

Inferno Tech Talk – Jan 2024

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MITRE | SOLVING PROBLEMS
FOR A SAFER WORLD™

Inferno Tech Talk Introduction

- Purpose: to provide regularly scheduled updates on the Inferno tool and its implementation of the (g)(10) test procedure
- Typical agenda to include:
 - Announcements about upcoming releases
 - Training on new features
 - Highlight outstanding issues or known problems
 - Open discussion
- Monthly recurrence: 2nd Wednesday at 1PM ET

Content reflects Inferno's implementation of applicable Test Procedure and does not necessarily reflect ONC policy.

Today's Agenda

- (g)(10) Standardized API Test Kit v5.0.0
- Preview of Site Redesigns:
 - Inferno on HealthIT.gov
 - Inferno Framework Home

ONC (g)(10) Standardized API Test Kit v5.0.0

- Approved Standard Update:
 - Removal of **US Core v5 / USCDI v2**
- Test Update:
 - Changes that may result in new failure: **1**

Approved Standards Update

- Removes US Core v5 / USCDI v2
- ONC requirement to remove this option for new certifications starting this month

← Options

US Core Version

US Core 3.1.1 / USCDI v1

US Core 4.0.0 / USCDI v1

US Core 6.1.0 / USCDI v3

SMART App Launch Version

SMART App Launch 1.0.0

SMART App Launch 2.0.0

Bulk Data Version

Bulk Data 1.0.1

Bulk Data 2.0.0

START TESTING

Changes that may result in new failures

- Previous version incorrectly omitted a required check for SMART App EHR Launch Encounter context when using US Core v6.1.0
- Added this check: it is the same as when users selected US Core 5

The screenshot displays the ONC Certification (g)(10) Standardized API v.5.0.0 interface. The top header includes the title and version, along with a 'NEW SESSION' button. Below the header, there is a 'Preset' dropdown menu set to 'None'. The main content area is divided into two columns. The left column lists various application types, with '3 EHR Practitioner App' highlighted in orange. A blue arrow points from this highlighted option to the right column, which lists several checks. The check '3.3.16 OAuth token exchange response body contains encounter context and encounter resource can be retrieved' is the one being highlighted by the arrow. Other checks include '3.3.10 User-level access with OpenID Connect and Refresh Token scopes used.', '3.3.11 Server rejects unauthorized access', '3.3.12 OAuth token exchange response body contains patient context and patient resource can be retrieved', '3.3.14 Launch context contains smart_style_url which links to valid JSON', '3.3.15 Launch context contains need_patient_banner', and '3.5 OpenID Connect'. The bottom of the interface features the 'INFERN' logo, version information 'BUILT WITH V.0.4.26 | API', and links for 'Report Issue', 'Open Source', and 'Download'.

Inferno Redesign Preview

inferno.healthit.gov

These reference applications are provided by ONC for demonstration only. Do not use to access sensitive data or Protected Health Information (PHI). Test sessions without testing activity for two months are removed. HHS Privacy Policy | HHS Vulnerability Disclosure Policy

HealthIT.gov

INFERNO

Inferno Framework is a rigorous and extensible testing development framework for HL7® FHIR® and beyond.

This is an instance of Inferno hosted by ONC for purposes of testing for the ONC Health IT Certification Program and to support community-driven health IT standards development projects. You can build your own tests using Inferno Framework and host your own local instance of Inferno by following the instructions in "Inferno Development Framework" below.

ANNOUNCEMENTS

1/10/2024 - Join us at the Inferno tech talk on the second Wednesday of every month at 1pm ET [here!](#)

ONC HOSTED TESTS AND UTILITIES

ONC Health IT Certification Program

ONC maintains and hosts an open source certification testing kit for systems seeking to meet the requirements of the Standardized API for Patient and Population Services criterion § 170.315(g)(10) in the 2015 Edition Cures Update.

[\(g\)\(10\) Standardized API Test Kit](#)

[Download](#)

INFERNO DEVELOPMENT FRAMEWORK

Inferno Framework

The Inferno Framework is a standards conformance testing framework. You can use it to develop tests for your own use cases, like HL7 FHIR implementation Guide conformance testing.

