminology. Image information captured in the AIM model includes the anatomic entity and its characteristics, imaging observation and its characteristics, and inference.

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What is in an AIM Template?

An AIM template contains a collection of data collection items (questions) and possible values (answers) for each question. You create a template for each imaging study. You capture each item and value using a standardized vocabulary.


An AIM template has one or more components. Each component represents a study question that may have one or more answers. Template components can be any of the following: anatomic entity, imaging observation, inference, calculation, or geometric shape (markup).

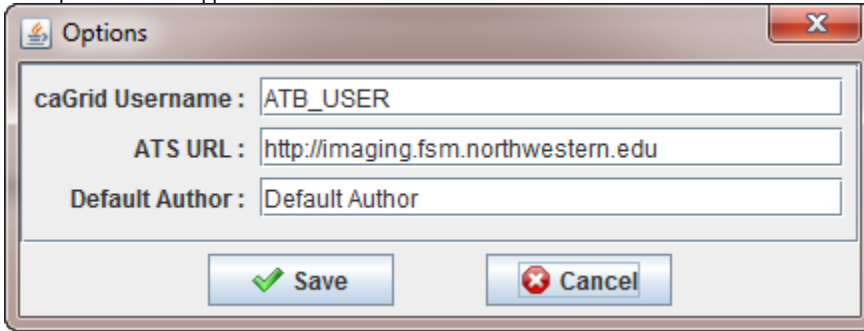
Both anatomic entities and imaging observations are also described by their associated characteristics. Anatomic entity and imaging observation characteristics inherit the attributes of their respective component. Characteristics have *annotator confidence* that allows a user to enter a percentage that represents the level of user confidence in answering the question. A characteristic may also have a quantification value.

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Configuring ATB for Publishing

You must configure ATB so that it can find the AIM Template Service and include the appropriate user name in an AIM template. The AIM Template Service is web service that can be used to store, search, and retrieve AIM template XML documents.

1. Click the **Settings** button ().
The Options window appears.



The Options dialog box is a standard Windows-style window with a title bar that says 'Options' and a close button (X). It contains three text input fields: 'caGrid Username' with the value 'ATB_USER', 'ATS URL' with the value 'http://imaging.fsm.northwestern.edu', and 'Default Author' with the value 'Default Author'. At the bottom, there are two buttons: 'Save' with a green checkmark icon and 'Cancel' with a red X icon.

2. Change the **caGrid Username** value to the name you used when you registered for your caGrid account. You must [have a caGrid account](#) to publish templates to the ATS.
3. Change the **ATS URL** value to the server where the AIM Template Service you will use is located. If you are not hosting your own AIM Template Service instance, the URL is <http://imaging.fsm.northwestern.edu>.
4. Confirm or change the **Default Author**. The default author's name appears in the metadata of any object you create in ATB.
5. Click **Save**.

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
Working with Template Groups

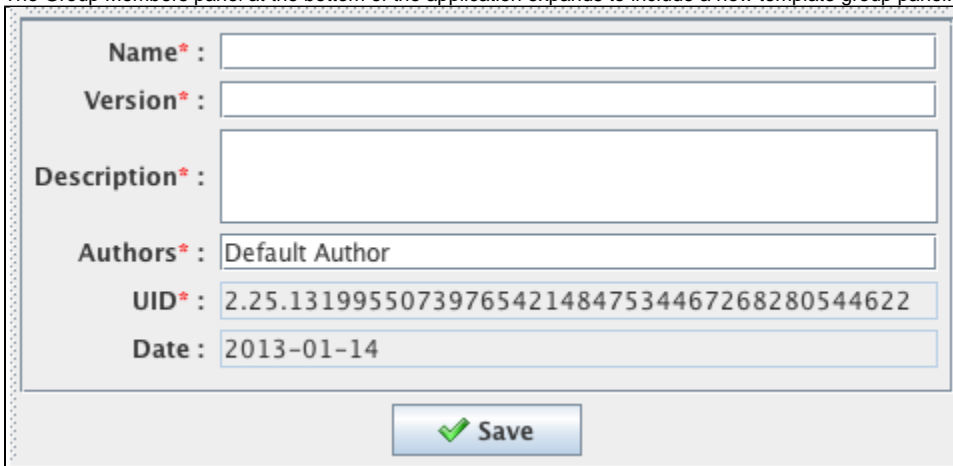
A template group is a container that holds individual templates.

Adding a Template Group

1. Click the **Template Groups** tab.

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2. Below the left panel, click  .
The Group Members panel at the bottom of the application expands to include a new template group panel.



The form for adding a new template group is contained within a dashed border. It has several labeled input fields: 'Name*' (empty), 'Version*' (empty), 'Description*' (empty), 'Authors*' (containing 'Default Author'), 'UID*' (containing '2.25.131995507397654214847534467268280544622'), and 'Date' (containing '2013-01-14'). At the bottom right of the form is a 'Save' button with a green checkmark icon.


3. Enter the name of the new group, its version number and description, and your name in the boxes provided. You can [edit this information](#) later if needed.
4. Click **Save**.
The new template group appears in the Groups panel on the left side of the application.


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Deleting a Template Group

Deleting a template group does not delete the templates within it.

1. Click the **Template Groups** tab.
2. Select the template group you want to delete by clicking it.

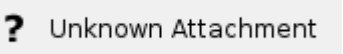
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3. Below the left panel, click  .
A message appears asking you to confirm the deletion.
4. Click **Delete**.

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Editing a Template Group

You can edit the name, version, description, and author of a template group.

1. Click the **Template Groups** tab.
2. Below the left panel, click . The selected template group's description appears.
3. Change the name of the group, version, description, and authors as needed.
4. Optionally, [add a tag to the group](#) to make it easier to search for the template group in the future.
5. Click **Save**. The edited template group appears in the Groups panel.

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Copying a Template Group

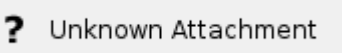
You can create a copy of a template group to make it easier for you to customize it.

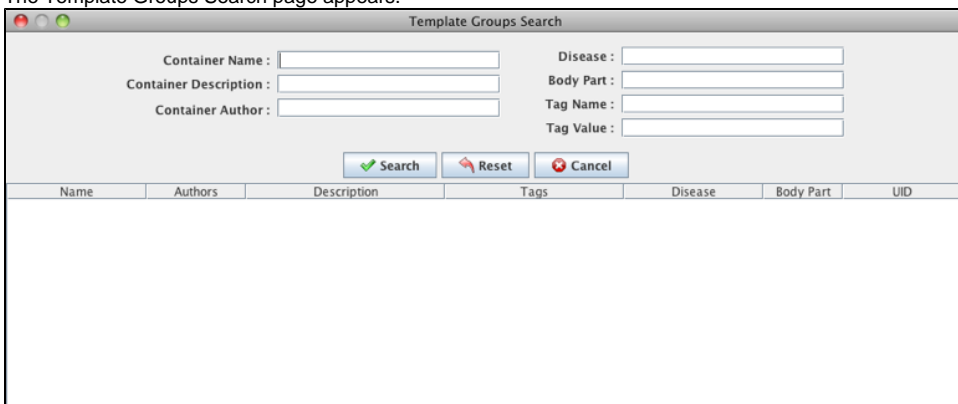
1. Click the **Template Groups** tab.
2. Select the template group you want to copy.
3. At the bottom of the Groups panel, click . A copy of the template with the name of **Current Template Name copy** appears in the Groups panel. You can now customize the copied template group.

