

FHIR PROFILING IN TRIFOLIA

Overview for Implementers

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Acknowledgements

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Existing Trifolia users that want to learn how to use the tool to create FHIR profiles.

FHIR profile implementers that want to learn about Trifolia.

- An introduction to the FHIR and the StructureDefinition resource (used when creating FHIR profiles)
- An brief introduction to Trifolia for new users
- Using Trifolia to create profiles on FHIR resources
- Using the Trifolia REST API
- Future work, known bugs, etc.
- Q&A

FHIR AND THE STRUCTURE DEFINITION RESOURCE

F – Fast (to design & to implement)

Relative – No technology can make integration as fast as we'd like

H – Health

Area of focus for HL7

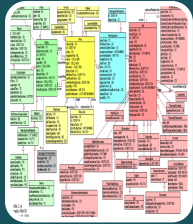
I – Interoperable

Purpose of HL7

R – Resources

Building blocks – more on these to follow

- **Focus on Implementers**
- **Target support for common scenarios**
- **Leverage cross-industry web technologies**
- **Support human-readability as the base-level for interoperability**
- **Make content freely available**
- **Support multiple paradigms & architectures**
- **Demonstrate best practice governance**



Reference Information Model

- Highly abstract
- Act, Participation, Role...



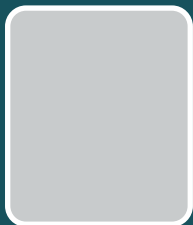
Reference Information Model

- Highly abstract
- Act, Participation, Role...



Refined Information Model

- Generic CDA
- Observation, Procedure, etc.



Templated CDA

- CCD or C-CDA or QRDA
- Allergy – Intolerance Observation, Problem Observation, etc.



Resource

- FHIR component for msg, doc
- AllergyIntolerance, Condition, etc.



Profile

- Localized resource
- DAF-AllergyIntolerance, DAF-Condition, etc.

Level of abstraction

DAF stands for Data Access Framework, a US Realm FHIR Implementation Guide

FHIR is like Lego(™) for Healthcare

Resources = Blocks

Resources are discrete chunks of clinical information

Resources can be assembled into larger constructs

You operate on resources via FHIR's REST APIs.

- Think Programming Lego Mindstorms (™)



For each resource, there is/are:

- Scope and Usage Notes
- Resource Content (UML and XML)
- Terminology Bindings
- Constraints
- Implementation Issues
- Search Parameters
- Examples, Profiles, and Formal Definitions
- Mappings to RIM, CDA, V2, etc.

