

Trifolia-on-FHIR

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Welcome

Trifolia-on-FHIR is an editor for FHIR resources that uses a FHIR server natively as its back-end. All STU3-compliant FHIR servers work with Trifolia-on-FHIR.

Core Features

- Edit conformance resource types:
 - ImplementationGuide
 - StructureDefinition
 - ValueSet
 - CodeSystem
 - CapabilityStatement
 - OperationDefinition
 - Questionnaire
- Import and view any other resource in FHIR specification (such as Patient, Observation, MedicationStatement, etc.)
- Validate with the "Validation" tab on every resource editing screen, which uses [FHIR.js](#).
- Export:
 - Implementation Guides and associated resources
 - Bundles
 - FHIR IG Publisher packages
- Import any resource or transaction bundle.

Requesting Support

Support requests are captured using JIRA Service Desk, located here:

<https://trifolia.atlassian.net/servicedesk/customer/portal/3>. JIRA will require that you be logged in with an Atlassian account before submitting/viewing support requests.

Additionally, the FHIR Zulip chat has a channel dedicated for Trifolia-on-FHIR questions and announcements, located on chat.fhir.org in the [#trifolia-on-fhir](#) channel.

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What's New

Release 1.4.0

Expand/navigate further into profile elements

Previous versions of Trifolia-on-FHIR had a limitation in how deep in the hierarchy of elements you could expand. Trifolia-on-FHIR no longer limits how far the user can expand into the hierarchy of a profile's elements.

Implementation guide narrative/prose supports images

Now users can add images to their implementation guides and render those images as part of the narrative/prose pages. Refer to the help documentation's "Adding images to pages" section for more information.

Guided walk-throughs

Many of the screens in Trifolia-on-FHIR now support guided a walk-through. Click the "i" (information) icon in the top-right of the screen on a page to get a guided walk-through of the key functionality/fields on a page.

Permissions

Users have the ability to control who can view and edit their data using the "Permissions" tab on all edit screens. Users can control view and edit permissions for other users and groups. Alternatively, users can

indicate that "everyone" has view and/or edit permissions to their resources.

Note that if a user is only granted "view" permissions, the resource will show up in the "browse" (search) screens, but the user will not be able to select "Edit" on the resource. Currently, there is no way to view the details of a resource beyond what is shown in the "browse" (search) screens. In the future, screens may be added to "view" a resource, which shows more information than the browse (search) screen shows and would apply directly to the "view" permission.

Development Log

Type	Key	Summary
New Feature	TRIFFHIR-207	Add guided walk-through to the "Other Res
New Feature	TRIFFHIR-184	Allow drill-down into data types
New Feature	TRIFFHIR-163	Image support in ImplementationGuide
New Feature	TRIFFHIR-126	Export and publish improvements
Improvement	TRIFFHIR-213	Value Sets Editor - Add VS Name to the fo
Improvement	TRIFFHIR-206	Add guided walk-through to implementation
Improvement	TRIFFHIR-205	Add guided walk-through to publish screen
Improvement	TRIFFHIR-203	Add guided walk-through to import screen
Improvement	TRIFFHIR-196	Include selected FHIR server in the browse
Improvement	TRIFFHIR-193	Limit users ability to constrain min[x], max
Improvement	TRIFFHIR-192	Limit the types available to the user for in t
Improvement	TRIFFHIR-191	targetProfile doesn't allow selection of just
Improvement	TRIFFHIR-189	Validate the user's entry of min and max c
Improvement	TRIFFHIR-186	Allow user to cancel changes to an IG's E
Improvement	TRIFFHIR-182	Show elements from base profile
Improvement	TRIFFHIR-181	Enabling a new item shouldn't collapse the
Improvement	TRIFFHIR-176	Use typeahead for IG selection on browse
Improvement	TRIFFHIR-175	Add .sh and .bat files when exporting with
Improvement	TRIFFHIR-173	Update publication framework to use title i
Improvement	TRIFFHIR-171	Improve readability/usability of "Type" drop
Improvement	TRIFFHIR-153	Create new profile - Type should not default
Improvement	TRIFFHIR-120	Clarify "Move" functionality for pages with t
Improvement	TRIFFHIR-62	Allow user to publish from "View Implemen
Defect	TRIFFHIR-209	An IG page that has a filename including /
Defect	TRIFFHIR-194	Import fails in DEV without meaningful mes
Defect	TRIFFHIR-183	HTML Export not including one of the reso
Defect	TRIFFHIR-177	Implementation Guide Validation/RAW not
Defect	TRIFFHIR-121	Description field appears blank until click