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Searching for a Template Group

When you search the AIM Template Service for a template group that you want to modify in ATB, you import it at the same time. You do not have to take a separate step to download the template group. Once you find the template group in the search results, click it to begin using it in ATB.

1. Click the **Template Groups** tab.
2. Below the left panel, click  and then select **Search Groups**. The Template Groups Search page appears.



Name	Authors	Description	Tags	Disease	Body Part	UID
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3. Narrow your search by entering information into the fields. If you do not enter any information into the fields, all template groups available in ATS appear, and it may take longer to see the results of your search. The following fields are available.

Field	Description
Container Name	Template group name
Container Description	Template group description
Container Author	Person who created the template group in the AIM-enabled application
Disease	Disease that is the topic of the templates in the template group
Body Part	Body part that is the topic of the templates in the template group
Tag Name	A name associated with this template group
Tag Value	The value associated with the tag name for this template group

- Click **Search**.

All template groups matching the search criteria you entered appear.

Name	Authors	Description	Tags	Disease	Body Part	UID
BRCA 04-18-12	kirbyju	TCGA Breast Research Group te...	Body Part		Breast	1.3.6.1.4.1.1451...
ATB-VASARI-Exa...	AIM Team	This template is used by an ap...	Body Part, Disease	Glioblastoma	Brain	2.25.234308535...
TCGA Renal	kirbyju	Template for TCGA Renal Rese...				2.25.215225874...
MR-Cardiac	Northwestern...	MR Cardiac				2.25.822196569...
RSNA - MR Knee...	RSAN DEMO	MR Knee	Source, Modality, Anatomic			2.25.208977181...
TEST 3 - 1	AIM Team - 1	Test three - 1	Varsari, Varsari			2.25.274792958...

- Click the name link for a template group.
ATB imports the template.

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Importing a Template Group

You can import a template group and use or customize it in AIM Template Builder.

- Click the **Template Groups** tab.

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- Below the left panel, click
- Click **Import**.
The **Open** dialog box appears.
- Search for an XML file that contains template group information in it. The AIM Template Builder only accepts template group files that have been validated by the AIM Template XML schema. This file could have been exported from the AIM Template Builder or it could have been created manually using the AIM template XML schema.

A message appears that notifies you if the file was successfully imported. A template group that is successfully imported also appears in the Template Group list. If the import was unsuccessful, a message appears that indicates the reason why.



No need to import template groups downloaded from the AIM Template Service

After you search for a template group in the AIM Template Service, you can open it and begin using it. It has already been imported to the AIM Template Builder. The import feature described in this procedure supports the importing of template files that are in XML format.

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Exporting a Template Group

You can export a template group you created in AIM Template Builder to use it in an AIM-enabled workstation. Template groups created in AIM Template Builder validate the AIM template schema, AIMTemplate_v2rv13.xsd, and are in XML format.

- Click the **Template Groups** tab.
- Select the template group you want to export.

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- Below the left panel, click
- Click **Export**.
The **Save** dialog box appears.
- Select a location where you want to save the template group XML file.

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Publishing a Template Group

You can publish a template group that you created in AIM Template Builder to the AIM Template Service so that others can find it or so that you can import it into another application.

- Click the **Template Groups** tab.
- Select a template group from the Groups panel.

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- Below the left panel, click
- Click **Publish**.
A window opens, prompting you to log in to the AIM Template Service.


- Enter your password or log in as a different user and then click **Login**. You must [have a caGrid account](#) to publish templates to the ATS. The steps that follow are unique to your configuration of the AIM Template Service.

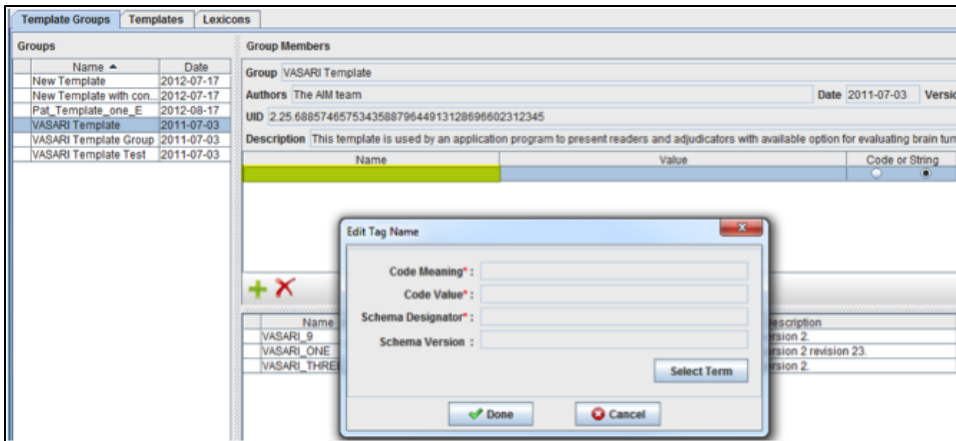
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Adding a Tag to a Template Group

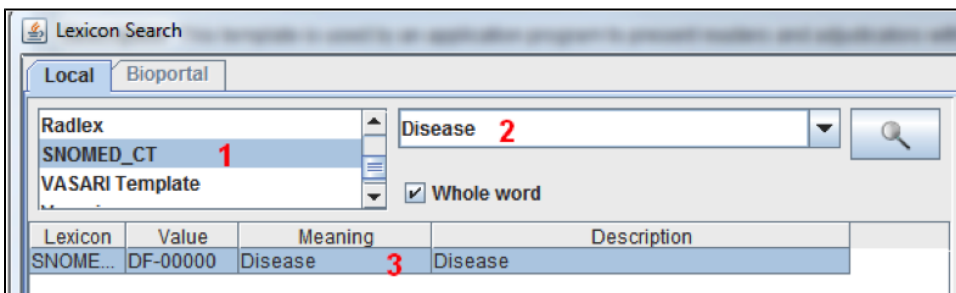
Associating one or more tags with a template group makes it easier for you to find and others to discover a template group that you created. Tags are composed of a name and a value. The tag name must be a lexicon term. The tag value can be a string you enter or a lexicon term.

- Click the **Template Groups** tab.
- Select a template group.
- Below the left panel, click  **Unknown Attachment**.
The selected template group's description appears.

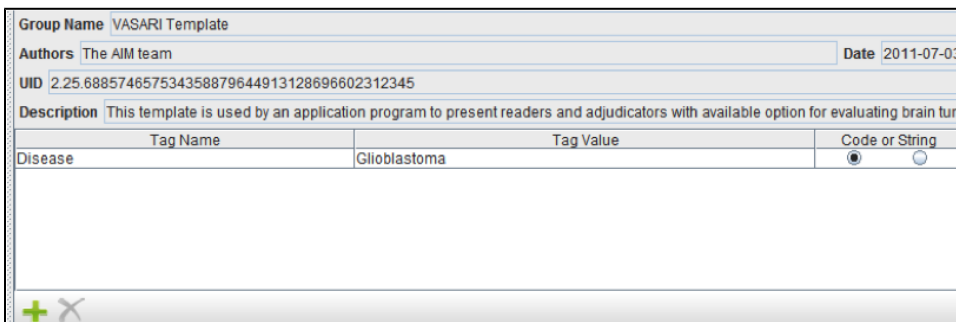
- Click  **Unknown Attachment**.
- Double-click the **Name** column.
The Edit Tag Name dialog box appears.