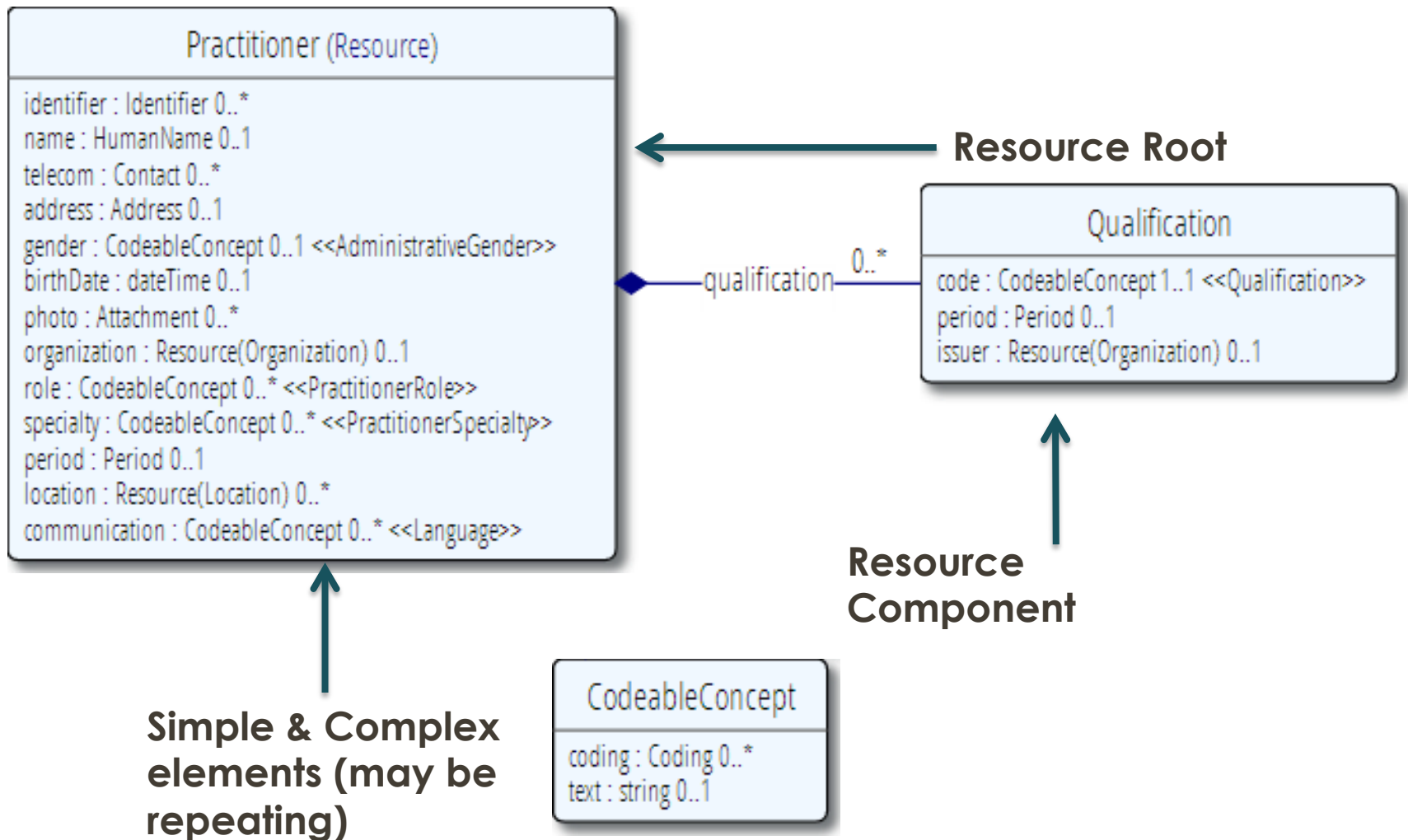
Resources have 4 main parts:



Resources are defined as an XML structure based on desired wire syntax.

- Hierarchy of Elements
- Each element has:
 - A Name
 - A Definition
 - Either a datatype or nested elements
 - Coded Elements (binding to Value Set)
 - Cardinality (all collections nested in a containing element)

Example Resource Definition



```
<Patient xmlns="http://hl7.org/fhir">
```

```
  <id value="glossy"/>
  <meta>
    <lastUpdated value="2014-11-13T11:41:00+11:00"/>
  </meta>
```

Identity & Metadata

```
  <text>
    <status value="generated"/>
    <div xmlns="http://www.w3.org/1999/xhtml">
      <p>Henry Levin the 7th</p>
      <p>MRN: 123456. Male, 24-Sept 1932</p>
    </div>
  </text>
```

Human Readable
Summary

```
  <extension url="http://example.org/StructureDefinition/trials">
    <valueCode value="renal"/>
  </extension>
```