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Additional Help

Additional Formats

The help documentation is available in several formats:

- CHM
- DOCX
- PDF
- EPub

Real-time Introduction (guided walk-through)

Users can click the "i" (information) button in the top-right corner of ToF to get a real-time introduction to the screen that they're looking at. This introduction will walk the user through the important elements of the current screen and give a brief description of what that element does. Users should keep in mind that if the screen has multiple tabs to look at, then the intro will only describe the elements that are visible to the user currently.

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Login

Login

Click the "Login" button on the top right side of the screen. Trifolia-on-FHIR (ToF) re-directs users to identity/configure users' profile details. If you do not already have an account, you may register via this screen. Once you have registered and logged-in with the identity provider, your browser will redirect to the ToF homepage.

If this is your first time logging-in to ToF, you must create a Practitioner resource for ToF to identify you as the author of resources and associate your Practitioner with audit records when changing resources. If you configure ToF with multiple FHIR servers, you may need to create a new Practitioner resource for each FHIR server.

Users can click on their name at the top right side of the screen to further edit the Practitioner resource on the selected FHIR server.

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Navigation

Navigation

The main navigation bar is on the top of the screen. Some menu items are hidden pending log-in.

- File
 - Home - This is the first screen users see after login. It presents high-level information about ToF.
 - Open from computer - Users can open a resource directly from their computers, either an XML file or JSON file, and edit the resource in ToF without saving the resource to the FHIR server. When saving, the browser prompts users to re-download the updated resource as an XML or JSON file depending on the format when opened.
 - Documentation - Opens this help documentation in HTML format.
 - Request Support - Opens the support page for ToF, where users can submit support requests (defects, new ideas for features/improvements and general questions).
 - Settings - This opens the settings window for ToF.
- Browse/Edit - Search, select, delete, and create new resources depending on the resource type selected in the sub-menu.
 - Implementation Guides
 - Profiles
 - Capability Statements
 - Operation Definitions
 - Value Sets
 - Code Systems
 - Questionnaires
- Import - Import resources from other locations into ToF.
- Export - Export implementation guides from ToF in various formats (i.e., bundles, FHIR IG Publisher

package, GitHub, etc).

- Publish - Publish your implementation guide using the FHIR IG Publisher.

On the right-side of the navigation menu, users will find:

- A label indicating the currently selected FHIR server. You may click on this label to open the settings for ToF and select a different FHIR server. This is the same as clicking on the File > Settings menu.
- A label indicating the user that is currently logged in. You may click on your name to edit your profile. A user is represented as a FHIR [Practitioner](#) resource.
- An icon for logging out of GitHub (if you are logged into GitHub within ToF).
- An icon for logging out of ToF (if you are logged into ToF).
- An icon for getting real-time guidance on how to use each screen. When clicked, a tour of the page will be started, highlighting key points of interest. *Note: not all screens support "tour" functionality.*

FHIR Versions in the UI

Depending on the FHIR server and the version it supports, the screens for editing resources may appear (e.g., STU3 vs. R4). The screens in ToF reflect the changes between STU3 and R4 resources. In STU3, for example, ImplementationGuide has "packages" with "resources" inside each package. In R4, ImplementationGuide has "resources" parallel to "packages," and each resource *references* a package.