- Click **Select Term**.
The Lexicon Search dialog box appears.
- Select a lexicon name and then search for an existing term. For example, in the following window, the selected lexicon is *SNOMED_CT* and the term is *Disease*.





- Click **Save**.
- Assign a code or string value to the term by clicking the Value column, entering the code or string value (for example, *GBM*), and then clicking **Enter**.
- Click **Done**.
You can see the tag when you open the template group.



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Deleting a Tag from a Template Group

1. Click  Unknown Attachment
2. Select the tag you want to delete.
3. Click  Unknown Attachment

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Working with Templates

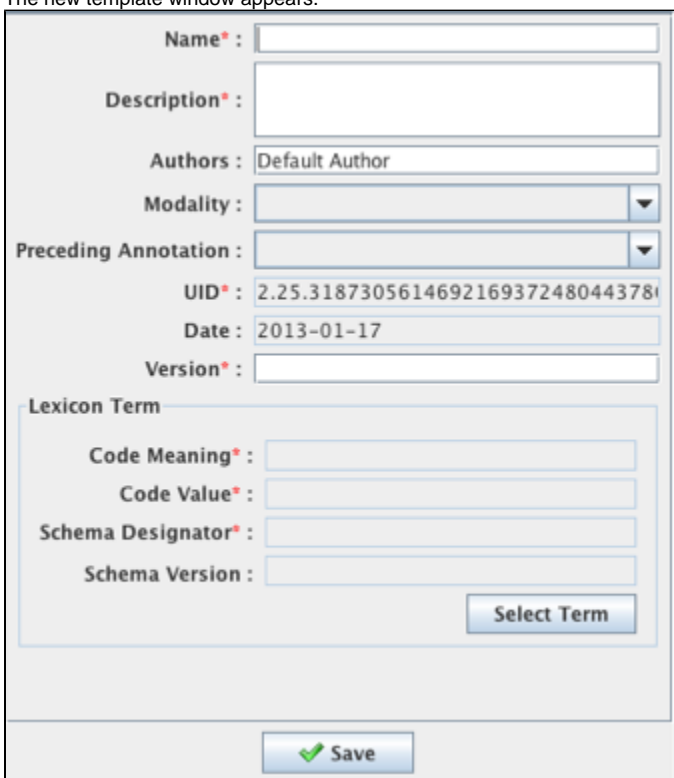
When you design a template, it is helpful to keep the purpose in mind. A template structures how users will enter information into an imaging application. The following table may help make the connection between the AIM Template Builder and information entered into an imaging application.

AIM Template Builder Concept	Annotation Concept
Component	Item being annotated; for example, Tumor Location. A component can be anatomic entity, imaging observation, inference, calculation, and markup or geometric shape.
Characteristic	Descriptive element of that item; for example, Site of Tumor Center. Only anatomic entity and imaging observation can have characteristics associated with them.
Answer Choice	Represents a possible answer choice. It is used to describe the descriptive element of a component or characteristic. For example, Frontal Lobe is an answer choice for anatomic entity.

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Creating a Template

1. Click the **Templates** tab.
2. Below the left panel, click  Unknown Attachment.
The new template window appears.



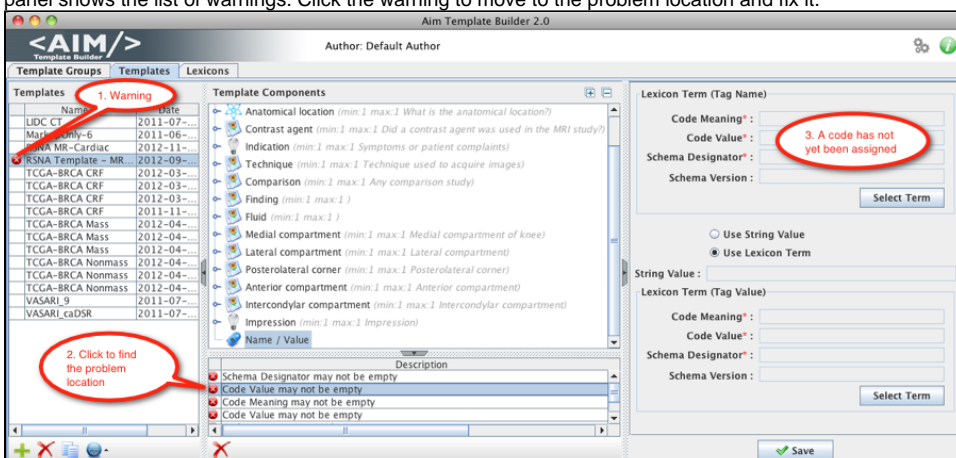
The screenshot shows a 'New Template' window with the following fields and sections:

- Name***: Text input field.
- Description***: Text input field.
- Authors**: Text input field with 'Default Author'.
- Modality**: Dropdown menu.
- Preceding Annotation**: Dropdown menu.
- UID***: Text input field with value '2.25.3187305614692169372480443781'.
- Date**: Text input field with value '2013-01-17'.
- Version***: Text input field.
- Lexicon Term** section:
 - Code Meaning***: Text input field.
 - Code Value***: Text input field.
 - Schema Designator***: Text input field.
 - Schema Version**: Text input field.
 - Select Term**: Button.
- Save**: Button with a green checkmark icon.

3. Enter a name, description, and version for the template. The UID is also a required field but the AIM Template Builder supplies it automatically. Optionally, select values for Modality and Preceding Annotation.

- Click **Save**.

The new template appears in the Templates panel. You may see warnings depicted by red circles with white x's in the template. For example, if you have not yet assigned the required metadata, you are notified that it is missing. The Description section below the Template Components panel shows the list of warnings. Click the warning to move to the problem location and fix it.



- Add a **tag** (also called a **code**) to the template. Tags can either be string values or lexicon terms. A template must have a code assigned to it. The assigned code describes the purpose of the template.
- Add **one or more components** to the template. Components can be anatomic entity, imaging observation, inference, calculation, and markup or geometric shape.
- Add **one or more characteristics** to each template component you add, as applicable (Inference and Calculation components do not have associated characteristics).
- Specify the **answer choices** for each characteristic (for Anatomic Entity and Image Observation components) or component (for Inference and Calculation components).



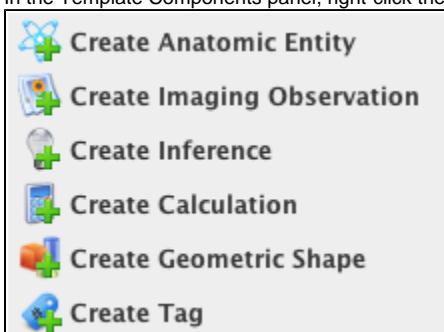
Expanding and collapsing

You can expand or collapse template components by double-clicking them or by clicking the plus or minus buttons in the upper right of the Template Components panel. When you expand a template component, you see all of its characteristics. When you collapse it, you see only the template component name.

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Adding a Template Component

- Click the **Templates** tab.
- In the Templates panel, select the template to which you want to add a component.
- In the Template Components panel, right-click the template name. A window appears that shows the template components you can create.



You can also access these options in the toolbar below the Template Components panel.



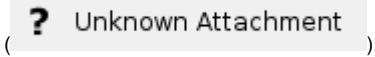
- Create a **anatomic entity**, **imaging observation**, **inference**, **calculation**, **geometric shape**, or **tag**.

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Creating an Anatomic Entity

- Click the **Templates** tab.
- In the Templates panel, select the template to which you want to add an anatomic entity.