The building blocks of Inferno Framework include 'Inferno Core' and 'Test Kits'. You can get started building your own tests using the "Test Kit" template repository on [Github here](#).

ONC-hosted testing for select Inferno tests

(e.g. (g)(10) Standardized API)

inferno-framework.github.io

Inferno Framework Documentation

Search Inferno Framework Documentation [Ruby API Docs](#) [JSON API Swagger Docs](#)

Inferno Framework

Everything you need to create, execute and share tests for health IT systems providing HL7® FHIR® standard APIs.

[Get started now](#) [Read the Docs](#) [View it on GitHub](#)

Simple to Read, Simple to Write

Inferno tests are written in a Ruby DSL, with a focus on readability. Inferno provides tools for easily testing FHIR APIs, including robust support for FHIR Resource validation.

```
test do
  title 'Server returns requested Patient resource from the Patient read interaction'
  description %(
    Verify that Patient resources can be read from the server.
  )

  input :patient_id
  # Named requests can be used by other tests
  makes_request :patient

  run do
    fhir_read(:patient, patient_id, name: :patient)

    assert_response_status(200)
    assert_resource_type(:patient)
    assert_resource.id == patient_id,
      "Requested resource with id #{patient_id}, received resource with id #{resource.id}"
  end
end
```

Inferno Documentation, including how to create your own tests

Redesign Goals

- Improve design & visually refresh both sites
- Better differentiate sites and their purposes
- Expand content and consolidate information across multiple channels
- Lay foundation for future content and improvements
- Minimally disrupt existing workflows and users

Preview available today – Release Planned for February 13

Preview at <https://inferno-qa.healthit.gov>

Inferno on HealthIT.gov

ONC-Hosted Inferno Test Site

inferno.healthit.gov Redesign

Landing Page

1. Distinct branding for **Inferno on HealthIT.gov**
2. Important links to get started do not require scrolling
3. Explanatory “What is Inferno?” and News/Events below the fold

Preview at <https://inferno-qa.healthit.gov>

INFERNO
on HealthIT.gov

Test Kits News & Updates Events About

Inferno on HealthIT.gov is for demonstration only. Not for use with sensitive data or Protected Health Information (PHI). Data periodically removed. ⓘ

Inferno on HealthIT.gov

HL7® FHIR® Testing by The Office of the National Coordinator for Health IT

Inferno on HealthIT.gov is a public service for running select FHIR conformance tests built with [Inferno](#). This includes tests relevant to the ONC Health IT Certification Program and tests that target other popular FHIR Implementation Guides.

[Learn More](#) [Start Testing Now](#)

ONC Health Certification Program

Evaluate a publicly accessible test server to the ONC (g)(10) Standardized API Certification Criterion using this public testing instance of Inferno.

[ONC \(g\)\(10\) Standardized Test Kit](#)

FHIR Resource Validator

Validate individual FHIR Resources to the base FHIR specification or specific FHIR Profiles

[Open Validator](#)

What is Inferno?

Open Source FHIR Testing

Inferno is an [open source](#) tool for creating, executing and sharing automated conformance tests for the FHIR Standard. Inferno on HealthIT.gov hosts several tests created with Inferno, but Inferno is designed so anyone can create and host their own tests.

Start Testing Today

Inferno on HealthIT.gov is a public host for the [\(g\)\(10\) Standardized API Test Kit](#), which is an approved test method for the [§170.315\(g\)\(10\) criterion](#) within the ONC Certification Program. It also contains tests for several popular FHIR Implementation Guides. Browse the [Test Kit](#) page for a list of tests that are currently available.

Create your own tests

Inferno is as flexible as the FHIR standard, and tests need to be created for each unique FHIR use case. The Inferno Framework provides tools and common approaches to testing systems for FHIR conformance. Visit the [Inferno Framework Documentation Site](#) to learn more.