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Process

Process

The work-flow for authoring an Implementation Guide:

1. Create an Implementation Guide
2. Create Profiles (StructureDefinition resources):
 - Create other resources (e.g., OperationDefinition, CapabilityStatement, ValueSet and CodeSystem) as needed for the profiles and implementation guide
 - Create samples of the profiles manually and import into ToF
3. Associate profiles, other conformance resources, and samples with the Implementation Guide
4. Export Implementation Guide using FHIR IG Publisher:
 - View the results of the export via the FHIR IG Publisher on the "Browse Implementation Guides" screen
 - The results include a Q/A tab, which identifies all errors the FHIR IG Publisher found during publication. Users should fix errors, when possible, and re-execute the export with the FHIR IG Publisher.
 - Users can download or upload the exported package to the appropriate GitHub repository for the Implementation Guide project.

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Guidelines and Best Practices

Guidelines and Best Practices

Trifolia-on-FHIR has the functionality to allow users to completely customize resources. By following these guidelines, users can ensure the FHIR publisher successfully processes the Implementation Guide.

Implementation Guide

- The URL of the Implementation Guide must be in the format of `http[s]://xxx.yyy/zzz/aaa/ImplementationGuide/my-ig-id`. For example:
`http://myproject.com/someRoot/ImplementationGuide/myproject-ig`
- The "id" of the implementation guide must align with the URL of the implementation guide. For example:

If the URL of your implementation guide is

`http://myproject.com/someRoot/ImplementationGuide/myproject-ig`, the id must be "myproject-ig". Users can select the "Change this resource's ID" button on the "Browse Implementation Guide" screen.

- The Implementation Guide should have a description. The main screen of the FHIR IG Publisher export displays the description.
- All contacts in the Implementation Guide appear as authors in the FHIR IG Publisher export.
- ToF only exports resources referenced directly within the Implementation Guide resource. Confirm the Implementation Guide resource references all resources.

All Resources

All resources within an Implementation Guide need URLs in one format. Based on the example above, if your implementation guide's URL is

`http://myproject.com/someRoot/ImplementationGuide/myproject-ig` then all profiles (StructureDefinition resources) within the Implementation Guide must have URLs that start with `http://myproject.com/someRoot/StructureDefinition/`.

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Value sets

Value sets used by an implementation guide *should* have a "compose" defined which asserts either the enumerated codes that should be included in the value sets, or asserts other value sets that should be included (making the value set a "wrapper" of sorts).

Enumerated codes are shown/edited in the "Compose" tab's "Concepts" section. This section is paged, showing five (5) codes at a time. You may search for a concept by either the code or display values by entering text in the "Code (search)" and "Display (search)" fields shown at the top of the table.

Additional fields (such as the "Designations") may be modified for each concept by clicking the "Edit" button.

Below the table of (at most) five (5) concepts is a set of buttons which allow you to control which page you are viewing/editing.

- The << button returns you to the first page of concepts
- The >> button moves you to the last page of concepts
- The < button moves you one page backward
- The > button moves you one page forward
- Selecting a number will bring you to that specific page number

The "Value Sets" section allows you to indicate what value sets should be included in this value set. Each entry in the "Value Sets" section represents the canonical URL of the value set (ValueSet.url).

When publishing an implementation guide which has a value set that references other value sets, those *other* value sets must be available to the FHIR IG Publisher via one of the following methods:

- Included in the implementation guide itself (via a resource referenced in the ImplementationGuide resource)
- The ValueSet is publicly available by the URL of the value set (e.x. putting the URL of the value set in a browser should return the ValueSet in either XML or JSON format)
- The terminology server used by the FHIR IG Publisher (tx.fhir.org) has the value set pre-loaded

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Adding images to pages

To add one or more images to pages in your implementation guide, follow these steps:

1. Import your images via the "Import" screen. You may drag-and-drop the images into the "Import" screen's "File" tab.
These images will be imported as "Media" resources. The "id" of the Media resource will be based on the filename of the image, and the exact filename will be stored as an "identifier" in the Media.
2. Add your newly imported Media resources to the IG's "resources".