3. In the Template Components panel, right-click the template name and select **Create Anatomic Entity**. You can also find this option in the toolbar




A new panel appears on the right and the toolbar below the Template Components panel changes to provide options for anatomic entities.

4. In the panel on the right, provide the required information, as follows:
 - a. Provide a **Label** for the anatomic entity. For example, "Where is the tumor located?"
 - b. Provide **Explanatory Text** to better describe the label.
 - c. Specify the minimum and maximum number of **Answer Choices** that the person answering the related question may select in the template.
 - d. Select the button that describes your display preference for the anatomic entity in the template.
 - e. Select the button that describes your display preference for **Annotator Confidence**.
 - f. Specify whether or not a comment is required.
 - g. Specify one or more names in the **Default Authors** field to show who created the entity.
 - h. Optionally, provide a **Group Label**, which can show an affiliation between this entity and others in the same group.
5. Click **Save**.
6. [Add one or more characteristics](#) to the anatomic entity.
For example, to describe a screen that is ruptured, the AIM template captures an anatomic entity of *spleen* and an anatomic entity characteristic of *ruptured*.


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Creating an Imaging Observation

1. Click the **Templates** tab.
2. In the Templates panel, select the template to which you want to add an imaging observation.
3. In the Template Components panel, right-click the template name and select **Create Imaging Observation**. You can also find this option in the toolbar ().
A new panel appears on the right and the toolbar below the Template Components panel changes to provide options for imaging observations.
4. In the panel on the right, provide the required information, as follows:
 - a. Provide a **Label** for the imaging observation. For example, "Where is the mass located?"
 - b. Provide **Explanatory Text** to better describe the label.
 - c. Specify the minimum and maximum number of **Answer Choices** that the person answering the related question may select in the template.
 - d. Select the button that describes your display preference for the imaging observation in the template.
 - e. Select the button that describes your display preference for **Annotator Confidence**.
 - f. Specify whether or not a comment is required.
 - g. Specify one or more names in the **Default Authors** field to show who created the imaging observation.
 - h. Optionally, provide a **Group Label**, which can show an affiliation between this imaging observation and others in the same group.
5. Click **Save**.
6. [Add one or more characteristics](#) to the imaging observation.
For example, to describe an image showing a cystic mass, the AIM template captures an imaging observation of *mass* and an imaging observation characteristic of *cystic*.

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Creating an Inference

1. Click the **Templates** tab.
2. In the Templates panel, select the template to which you want to add an inference.
3. In the Template Components panel, right-click the template name and select **Create Inference**. You can also find this option in the toolbar ().
A new panel appears on the right and the toolbar below the Template Components panel changes to provide options for inferences.
4. In the panel on the right, provide the required information, as follows:
 - a. Provide a **Label** for the inference.
 - b. Provide **Explanatory Text** to better describe the label.
 - c. Specify the minimum and maximum number of **Answer Choices** that the person answering the related question may select in the template.
 - d. Select the button that describes your display preference for the inference in the template.
 - e. Select the button that describes your display preference for **Annotator Confidence**.
 - f. Specify whether or not a comment is required.
 - g. Specify one or more names in the **Default Authors** field to show who created the inference.
 - h. Optionally, provide a **Group Label**, which can show an affiliation between this inference and others in the same group.
5. Click **Save**.
6. [Add one or more questions](#) to the inference.

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Creating a Calculation

1. Click the **Templates** tab.
2. In the Templates panel, select the template to which you want to add a calculation.

3. In the Template Components panel, right-click the template name and select **Create Calculation**. You can also find this option in the toolbar (

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). The toolbar below the Template Components panel changes to provide options for calculations.

4. In the panel on the right, provide the required information, as follows:
 - a. Provide a **Label** for the calculation.
 - b. Provide **Explanatory Text** to better describe the label.
 - c. Specify the minimum and maximum number of **Answer Choices** that the person answering the related question may select in the template.
 - d. Select the button that describes your display preference for the inference in the template.
 - e. Select the button that describes your display preference for **Annotator Confidence**.
 - f. Specify whether or not a comment is required.
 - g. Specify one or more names in the **Default Authors** field to show who created the calculation.
 - h. Optionally, provide a **Group Label**, which can show an affiliation between this calculation and others in the same group.
 - i. If this is the last question in the template, select **No More Questions**.
 - j. If this is not the last question, select the question that should follow this one from the options in the **Next Question to Ask** box.
5. Click **Save**.
6. Right-click the calculation and select **Create Calculation Type**. You can also find this option in the toolbar (

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). The toolbar below the Template Components panel changes to provide options for calculation types, which are to [Add Valid Terms](#), [Create](#)

[Algorithm Type](#), and [Delete Calculation Type](#) (? Unknown Attachment).

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Creating an Algorithm Type

Algorithms are types of calculations that you can add to an AIM template.

1. [Create a Calculation](#).
2. Click ? Unknown Attachment to add an algorithm type to the calculation type. A new panel appears on the right for algorithm attributes.

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3. Provide attributes for the algorithm type.

Field	Description
Description	Explanatory text about the component
Unique Identifier	Any string that uniquely identifies this algorithm
Algorithm Name	Algorithm name
Algorithm Version	Algorithm version
MathML	An optional mathML representation of the calculation

4. Click **Save**.

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Creating a Geometric Shape

Geometric shapes, which are equivalent to markups, describe a user's region of interest on an image and are patterned after DICOM SR graphical types. Combinations of these shapes can be used to represent graphical drawings placed on images.

1. Click the **Templates** tab.
2. In the Templates panel, select the template to which you want to add a geometric shape.
3. In the Template Components panel, right-click the template name and select **Create Geometric Shape**. You can also find this option in the

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toolbar ().

A new panel appears on the right and the toolbar below the Template Components panel changes to provide the option for geometric shapes.

4. In the panel on the right, provide the required information, as follows:
 - a. Provide a **Label** for the calculation.
 - b. Provide **Explanatory Text** to better describe the label.
 - c. Specify the minimum and maximum number of **Answer Choices** that the person answering the related question may select in the template. Answer Choices inform the AIM template user how many markups the user has to create. For example, if there are two circles (min=max=2), the user should create two circles. If a multipoint is assigned with a value min=max=2, ATB interprets that this is a line (with two points, x1,y1 and x2,y2). Developers of an AIM-enabled workstation must know how to map AIM template markup to an appropriate graphical drawing tool on their workstation.
 - d. Select the button that describes your display preference for the inference in the template.

- e. Select the button that describes your display preference for [Annotator Confidence](#).
- f. Specify whether or not a comment is required.
- g. Specify one or more names in the **Default Authors** field to show who created the calculation.
- h. Optionally, provide a **Group Label**, which can show an affiliation between this calculation and others in the same group.
- i. Select the **Shape Type** from the options of two-dimensional and three-dimensional shapes.
The geometric shapes available are as follows. ATB follows the DICOM standard.