Extension with
reference to its
definition

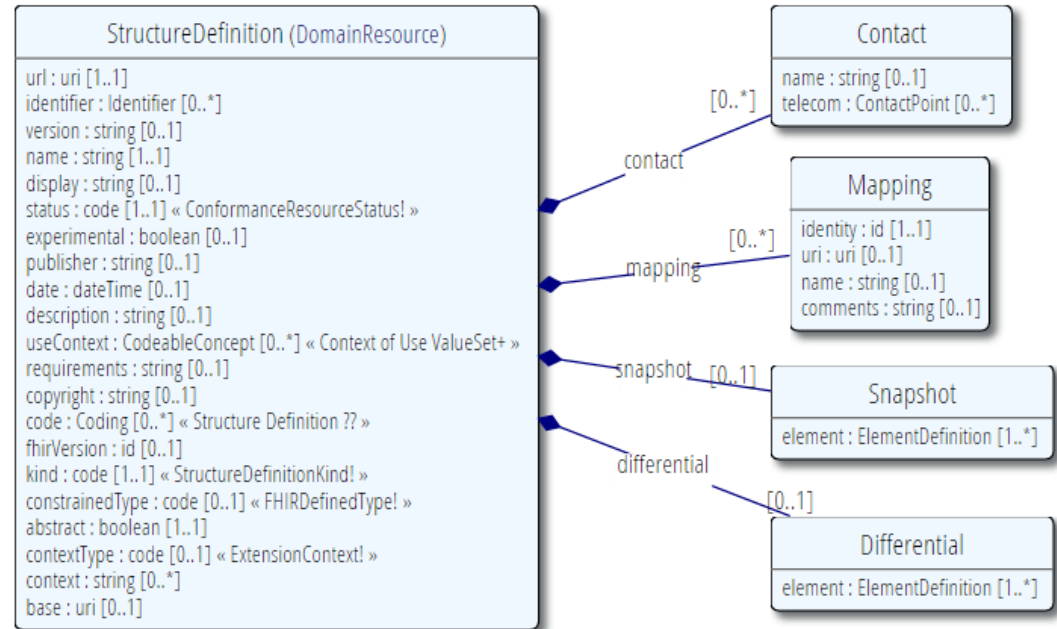
```
  <identifier>
    <use value="usual"/>
    <type>
      <coding>
        <system value="http://hl7.org/fhir/v2/0203"/>
        <code value="MR"/>
      </coding>
    </type>
    <system value="http://www.goodhealth.org/identifiers/mrn"/>
    <value value="123456"/>
  </identifier>
  <name>
    <family value="Levin"/>
    <given value="Henry"/>
    <suffix value="The 7th"/>
  </name>
  <gender value="male"/>
  <birthDate value="1932-09-24"/>
  <careProvider>
    <reference value="Organization/2"/>
    <display value="Good Health Clinic"/>
  </careProvider>
  <active value="true"/>
</Patient>
```

Standard Data
Content:

- MRN
- Name
- Gender
- Date of Birth
- Provider

Profiles and the Structure Definition Resource

- Profiles in FHIR are like Templates in CDA
- The StructureDefinition Resource is the computable representation of a FHIR Profile



Changing Cardinality

- Make optional things required
- Limit repeatable or optional things to 0 or 1

Constraining References

- Require Reference types to match a specific profile

Slicing

- FHIR's mechanism for predicate logic like a SQL WHERE clause.
- Similar to "such that" constraints in CDA implementation guides.

USING TRIFOLIA TO CREATE FHIR PROFILES

Trifolia is a web-based tool for standards development work.

Basic Features:

- Enhanced Publishing Tool: Export templates/profiles as customized Word documents or FHIR StructureDefinition resources to share within and outside your organization
- Template/Profiles Versioning: View version changes in templates/profiles
- Enhanced Value Set Support: tools for editing and viewing value sets
- Template/Profile Repository: A centralized database for template/profile management
- Documentation: User guides and online help

Using the Trifolia DEV Server

<http://dev.trifolia.lantanagroup.com>

- Login using HL7 credentials just like production environment
- Beware that Trifolia's dev environment is used for testing new Trifolia features; the database may be overwritten without notice, and functionality may be broken

Creating an Implementation Guide (IG)

Trifolia requires all templates and profiles to belong to an IG.

If you don't create one, Trifolia will assign your resource to a default IG for unowned profiles.

To create an IG

- Go to the Browse menu
- Select Implementation Guides
- Click the Add button
- Fill in the form
- Save the IG

The image shows two screenshots of the Trifolia Workbench interface. The top screenshot displays the 'Browse Implementation Guides' page, which includes a search bar, a table of existing guides, and an 'Add' button. The bottom screenshot shows the 'Edit Implementation Guide' form, which has tabs for 'General', 'Template Types', 'Cardinality', 'Custom Schematron', 'Permissions', and 'Volume 1'. The 'General' tab is active, showing fields for 'Name', 'Display Name', and 'Web Display Name'.