Make sure they are *not* marked as an example. Leave the "Example" field either "Undefined" or "No". Otherwise, your Media resources will be treated as an example and will be preserved during the implementation guide's export, which may produce errors during final publication.

3. Open the page(s) you would like the image to show in, place your cursor where you want the image inserted and select the "Insert image from pre-defined list" option in the Markdown editor.
4. Select the image you want to add.
5. Text will be placed at your cursor for the image you selected.

Note: The following image types are supported:

- .JPG
- .GIF
- .PNG
- .BMP

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Binding values to elements in a profile

To create a fixed binding for an element in a profile:

Starting from the profile editor's "Elements" tab:

1. Select the element you want to bind the fixed value to.
2. Select the "binding" tab in the properties of the element (on the right side of the screen).
3. Check the checkbox next to "Fixed".
4. Select the corresponding "type" for the element (ex: "CodeableConcept" or "string" or whatever, depending on the data type of the element you are constraining).
5. Edit the value of the fixed binding according to what you want to make sure the implementer uses. In some cases, more complex data types (such as CodeableConcept) will show an "edit" (pencil) icon next the type you selected in #4 which opens a pop-up dialog box to have you enter the information. Types that are simple (such as "code" or "string") just simply show a text field for you to enter the value in.

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Export

Export

Select Export in the tabbed tool bar on the top of the screen.

The Export page contains form fields that allow users to specify the details of their exports. Users can export the Implementation Guides (IGs) saved under the Browse/Edit tab at the top right side of the screen. Users can export IGs as bundles or HTML with the IG Publisher. Once the form fields are complete, select the Export button on the left side of the scrolling tab at the bottom of the screen.

- Bundle exports produce a single download (pretty quickly) as a single XML file. This XML file is a FHIR [Bundle](#) that can be used to import the resources for the implementation guide in another FHIR environment.
- HTML exports produce a package (ZIP file) for use with the FHIR [IG Publisher](#). Depending on whether you select "Run IG Publisher", the IG Publisher will automatically be executed for the package, and the output from the IG Publisher will be included in the download. If you select *not* to execute the IG Publisher, the package will still be produced and can be downloaded.
 - The Export tool will take a few minutes to process. The length of time is correlated with the size of the export. Users will see the tool processing the export as lines of code executions. After completing the process, the export will automatically download to users' computers in a compressed folder.
 - When the IG Publisher is executed, the output from the IG Publisher is copied to a public location in Trifolia-on-FHIR for preview.

Import

Import

ToF allows users to import files, text, and VSAC content.

File imports allow users to drag-and-drop resources (e.g., StructureDefinitions, ValueSets, CodeSystems) from users' hard drives to the ToF tool.

VSAC imports require users' VSAC credentials, which are not persisted on the ToF server. If users select 'Remember VSAC Credentials,' the tool will store this information as cookies in the users' browser.

Users who upload more than 20 resources at once may experience a timeout error notification. In the event of a timeout error notification, users should reduce the size of the resource import.

Users can edit resource numbers based on individual needs.

Excel Value Sets

In the "Files" tab you may import excel spreadsheets (XLSX) that represent value sets.

The spreadsheet document must have these columns, in order:

- ID - This is the ID of the value set. This value in this column is repeated for each code/row. The value must be formatted as a [valid ID](#). Ex: 2.16.840.1.113883.42.3.1
- Name - The name of the value set. This value in this column is repeated for each code/row.
- URL - The URL of the value set. This value in this column is repeated for each code/row. Ex: `http://some.com/test/fhir/valueset`
- Code - The code representing the concept. Ex: 9000000000000073002
- Display - The display representing the concept. Ex: "Sufficiently defined concept definition status"
- System - The system URL that owns/maintains the code. Ex: `http://snomed.info/sct`

GitHub Integration

Authentication

The import and export screens both contain options for GitHub. As soon as the GitHub option is selected in either screen, you are prompted to login with your GitHub credentials. Once logged in, your GitHub authentication token is stored in cookies so that you do not have to login every time you select "GitHub" under the import/export screens.