Shape	Description
2D Point (Arrow)	A single pixel denoted by a single (column,row) pair
2D Circle	A circle defined by two (column,row) pairs. The first point is the central pixel. The second point is a pixel on the perimeter of the circle.
2D Polyline (Closed Polygon)	A series of connected line segments with ordered vertices denoted by (column,row) pairs. If the first and last vertices are the same, it is a closed polygon.
2D Ellipse	An ellipse defined by four pixel (column,row) pairs. The first two points specify the endpoints of the major axis and the second two points specify the endpoints of the minor axis of an ellipse.
2D Multipoint (Connected Points)	Multiple pixels each denoted by a (column,row) pair
3D Polygon (Closed Coplanar Polygon)	A series of connected line segments with ordered vertices denoted by (x,y,z) triplets, where the first and last vertices shall be the same forming a polygon; the points shall be coplanar.
3D Polyline (Connected Line Segments)	A series of connected line segments with ordered vertices denoted by (x,y,z) triplets. The points need not be coplanar.
3D Multipoint (Series of Points)	Multiple locations each denoted by an (x,y,z) triplet. The points need not be coplanar.
3D Point (Arrow)	A single location denoted by a single (x,y,z) triplet.
3D Ellipse	An ellipse defined by four (x,y,z) triplets. The first two triplets specify the endpoints of the major axis and the second two triplets specify the endpoints of the minor axis.
3D Ellipsoid	A three-dimensional geometric surface whose plane sections are either ellipses or circles and contains three intersecting orthogonal axes, "a", "b", and "c". The ellipsoid is defined by six (x,y,z) triplets, the first and second triplets specifying the endpoints of axis "a", the third and fourth triplets specifying the endpoints of axis "b", and the fifth and sixth triplets specifying the endpoints of axis "c".

- j. If this is the last question in the template, select **No More Questions**.
- k. If this is not the last question, select the question that should follow this one from the options in the **Next Question to Ask** box.


5. Click **Save**.

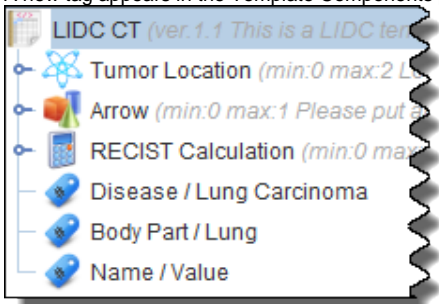
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Adding Tags to a Template

Associating one or more tags with a template makes it easier for you to find and others to discover a template that you created. Tags are composed of a name and a value. The tag name must be a lexicon term. The tag value can be a string you enter or a lexicon term.

1. Click the **Templates** tab.
2. Select a template.
The template components appear in the center panel.
3. In the Template Components panel, right-click the template name.

- From the menu that appears, select . A new tag appears in the Template Components panel.



- Provide the tag name and value.
 - To provide the tag name, click **Select Term** in the Lexicon Term (Tag Name) panel in the top right. A tag must contain at least three characters.
 - To provide the tag value, enter your own or [select a term from the lexicon](#). To enter your own value, click **Use String Value** and then enter a value in the String Value box.
- Click **Save**.

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Managing Question and Answer Choices

A key concept in understanding answer choices in AIM Template Builder is the difference between *pre-coordinated* and *post-coordinated terms*.



Understanding Pre- and Post-Coordinated Terms

A *pre-coordinated term* has a single code associated with it. A term may consist of one or more words. A well-defined collection of words represents a concept or thing. For example, RadLex assigns the code RID1276 to the term *left upper lobe bronchus*.

A *post-coordinated term* has two or more codes that represent a collection of concatenated words. It concatenates preexisting terms to create a new concept. The concept is represented by a collection of concatenated codes ordered by when a word appears in the term. For example, *left* and *lung* are preexisting terms. Concatenated, they become *left lung*, to which the National Cancer Thesaurus assigns it two codes, C25229 and C12468.

Adding Answer Choices

When users of your AIM template answer template questions, you can offer a list of standardized terms from a lexicon for their answers. These terms are called *answer choices* in ATB 2.0 but were called *allowed terms* in ATB 1.1. You can associate answer choices with Anatomic Entity, Imaging Observation, and Inference components, and Anatomic Entity and Imaging Observation characteristics.




Once you create an answer choice, you can add more answer choices under it hierarchically. This allows you to create new concepts, also called *post-coordinated terms*, from existing answer choices.



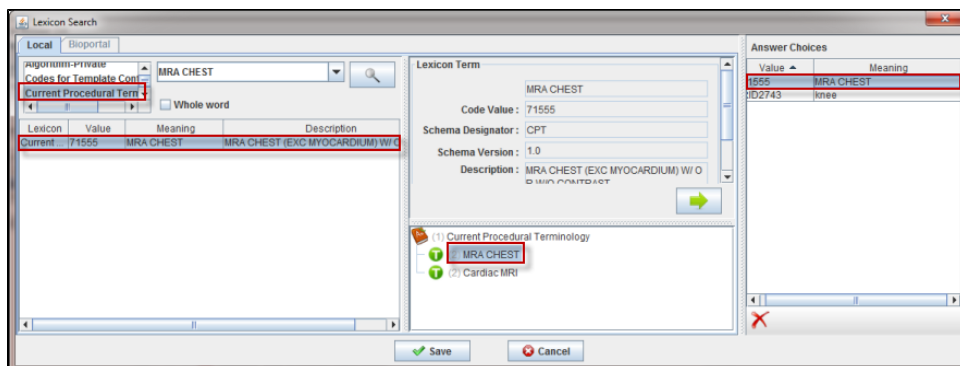
The number of answer choices you add must be equal or greater than the maximum number of answer choices you specify when you [add a characteristic to a component](#).



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- Right-click the component or characteristic and select **Add Answer Choices** or click  **Unknown Attachment** in the toolbar. The Lexicon Search dialog box appears.
- Select an answer choice from a [lexicon you have created](#) as follows.
 - From the list on the far left of the page, select at least one lexicon where you believe the term you are searching for is located. Click and hold the Shift or Ctrl key to select multiple lexicons.
 - In the list to the right, enter the term you want to search for. Options include the following:
 - Click **Whole word** if you are entering the whole word and want to restrict your search to it.
 - Enter only part of the term, such as "Tum" for "Tumor".
 - Do not enter any terms to retrieve all terms in the selected lexicon(s).
 - Click  **Unknown Attachment**. All lexicon entries matching your search criteria appear in the search results.
 - Select a term from the search results.
 - Click  **Unknown Attachment**.

The answer choice appears in the Answer Choices list in the right panel, as shown below. Relevant steps in the selection of this answer choice are highlighted in red.



Slide panel borders

Adjust your view of the information in multiple panels by clicking and dragging the border between them.

f. Click **Save**.

The answer choice appears in the Template Components panel under the component or characteristic you originally selected.

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Modifying Answer Choices

You can modify an answer choice by choosing a different lexicon term for it, changing its metadata, making it the default answer, or making its selection indicate that the template user has reached the last question.

1. Select an answer choice belonging to a template component.
The metadata associated with that answer choice appears in the right panel.
2. Below that metadata, click **Select Term**.
The Lexicon Search dialog box appears. The term you selected appears in the Lexicon Term panel on the right.
3. From the list on the far left of the page, select at least one lexicon where you believe the term you are searching for is located. Click and hold the Shift or Ctrl key to select multiple lexicons.
4. In the list to the right, enter the term you want to search for. Options include the following:
 - Click **Whole word** if you are entering the whole word and want to restrict your search to it.
 - Enter only part of the term, such as "Tum" for "Tumor".
 - Do not enter any terms to retrieve all terms in the selected lexicon(s).
5. Click . All lexicon entries matching your search criteria appear in the search results.
6. Select a term in the search results.
The selected term replaces your original term in the Lexicon Term panel.

- Click **OK**.

The Templates tab appears with the lexicon term in the right panel.

- Click the **Default Answer** checkbox if you want this answer choice to be the default answer. If you choose this, the answer choice is preceded by a blue icon in the Template Components tree, as follows:



The number of default answers must be equal or greater than the minimum number of answer choices you specified when you [added this characteristic to the template component](#).