Trifolia Workbench Home Browse Export Help Rick Geimer

Browse Implementation Guides

Search... X

Don't see the implementation guide you are looking for? [Request access here.](#)

Name ▲	Status	Publish Date	Add	
ACCF DEMO	Draft		View	Edit
ASCO Training - Lung Cancer IG	Draft		View	Edit
Alberta Transcribed Reports CDA Implementation Guide	Draft		View	Edit
BDF_CCDA	Draft		View	Edit
BORNA-EREFERRAL-IG Date = 2015-02-13 Version = 1	Draft		View	Edit

Trifolia Workbench Home Browse Export Help Rick Geimer

Edit Implementation Guide

General Template Types Cardinality Custom Schematron Permissions Volume 1

Categories

Name

My New FHIR IG

Display Name

Display name is used on many of the management screens, and in the DOCX export

Web Display Name

Web Display Name is used only by the web-based implementation guide, in the home screen's "Welcome to

Creating a Resource Profile

To create a profile

- Go to the Browse menu
- Select Templates
- Click the Add Template button
- Fill in the template form
- Go to the Constraints tab to edit cardinalities, etc.
- Save the profile

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Template Constraints Preview Validation

Name:

Name is required.

Identifier:

ID is required.

Bookmark:

Bookmark is required.

Implementation Guide: Select

Owning Implementation Guide is required.

Extensibility: Open

Save Cancel Quick Edit View Mode Analyst

Trifolia Workbench Home Browse Export Help Rick Geimer

Browse Templates

Search

Page 1 of 30, 1460 templates

Name	Identifier	Implementation Guide	Type	Add Template
BORNA-EREFERRAL-REPC_MT210001ON.Organization	urn:oid:1.3.6.1.4.1.19376.1.4.1.6.4.99.785	BORNA-EREFERRAL-IG Date = 2015-02-13 Version = 1	subentry (CDA)	View Edit
ACCF Family History	urn:oid:1.3.6.1.4.1.19376.1.4.1.6.4.99.6	ACCF DEMO	section (CDA)	View Edit
ACCF Medical History Section	urn:oid:1.3.6.1.4.1.19376.1.4.1.6.4.99.4	ACCF DEMO	section (CDA)	View Edit
ACCF Medical History Section GS	urn:oid:1.3.6.1.4.1.19376.1.4.1.6.4.99.42	ACCF DEMO	section (CDA)	View Edit

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Continuity of Care Document (CCD) (CCoF)

<http://www.hl7.org/fhir/ccof/ccd>

Template Constraints Preview Validation

Context	CONF#	Q	BR	BI	Conformance	Card.	Data Type
id					MAY	0..1	id
meta					MAY	0..1	Meta
implicitRules					MAY	0..1	uri
language					MAY	0..1	code
text					MAY	0..1	Narrative
contained					MAY	0..*	ResourceContainer
extension					MAY	0..*	Extension
modifierExtension					MAY	0..*	Extension
identifier					MAY	0..1	Identifier
date					SHALL	1..1	dateTime
type	1072		No	No	SHALL	1..1	CodeableConcept
class					MAY	0..1	CodeableConcept
title					SHALL	1..1	string
status					SHALL	1..1	CompositionStatus
confidentiality					MAY	0..1	code
subject					SHALL	1..1	Reference

Save Cancel Quick Edit View Mode Analyst

Editing an Existing Profile

To edit a profile

- Go to the Browse menu
- Select Templates
- Select a FHIR DSTU 2 resource type from the type column to filter the list.
- Click Edit next to the desired profile.
- Continue as for creating a new profile.

The screenshot shows the Trifolia Workbench interface. The top section is titled "Browse Templates" and displays a table of templates. The table has columns for Name, Identifier, Implementation Guide, and Type. The "Type" column is filtered to show "FHIR DSTU2: Composi". The table lists three templates: "Continuity of Care Document (CCD) (CCoF)", "Discharge Summary (CCoF)", and "US Realm Header (CCoF)". Each row has "View" and "Edit" buttons.