After you have logged into GitHub, a GitHub icon appears in the top-right corner of the all screens. When clicked, this icon logs you out of GitHub within ToF.

ToF uses a pop-up window to authenticate with GitHub. If your browser blocks the pop-up window, ToF will not be able to authenticate with GitHub and you will receive an error.

Work Flow

The work flow within ToF for GitHub is to

1. Import resources from a GitHub repository into the selected FHIR server
2. Edit the resources using ToF
3. Export the resources back to the GitHub repository after they have the desired changes

Extensions

When importing resources, two extensions are added to each resource representing the location within GitHub for where the resource came from. This enables ToF to know where in GitHub to export the resources back to.

If you are exporting *new* resources to GitHub, these extensions will not yet exist and you will need to specify where the resources should be stored during the export (which will create the two extensions on the resource).

Limitations

- Trifolia only exports the individual resources associated with the implementation guide, and does not include the entire IG Publication package. For example, the "framework" (html templates) folder is not included in the export.
- Trifolia only allows importing FHIR resources. Trifolia-on-FHIR allows the user to select any JSON or XML file from GitHub. If the user selects an XML or JSON file that is not a FHIR resource, the import will fail.
- GitHub does not allow retrieving/updating very large files. For example, if attempting to import/export a large ValueSet resource, GitHub may fail with a "Payload too large" error.

Signing Out

When you sign out of GitHub within Trifolia, this clears your GitHub session only within Trifolia. GitHub maintains its own session within your browser. To sign out of GitHub entirely, you will need to go to github.com and click "Sign out".

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Validation

Validation

Trifolia on FHIR utilizes 3 validation methods to provide as much feed-back to IG authors as possible.

1. **Real-time UI validation while editing**
This validation checks the base FHIR specification requirements (i.e. cardinality, terminology bindings, value set requirements). This validation occurs as each field in ToF is changed, allowing it to update and render to the user in real-time.
2. **Pre-publish validation**
When publishing an implementation guide from the "Publish" screen, the FHIR Server's [\\$validate operation](#) is executed for each resource in the implementation guide. This is specific to the FHIR server being utilized by ToF for this IG (ex: HAPI, or the FHIR server instance selected in the top right of ToF).
3. **HL7 IG Publisher validation**
This validation is performed automatically *during* the publish process by the FHIR IG Publisher. Validation checks for relationships between all resources and pages within this IG package. This includes all applicable IG resources, profiles, extensions, value sets, etc. FHIR IG Publisher validation also validates HTML links contained in the package. This validation method cannot be invoked externally/independently of initiating the publish process for an entire IG.

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Walk-through

The purpose of this page is to guide new users through Trifolia-on-FHIR:

1. Create account and Login
2. Select FHIR Release version (gear icon in top right)
3. Create new Implementation Guide

- Option A: Create IG from scratch. Navigate to Browse Implementation Guides > click the "plus" + button at top IG list/table.
- Option B: Import IG from a file. Import IG.xml from your computer ("Import" button at top and either drag-and-drop the IG.xml file into the "Files" tab or copy/paste the contents of IG.xml into the second tab).
- 4. Modify IG. Be sure to always Save (bottom left)