- Select the **No More Questions** checkbox if you want the selection of this answer choice to indicate that this is the last question in the template.
- In the **Next Question to Ask** section, highlight the next question that the template should ask the user. This selection is not available if you have identified this as the last question in the template.
- Click **Save**.

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Adding Valid Terms to an Answer Choice

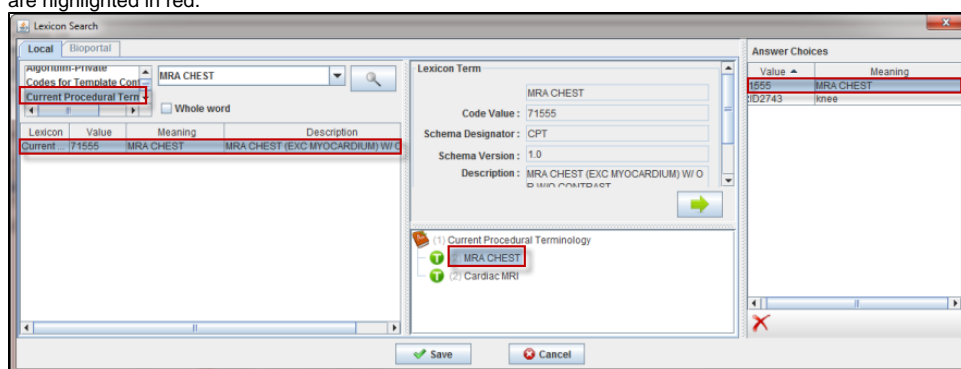
When an answer choice must be specific, you can add valid terms to the answer choice so that the template forces the user to specify one of those terms.

- In the Template Components panel, right-click an answer choice and select **Add Valid Terms** or select in the toolbar. The Lexicon Search page appears.
- Select a valid term from a [lexicon you have created](#) as follows.
 - From the list on the far left of the page, select at least one lexicon where you believe the term you are searching for is located. Click and hold the Shift or Ctrl key to select multiple lexicons.
 - In the list to the right, enter the term you want to search for. Options include the following:
Click **Whole word** if you are entering the whole word and want to restrict your search to it.
Enter only part of the term, such as "Tum" for "Tumor".
Do not enter any terms to retrieve all terms in the selected lexicon(s).
 - Click . All lexicon entries matching your search criteria appear in the search results.
 - Select a term in the search results.

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e. Click

The valid term appears in the Answer Choices list in the right panel, as shown below. Relevant steps in the selection of this valid term are highlighted in red.



i Slide panel borders

Adjust your view of the information in multiple panels by clicking and dragging the border between them.

f. Click **Save**.

The valid term appears in the Template Components panel under the answer choice you originally selected.

3. Repeat this procedure until you have added all of the valid terms for the answer choice. You can also add valid terms to other valid terms.

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Adding a Characteristic to a Template Component

When you add an anatomic entity or imaging observation component to your template, you may add one or more characteristics to it. When you import a template into an imaging application, each template component becomes a heading and characteristics describe the component. For example, the component could be "Lesion" with the characteristics of "Enhancement Quality", "Proportion Enhancing", "Proportion nCET", and "Proportion Necrosis".



Anatomic entity characteristics and imaging observation characteristics can be quantifiable or non-quantifiable. A quantifiable value can be scale, quantile (such as quartile, percentile, or n-tile), numerical like a decimal number in a UCUM (Unified Code for Units of Measurement) unit, and interval. Examples of non-quantifiable characteristics are *present*, *absent*, and *not applicable*.

1. [Add a template component](#) of the Anatomic Entity or Imaging Observation.



2. Right-click the component and select **Create Anatomic Entity Characteristic** () or **Create Imaging Observation Characteristic** ().

3. Specify information describing the characteristic, as follows.

Field	Description
Label	Required field. Double-click this field to add a label. A label becomes a heading in the image annotation form that users complete once the template is imported into an imaging application. For example, "Lesion".
Explanatory Text	Description of the component; for example, "Select the type of lesion".
Answer Choices	Required field. The minimum and maximum number of times the users may select this term when they annotate an image. <div> The number of answer choices you add must be greater than or equal to the maximum number you specify here.</div>
Should Display	Required field. Select this box to display this component in the template. In certain situations, information in a component is known and will not be changed. <div> If you choose not to display a question (a characteristic) in a template, you must specify a default answer if the minimum number of answer choices is one or greater.</div>
Annotator Confidence	Required field. Display or hide this value. Annotator confidence is a percentage that represents the level of user confidence in answering the question.
Require Comment	Select Yes or No to indicate whether users must provide a comment when answering this question.

Authors	Describes the AIM Template Builder user who created this component.
Group Label	Describes any text that you want to associate with one or more template components and thereby group them together for display purposes.


4. Click **Save**.
5. [Add an answer choice](#) to the characteristic.
6. [Create a characteristic quantification](#).

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Creating a Question


AIM templates include a set of questions and one or more answer choices for each question.

1. [Add a template component](#).
2. Right-click the template component and select **Create Question**. You can also find this option in the toolbar (

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A new panel appears on the right and the toolbar below the Template Components panel changes to provide options for question, which are to

add or delete a question ( **Unknown Attachment**).

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3. Provide information about the question.

Field	Description
Code Meaning	The lexicon term you want to use in the question
Code Value	The value of the lexicon term
Schema Designator	The organization that created the schema
Schema Version	The version of the schema you are using

In this version of ATB, a question is defined as a concept code. This means that you will have to select a concept code from a list of existing lexicons from your local ATB. If you don't have a concept code defined, which you probably don't have in your local ATB, you will have to create your private lexicon that consists of your set of questions.



Refer to the *Questions and instructions* lexicon for example questions to consider.

Example



You may want to create the following question: *Where is a tumor located?*

You may define the question as follows.

- Create a lexicon called *My private questions*.
 - Select the Lexicon tab.

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 - Click  to add a new lexicon.
 - Enter the metadata as follows:

Name: *My Private Lexicon*
 Schema Designator: *MPL*
 Schema Version: *1.0*
 Description: *My private lexicon*
 Authors: *NCI*
 - Click **Save**.

 **Unknown Attachment**
- Click  to add a new term.
- Enter the metadata as follows:

Code Meaning: *Where is the tumor?*
 Description: *Identify where the tumor is on the image or images.*
 Code Value: *MPL-0001*
- Click **Save**. You can now use this question concept code.

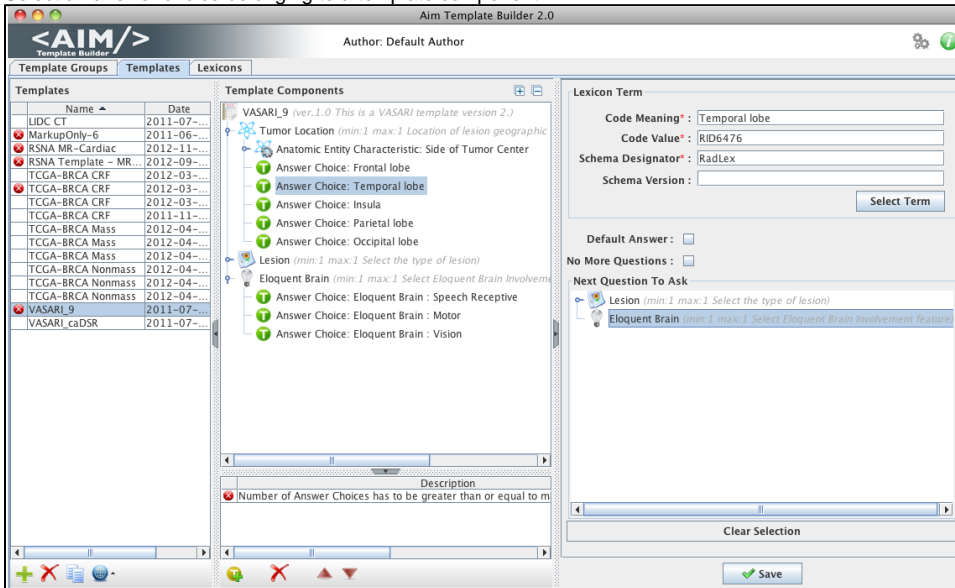
4. Click **Save**.
5. [Add answer choices](#) to the question. Answer choices are lexicon entries that you want to reference in a question in the template.