[Run your own Inferno Instance](#) [Integrate with Inferno](#) [Additional Tools](#)

inferno.healthit.gov Redesign

Test Kit Listing Page

1. Tests are organized by Test Kits, which aligns with fundamental Inferno packaging strategy
2. Description, Last Updated and other metadata provided
3. Search/Filter added to accommodate growing list of test kits available on this host
4. "Your Recent Sessions"

Preview at <https://inferno-qa.healthit.gov>

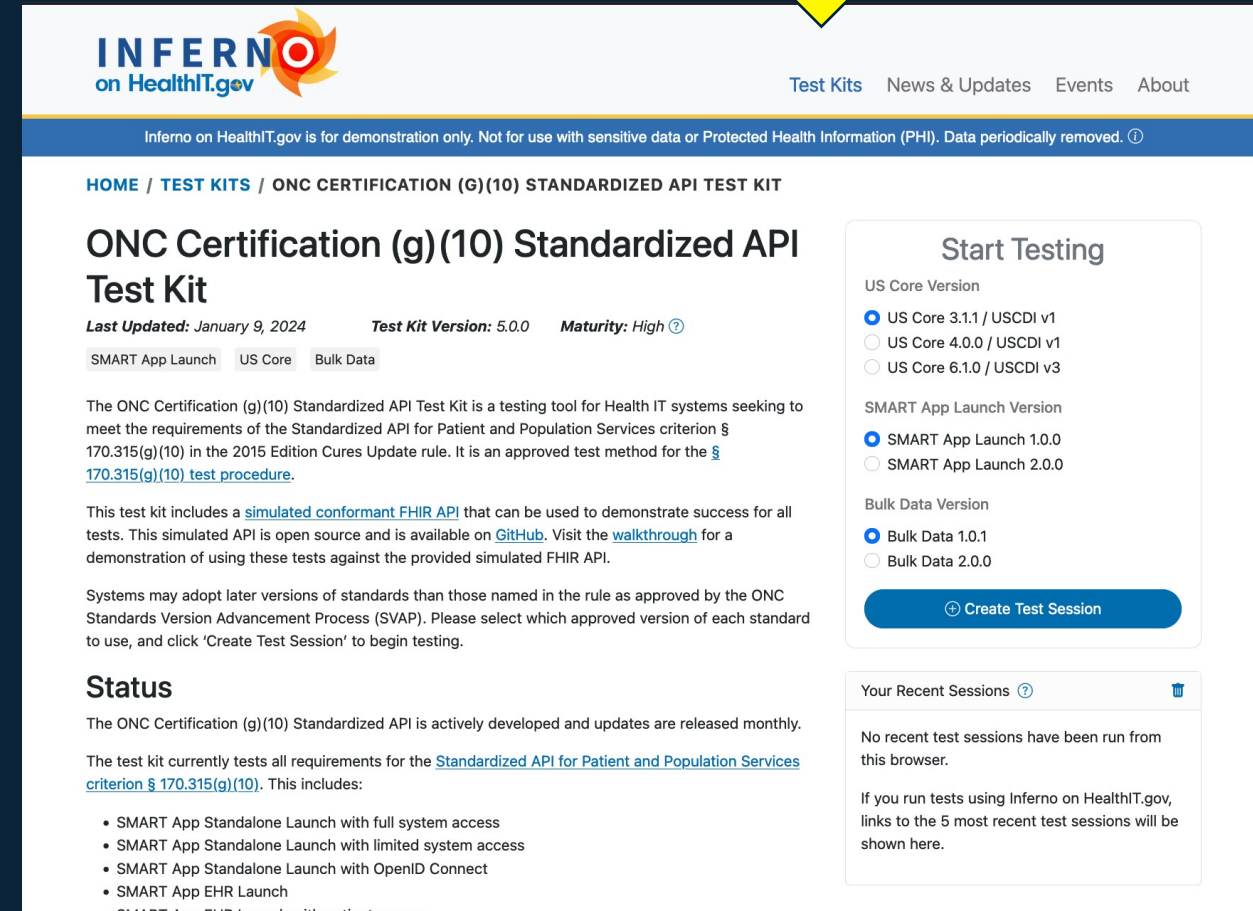
The screenshot shows the 'Test Kits' page on the inferno.healthit.gov website. The page has a white header with the 'INFERNO on HealthIT.gov' logo and navigation links for 'Test Kits', 'News & Updates', 'Events', and 'About'. A blue banner below the header contains a disclaimer: 'Inferno on HealthIT.gov is for demonstration only. Not for use with sensitive data or Protected Health Information (PHI). Data periodically removed.' The main content area is titled 'HOME / TEST KITS' and includes a search bar and two filter dropdowns: 'Standard' (set to 'All Standards') and 'Test Kit Maturity' (set to 'All Levels'). Below the filters, there are four test kit listings, each with a title, description, and metadata (e.g., 'Updated', 'Version', 'Maturity'). The first listing is 'ONC Certification (g)(10) Standardized API Test Kit'. The second is 'UDS+ Test Kit'. The third is 'US Core Test Kit'. The fourth is 'International Patient Access Test Kit'. On the right side, there is a sidebar with two sections: 'Select a Test Kit to Start Testing' and 'Your Recent Sessions'. The 'Your Recent Sessions' section shows 'No recent test sessions have been run from this browser.'