NOTE: When creating and ordering pages, you can only pivot a page's position with pages that are siblings with one another. Pages that are children of the page you're trying to move or children of a page that's not the parent of the page being moved can not be swapped.
- 5. Create/import additional templates/profiles
 - Option A: Create Profile from scratch. Navigate to Browse Templates/Profiles > click the "plus" + button at top of Profile list/table.
 - Option B: Import profiles from directories on computer
- 6. Modify and constrain the templates/profiles to use case
- 7. Resolve all Validation errors and warnings on Validation (tab) within each profile
- 8. Export selected IG package. Suggested settings for initial export:
 1. Export Format: HTML (IG publisher)
 2. Run the IG Publisher: Yes
 3. Run the latest version of the IG Publisher: No
 4. Use terminology server: Yes/No (Suggest No if IG uses large standard codesets)
Selecting Yes will verify applicable value sets and code systems externally
 5. Download: Yes
 6. Output format: XML
- 9. Confirm build logs against CI-publisher on Zulip > Notifications

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Security and Permissions

Authentication

Trifolia-on-FHIR is designed to minimally require that the user authenticate in order to access the data that is stored on the FHIR servers that ToF is configured to use. Additional permissions may be required depending on the configuration of the ToF installation.

Permissions

If the ToF installation is configured to require permissions, only data that the user has been permitted to view/edit will be access to them in the user interface. The remainder of this section presumes that permissions are enabled in the installation.

Permissions are maintained for each individual resource in the system. For example, permissions may be different for an instance of an ImplementationGuide compared to a StructureDefinition that the implementation guide references.

Each edit screen contains a "Permissions" tab which allows the user to define the permissions for the resource. The user may search for users and groups, and add read and/or write permissions to the resource for the selected users/groups.

The user may select a different resource to copy permissions from. This can be done either by:

1. Selecting a resource type and typing search criteria in the text field. Suggestions will be presented below the text field. Select one of the suggestions and press the "Copy" button.
2. Click the "Search" button next to the text field to select a resource using the advanced search pop-up window. Once a resource has been identified and selected, click the "Copy" button.

If you have been granted permissions to a resource via a group and that resource has other groups associated with it that you *aren't* a member of, the name of the group will not be shown and the "Permissions" tab will only show you the ID of those other groups.

If you do not have permissions to edit a resource, you will not be able to click the "Edit" button on the resource from the browse screen. Future enhancements may be made to allow the user to access the "Edit" screen in a disabled state when the user doesn't have edit permissions to the resource.

Managing Groups

All users may create/manage their own groups. A group may only have one manager.

To create/edit/delete groups, click your name in the top-right of ToF, and select the "Groups" tab. Changes made to the "Groups" tab are persisted immediately; pressing "Save" is not required and only applies to editing information for your profile.

When you create a group, you are automatically added as a member to the group. You cannot remove yourself as a member from the group.

Importing Resources

When importing *new* resources, the permissions for those new resources are defaulted to allow the user performing the import view/edit access. To allow additional permissions, you will need to edit each resource and grant additional permissions.

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Glossary

Acronym	Definition
ToF	Trifolia-on-FHIR
FHIR	Fast Healthcare Interoperability Resources
VSAC	Value Set Authority Center
IG	Implementation Guide
VS	Value Set
CS	Code System

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FAQ

General

My implementation guide has pages, but the table of contents is empty?

Make sure that the "Table of Contents" page's "Auto Generate Table of Contents?" field is set to "Yes".

Exporting/Publishing with the FHIR IG Publisher

The IG Publisher reports "Property name not found"

This may be due to dependencies being listed in the ImplementationGuide resource incorrectly.

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Technical Details

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System Requirements

System Requirements

Users will need a modern browser (e.g., Chrome, Firefox, Internet Explorer, Safari) to use Trifolia-on-FHIR.

Administrators must ensure the following requirements to install Trifolia-on-FHIR in their individual servers:

- Windows or Linux
- FHIR Server (STU3 or R4)
 - Must support creating resources via a PUT with an ID
 - Must support the [\\$validate operation](#)
 - Must support the [\\$meta-delete operation](#)
 - Must support ImplementationGuide search query parameters:
 - resource
 - global
 - Must support _has (reverse chaining) search criteria. For example: GET /StructureDefinition?_has=ImplementationGuide:resource:_id=<IG_ID>
 - Must support _include search criteria to get a list of all resources related to an implementation guide. For example: GET /ImplementationGuide?_id=some-ig-id&_include=ImplementationGuide:resource&ImplementationGuide:global

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FHIR Versions

FHIR Versions

Trifolia-on-FHIR supports multiple versions of the FHIR standard. ToF currently supports STU3 and R4. Users can select a FHIR server with the drop down menu at the top right of every screen.