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Skiping Questions in a Template

When you create a template, you add questions and answer choices that are usually presented sequentially. However, you may want certain answer choices to trigger a different question than the next one in the template. You can specify the next question to ask for each answer choice.


1. Select the Templates tab.
2. Select an answer choice belonging to a template component.



3. In the Next Question to Ask section on the right, select the next question to ask from the list of template questions. This does not need to be a sequential question. Note that in the example above, the answer choice belongs to the Tumor Location component and Side of Tumor Center characteristic. The next question in the template is Lesion ("Select the type of lesion") but the selected next question to ask is Eloquent Brain ("Select Eloquent Brain involvement feature").
4. Click **Save**.

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Creating a Characteristic Quantification

1. Add a template component of the Imaging Observation or Anatomic Entity type.
2. Add a characteristic to a template component of the Imaging Observation or Anatomic Entity type.
3. Add an answer choice to the characteristic.
4. Right-click the answer choice and select **Create Characteristic Quantification** ().
5. In the panel on the right, enter a name for the characteristic and select **Annotator Confidence**, if that attribute applies to the template component.
6. Click **Save**.
7. Create a characteristic quantification type. The options include **Non Quantifiable**, **Scale**, **Numerical**, **Quantile**, and **Interval**. Except for the Non Quantifiable type, which can always be added, you cannot create more than one type for a single answer choice.




Note

Delete any quantification from an answer choice by right-clicking it and selecting

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Creating a Non Quantifiable

1. Add a characteristic to the component.
2. Add an answer choice.
3. Right-click the answer choice and select **Create Non Quantifiable** ().
4. Search for the lexicon term you want to use to describe the non quantifiable.
 - a. Click **Select Term**.
The Lexicon Search dialog box appears.
 - b. From the list in the center of the page, select at least one lexicon where you believe the term you are searching for is located.
 - c. From the list that is furthest to the left on the page, enter the term you want to search for. You can also enter only part of the term, such as "Non" for "None", and then select **RadLex** from the lexicon list.

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d. Click

All lexicon entries containing the word you entered appear in the search results.

e. Select a term in the search results.

f. Click **OK**.

The metadata for the lexicon term you selected populates the Code Meaning, Code Value, Schema Designator, and Schema Version fields.

5. Click **Save**.

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Creating a Scale

1. [Add a characteristic to the component](#).

2. [Add an answer choice](#).

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3. Right-click the answer choice and select **Create Scale** ().

4. Add a description of the scale and additional comment, if needed.

5. Click **Save**.

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6. Right-click the scale and select **Create Ordinal Level** ().

7. Provide a value for the ordinal level by typing in a number or using the arrow keys to reach the desired number.

8. Optionally, describe the ordinal level.

9. Click **Save**.

10. Return to step 3 to create additional ordinal levels.

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Creating a Numerical

1. [Add a characteristic to the component](#).

2. [Add an answer choice](#).

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3. Right-click the answer choice and select **Create Numerical** ().

4. Provide a value and UCUM string for the numerical (required).

5. Select an operator from the list (optional).

6. Click **Save**.

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Creating a Quantile

1. [Add a characteristic to the component](#).

2. [Add an answer choice](#).

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3. Right-click the answer choice and select **Create Quantile** ().

4. Enter a value into the **Bins** field.

For example, if your range is 100, you could create 5 bins containing 20 units each. Your Bin number would be 5 in this case.

5. Click **Save**.

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Creating an Interval

1. [Add a characteristic to the component](#).

2. Add an answer choice.

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3. Right-click the answer choice and select **Create Interval** ().

4. Specify **Min Value**, **Max Value**, **Min Operator**, **Max Operator**, and **UCUM Value** for an interval.

5. Click **Save**.

6. Return to step 3 to create additional intervals.

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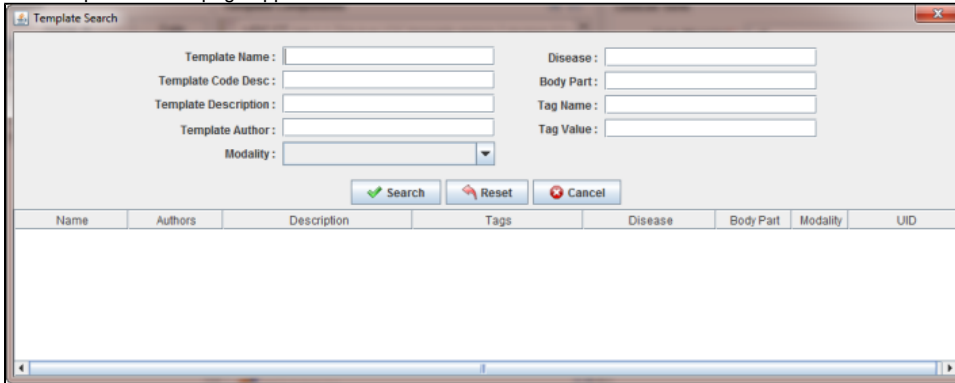
Searching for a Template in the AIM Template Service

You can search the AIM Template Service for a template that you can customize in ATB. Once you find the template you want to use in the search results, you can [import](#) it. ATB 2.0 automatically converts older ATB templates to the latest schema version upon import.

1. Click the **Templates** tab.

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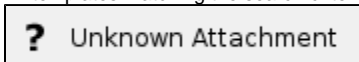
- Below the left panel, click **? Unknown Attachment** and then select **Search Templates**. The Template Search page appears.



- Narrow your search by entering information into the fields. If you do not enter any information into the fields, all template groups available in the AIM Template Service appear, and it may take longer to see the results of your search. The following fields are available.

Field	Description
Template Name	Template name
Template Code Desc	Template code description
Template Description	Template description
Template Author	Person who created the template in the AIM-enabled application
Modality	Any of the various types of equipment or probes used to acquire images of the body, such as radiography, ultrasound and magnetic resonance imaging
Disease	Disease that is the topic of the templates in the template group
Body Part	Body part that is the topic of the templates in the template group
Tag Name	A name associated with this template
Tag Value	The value associated with the tag name for this template

- Click **Search**. All templates matching the search criteria you entered appear.



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Importing a Template from the AIM Template Service

Once you find a template after searching the ATS, you can simply click it to import it to ATB.

- [Search for a template](#) in ATS.
- Click the **Name** link of the template you want to import. The template you imported appears in the Templates panel as "Copy of *Original Template Name*".

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Editing a Template

- Click the **Templates** tab.
- Select the template you want to edit. The template information appears in the right panel.
- Edit any of the information about the template that you want to change.
- Click **Save**.