The bottom section shows the "Continuity of Care Document (CCD) (CCoF)" profile being edited. The URL is "http://www.hl7.org/fhir/ccof/ccd". The "Template" tab is selected, and a table of constraints is visible. The table has columns for Context, CONF#, Q, BR, BI, Conformance, Card, and Data Type. The "type" constraint is highlighted, showing a value of "1072".

Context	CONF#	Q	BR	BI	Conformance	Card	Data Type
id					MAY	0..1	id
meta					MAY	0..1	Meta
implicitRules					MAY	0..1	uri
language					MAY	0..1	code
text					MAY	0..1	Narrative
contained					MAY	0..*	ResourceContainer
extension					MAY	0..*	Extension
modifierExtension					MAY	0..*	Extension
identifier					MAY	0..1	Identifier
date					SHALL	1..1	dateTime
type	1072		No	No	SHALL	1..1	CodeableConcept
class					MAY	0..1	CodeableConcept
title					SHALL	1..1	string
status					SHALL	1..1	CompositionStatus
confidentiality					MAY	0..1	code
subject					SHALL	1..1	Reference

The right side of the screenshot shows the "type" constraint being edited. The value "1072" is entered in the input field. Below the input field, there are several dropdown menus and checkboxes for configuration, including "ConfCard" (set to SHALL), "Data Type" (set to DEFAL), "Binding Type" (set to Single Value), and "Code System" (set to LOINC). A preview of the constraint is shown at the bottom right.

Trifolia Profiling Demo

Live demo

- Modify a resource

The screenshot shows the Trifolia Workbench interface. At the top, there is a navigation bar with the text "Trifolia Workbench" on the left and several menu items on the right: "Home", "Browse" (with a dropdown arrow), "Export" (with a download icon), "Help" (with a question mark icon), and "Rick Geimer" (with a dropdown arrow). Below the navigation bar, the main content area starts with a "Welcome to Trifolia Workbench!" message. This is followed by a "Did you know?" section with a tip about requesting access to implementation guides. Next is the "Version 2.19" section, followed by a "Web-based IG" section that explains how to generate and view web-based implementation guides. Below that is the "Create sections for the 'Overview' of an IG" section, which mentions the wysiwyg editor. The final section is "Edit Implementation Guide", which features a horizontal tabbed interface with tabs for "General", "Template Types", "Cardinality", "Custom Schematron", "Permissions", "Volume 1", and "Categories". The "Volume 1" tab is currently selected. Underneath the tabs, there is a "Type" label and a dropdown menu that currently displays "Defined Sections".

THE TRIFOLIA FHIR REST API

Using the Trifolia DEV FHIR Endpoint

<http://dev.trifolia.lantanagroup.com/api/FHIR2>

- Login using HL7 credentials just like production environment
- Beware that Trifolia's dev environment is used for testing new Trifolia features; the database may be overwritten without notice, and functionality may be broken

Getting a Trifolia API Key

The Trifolia REST API requires an API Key.

To get a key:

- Under your user name at the top right, select My Profile
- Scroll down to API Key and click Generate.
- Save the API Key to your profile by clicking the “Save” button at the bottom
- Scroll down to “Generate authorization header...” and click the Generate button.
- Use the auth header in the Authorization Bearer HTTP header in your REST calls.
- **Note that the auth header will expire in 5 minutes.**

The screenshot shows the Trifolia Workbench interface. At the top, there's a navigation bar with 'Home', 'Browse', 'Export', 'Help', and 'Rick Geimer'. The main content area is titled 'My Profile' and contains a form with the following fields:

- User Name:** 23889
- Account Organization:** HL7
- First Name:** Rick
- Last Name:** Geimer

Below the profile information, there's a section for the 'API Key'. It shows a generated key: 'e29c31f9-cd56-c0a3-1f67-e093b6cd21de'. A 'Generate' button is visible next to the key.