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REST API

Trifolia-on-FHIR's REST API is documented using Swagger. The publicly available installation of Trifolia-on-FHIR exposes the API documentation here: <https://trifolia-fhir.lantanagroup.com/api-docs/>. The API described by **/api-docs** is the same API that the web application (user interface) uses.

Multiple FHIR servers

If the ToF installation is configured to support multiple FHIR servers, the first FHIR server is used by default in the REST API. If you wish to perform REST API operations on a FHIR server other than the first, you must specify a **fhirserver** header in each request. The value of the **fhirserver** header must be the **id** of one of the FHIR servers returned by **/api/config**.

FHIR Server Proxy

An **/api/fhir** end-point is available in the API that represents a "proxy" to the FHIR server(s) available within the ToF installation.

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Security and Permissions

Permissions for resources are stored in Resource.meta.security. A custom code is created for three types of permissions:

- Everyone - Anyone that has a user account in the installation.
- Group - One or more users (Practitioners) that are represented together as a single Group. Use a group to represent a team of users.

- User (Practitioner) - A single person that has access to the installation. ToF requires every user to create a Practitioner that represents their user when the login and open ToF to a specific FHIR server for the first time.

There are two levels of permissions:

- Read - Allows the user to search/view the resource
- Write - Allows the user to update/delete the resource

With these concepts combined, the resource may have several security codes. For example:

```
{
  resourceType: "ImplementationGuide",
  meta: {
    security: [
      // Everyone has access to read/write
      { system: "https://trifolia-fhir.../security", code: "everyone^read" },
      { system: "https://trifolia-fhir.../security", code: "everyone^write" },
      // Members of group test-group-id have access to read/write
      { system: "https://trifolia-fhir.../security", code: "group^test-group-id^read" },
      { system: "https://trifolia-fhir.../security", code: "group^test-group-id^write" },
      // A specific user (Practitioner) with id test-practitioner-id has access to read/write
      { system: "https://trifolia-fhir.../security", code: "user^test-practitioner-id^read" },
      { system: "https://trifolia-fhir.../security", code: "user^test-practitioner-id^write" }
    ]
  }
}
```

When a user searches for ImplementationGuide resources, ToF sends a search request to the FHIR server that includes a `_security` parameter with all possible variations that are applicable to the currently logged-in user. For example:

```
// un-encoded for readability
https://some-fhir-server.com/fhir/ImplementationGuide?_security=<system>|
everyone^read,<system>|group^test-group-id^read,<system>|user^test-practitioner-id^read
// encoded
https://some-fhir-server.com/fhir/ImplementationGuide?_security=https%3A%2F%2Ftrifolia-fhir...%
2Fsecurity%7Ceveryone%5Eread%2Chttps%3A%2F%2Ftrifolia-fhir...%2Fsecurity%7Cgroup%
5Etest-group-id%5Eread%2Chttps%3A%2F%2Ftrifolia-fhir...%2Fsecurity%7Cuser%5Etest-
practitioner-id%5Eread
```

When a user clicks the "Edit" button on a resource, this initiates getting a single/specific resource. The ToF server checks that the persisted resource grants the logged-in user permissions to view the resource before sending the resource back to the user's browser for viewing.

Similarly, when a user clicks "Save" or "Delete", the ToF server first retrieves the instance of the resource that is persisted on the FHIR server, checks whether the user has permissions to modify the resource, and rejects the request with a 401 Unauthorized response if the user does not have permissions. Otherwise, the resource is updated on the FHIR server according to the user's request.