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Copying a Template

You can create a copy of a template to make it easier for you to customize it.

1. Click the **Template** tab.
2. Select the template you want to copy.

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3. At the bottom of the Templates panel, click
A copy of the template with the name of **Current Template Name copy** appears in the Templates panel. You can now customize the copied template.

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Deleting a Template

1. Click the **Templates** tab.
2. Select the template you want to delete by clicking it.
3. Below the left panel, click
A message appears prompting you to confirm the deletion.
4. Click **Delete**.
The template is no longer in the Templates panel.

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Adding a Template to a Template Group

You can combine any number of templates in a template group. You may want to do this, for example, to make it easier for you to reference your data during a certain time in a longitudinal study.

This procedure assumes that you have already created both templates and template groups.

1. Click the **Template Groups** tab.
2. Select the template group that you want to populate with one or more templates.
3. In the Group Memberships panel on the right side of the screen, click the boxes next to the templates you want to add to the selected template group.

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4. Below the Group Memberships panel, click
The templates appear in the Group Members panel.

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Removing a Template from a Template Group

1. If you are not already on the **Template Groups** tab, click it to select it.
2. In the Group Memberships panel on the right side of the screen, click the box next to the template you want to remove from the template group.

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3. Click
The page refreshes and the Group Members panel no longer shows the template in the template group.

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Building a Lexicon

A lexicon organizes the vocabulary that may appear in an AIM template. When you build a template, you can select terms from a lexicon that users of the template will be able to select as answers to template questions. For example, if an AIM template imported into an appropriate application prompts the user to specify the location of a lesion's geographic center, the template could restrict answers to certain allowed terms from the lexicon.

You must first create a lexicon, then add lexicon entries to it. Those lexicon entries become the allowed terms that you add to a template.


The ATB contains preselected terms from RadLex, caDSR (cancer Data Standards Registry and Repository) designed for a particular imaging study such as LIDC (Lung Image Database Consortium), and VASARI (Visually Accessible Rembrandt Images) vocabularies.

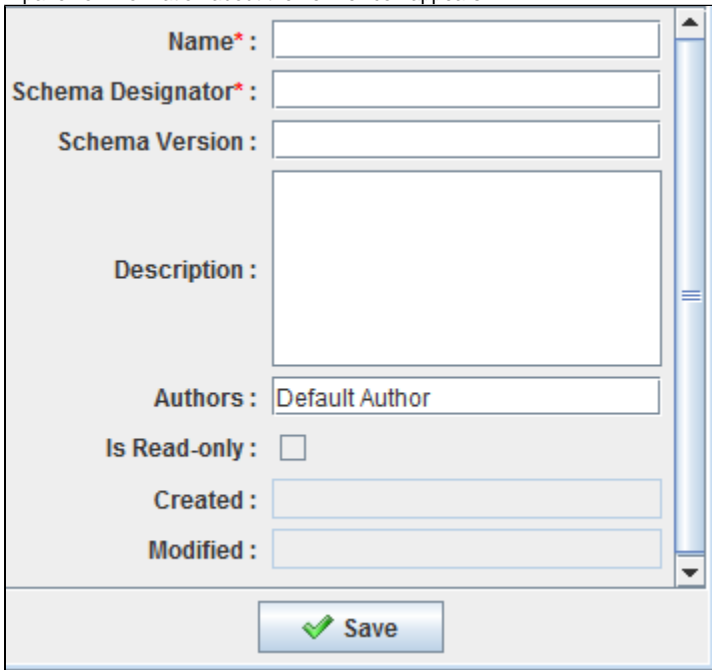
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Creating a Lexicon

1. Click the **Lexicons** tab.

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2. In the toolbar at the bottom of the page, select . A panel for information about the new lexicon appears.



3. Enter information about the lexicon. Lexicon name and Schema Designator are required and the rest of the fields are optional. You can change the Authors from what appears by default, which is the user who is currently logged in. If the **Is Read-Only** checkbox is selected, this is a lexicon built in to ATB 2.0 and you cannot modify it.
4. Click **Save**. The lexicon appears in the Lexicon panel.

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Creating a Lexicon File Outside of ATB 2.0

You can create a lexicon file that you can import into ATB 2.0. The lexicon file must contain terminology extracted from a standard lexicon such as RadLex, SONMED® CT, DICOM, or a user-defined lexicon.

1. Create a CSV file with a tab separator. When creating a new line, press Enter.
2. Make the first line the file header, with subsequent lines containing the actual data you are importing.
3. Structure the header in the following way:

Column 1	Column 2	Column 3	Column 4	Column 5
Code Meaning	Code Value	Coding Scheme Designator	Description	Parent

An explanation of the header columns follows.

Header Column Name	Description
Code Meaning	A brief description of the code
Code Value	Code
Coding Scheme Designator	A source such as RadLex, DCM, STR, etc.
Description	A full description of the code
Parent	"Code Value" of the parent of a child term

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Deleting a Lexicon

1. Click the **Lexicons** tab.
2. Select the lexicon you want to delete by clicking it.

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3. At the bottom of the Lexicon panel, click
A confirmation message appears.
4. Click **Delete**. The lexicon is no longer in the Lexicon panel.

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Creating a Lexicon Entry

1. Click the **Lexicons** tab.
2. Select the lexicon that you want to contain your new lexicon entry.
3. Right-click the lexicon and select **Create Lexicon Entry**, or click **? Unknown Attachment** in the toolbar.
A panel for the new lexicon entry appears.
4. Complete the fields to describe the lexicon entry.
An explanation of the purpose of each field is shown in the table below.

Field	Description
Code Meaning	The name of the term you want to use as the lexicon entry
Description	A description of the term
Code Value	The value assigned by the coding scheme designator

5. Click **Save**.

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Deleting a Lexicon Entry

1. Click the **Lexicons** tab.
2. Select the lexicon that contains the term you want to delete.
3. Click the term you want to delete to select it.
4. Click **? Unknown Attachment**.
A confirmation message appears.
5. Click **Delete**. The lexicon entry no longer appears in the Lexicon Terms panel.

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Searching for a Term

1. Click the **Lexicons** tab.
2. At the bottom of the Lexicons panel, click the **Search Terminology** button (**? Unknown Attachment**).
The Lexicon Search window appears.

The screenshot shows the 'Lexicon Search' window. It features a search bar at the top with a magnifying glass icon. Below the search bar, there are two tabs: 'Local' and 'Biportal'. Under the 'Local' tab, a list of lexicons is displayed, with 'Algorithm-Private' selected. To the right of the list is a search button. Below the list, there is a table with columns 'Lexicon', 'Value', 'Meaning', and 'Description'. On the right side of the window, there is a 'Lexicon Term' panel with input fields for 'Code Value', 'Schema Designator', 'Schema Version', and 'Description'. At the bottom of the window, there are 'Save' and 'Cancel' buttons.

3. From the list on the far left of the page, select at least one lexicon where you believe the term you are searching for is located. Click and hold the Shift or Ctrl key to select multiple lexicons.
4. In the list to the right, enter the term you want to search for. Options include the following:
 - Click **Whole word** if you are entering the whole word and want to restrict your search to it.
 - Enter only part of the term, such as "Tum" for "Tumor".
 - Do not enter any terms to retrieve all terms in the selected lexicon(s).
5. Click **? Unknown Attachment**.
6. All lexicon entries matching your search criteria options appear in the search results.
7. Click to select a term from the search results.
8. Click **Save**.
The term appears in the Lexicon Terms panel of the Lexicons tab.

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