Underneath, there's a section titled 'Using the API Key' which explains that the API key is used to authorize requests to the Trifolia REST API. It provides instructions on how to generate the Authorization header for REST calls. The instructions are as follows:

1. Create a string in the following format: "UserName/OrganizationName/TimeStamp/Salt/APIKey"
 - **UserName:** The username associated with your account
 - **OrganizationName:** The name of the organization in Trifolia associated with your account (ex: "LOG" or "HL7")
 - **TimeStamp:** Time, in milliseconds, from 1/1/1970
 - **Salt:** Any random number for salting the hash in the next step
 - **APIKey:** e29c31f9-cd56-c0a3-1f67-e093b6cd21de
2. Encrypt the string using a SHA1 hash
3. Create a new string in the following format: "UserName/OrganizationName/TimeStamp/Salt/Hash"
 - **Hash:** The hash generated from the previous step
4. Base64 encode the string and send it in the Authorization header in the following format: "Bearer BASE64String"

Below the instructions, there's a code block for Node JS and JavaScript. The code defines a function to generate the authorization header based on the provided API key. The function takes the API key as input and returns the authorization header. The generated header is: "Bearer e29c31f9-cd56-c0a3-1f67-e093b6cd21de".

```
var crypto = require('crypto');
function generateAuthorizationHeader(userName, accountOrganization, apiKey) {
  var timestamp = Date.now();
  var salt = Math.random();
  var properties = username + '|' + accountOrganization + '|' + timestamp + '|' + salt + '|';
  var hashContent = properties + apiKey;
  var authBasicValue = properties + crypto.createHash('sha1').update(hashContent).digest('base64');
  var hashedBasicValue = new Buffer(authBasicValue).toString('base64');
  var authorizationHeader = "Bearer " + hashedBasicValue;
  return authorizationHeader;
}
var authorizationHeader = generateAuthorizationHeader('23889', 'HL7', 'e29c31f9-cd56-c0a3-1f67-e093b6cd21de');
```

At the bottom of the page, there's a 'Save' button and a checkbox for 'It is OK to contact me.'

GET, POST, and PUT are supported on the following resources

- StructureDefinition
- Implementation Guide
- Value Set

Live demo

- Use GET to retrieve a resource

Trifolia Workbench Home Browse Export Help Rick Geimer

Welcome to Trifolia Workbench!

Did you know?

If you don't have access to an implementation guide, you may be able to "Request Access" to the implementation guide view the "Browse Implementation Guides" screen. Requesting access sends a notification email to the access manager of the implementation guide.

Version 2.19

Web-based IG

Trifolia can now generate a web-based IG. You can view the web-based IG in real-time while the IG is being developed, or you can generate a JSON snapshot of the data in the IG and generate a URL in Trifolia that represents that specific point-in-time snapshot of the IG. The IG can be viewed directly within the Trifolia web application, or it can be downloaded for offline viewing.

Create sections for the "Overview" of an IG

You can either specify plain HTML or use the wysiwyg editor to create the content of the section in the Edit Implementation Guide screen

Edit Implementation Guide

[General](#) [Template Types](#) [Cardinality](#) [Custom Schematron](#) [Permissions](#) [Volume 1](#) [Categories](#)

Type

Defined Sections

Known Bugs and Limitations in Trifolia

- Most of the labeling in Trifolia uses CDA terms like templates, etc. even when profiling FHIR resources (i.e., Add Template instead of Add Template/Profile).
- Trifolia does not yet support FHIR's choice syntax (i.e., deceased[x]).
- No way to import FHIR profiles using the UI.
- Some syntax bugs in Trifolia's StructureDefinition export.

Consolidated CDA (C-CDA) on FHIR

The HL7 Structured Documents Working Group is currently creating FHIR profiles for C-CDA Release 2.1.

The work is proceeding using multiple tools including

- Trifolia (Lantana)
- Forge (Furore)
- FHIR Profiling Spreadsheets (part of the FHIR build process)

The interoperability goal:

- By completion, all profiles will be interoperable between multiple tools and integrate seamlessly with the FHIR build process.

Calls are every Wednesday at 3pm ET. See the HL7 Conference Call Center for more details.

Questions?