inferno.healthit.gov Redesign

Test Kit Page

1. New view with overview of the Test Kit and provides a permanent URL
2. Provides metadata such as version, maturity, last updated
3. Flexibility to provide extended content and links

Preview at <https://inferno-qa.healthit.gov>



The screenshot shows the 'Test Kit Page' for 'ONC Certification (g)(10) Standardized API Test Kit'. The page features a navigation bar with 'Test Kits', 'News & Updates', 'Events', and 'About'. A yellow arrow points to the 'Test Kits' link. Below the navigation bar, a blue banner contains the text: 'Inferno on HealthIT.gov is for demonstration only. Not for use with sensitive data or Protected Health Information (PHI). Data periodically removed.' The main content area includes a breadcrumb trail: 'HOME / TEST KITS / ONC CERTIFICATION (G)(10) STANDARDIZED API TEST KIT'. The title is 'ONC Certification (g)(10) Standardized API Test Kit'. Metadata includes 'Last Updated: January 9, 2024', 'Test Kit Version: 5.0.0', and 'Maturity: High'. There are three tabs: 'SMART App Launch', 'US Core', and 'Bulk Data'. The main text describes the test kit as a tool for Health IT systems seeking to meet the requirements of the Standardized API for Patient and Population Services criterion § 170.315(g)(10) in the 2015 Edition Cures Update rule. It is an approved test method for the § 170.315(g)(10) test procedure. The text also mentions a simulated conformant FHIR API that can be used to demonstrate success for all tests. This simulated API is open source and is available on GitHub. Visit the walkthrough for a demonstration of using these tests against the provided simulated FHIR API. Systems may adopt later versions of standards than those named in the rule as approved by the ONC Standards Version Advancement Process (SVAP). Please select which approved version of each standard to use, and click 'Create Test Session' to begin testing. The 'Status' section states that the ONC Certification (g)(10) Standardized API is actively developed and updates are released monthly. The test kit currently tests all requirements for the Standardized API for Patient and Population Services criterion § 170.315(g)(10). This includes:

- SMART App Standalone Launch with full system access
- SMART App Standalone Launch with limited system access
- SMART App Standalone Launch with OpenID Connect
- SMART App EHR Launch
- SMART App EHR Launch with patient scopes

On the right side, there is a 'Start Testing' section with three radio button options for 'US Core Version': 'US Core 3.1.1 / USCDI v1' (selected), 'US Core 4.0.0 / USCDI v1', and 'US Core 6.1.0 / USCDI v3'. Below this are two sections for 'SMART App Launch Version' and 'Bulk Data Version', each with two radio button options. A blue button labeled '+ Create Test Session' is located below these options. At the bottom right, there is a 'Your Recent Sessions' section with a question mark icon and a trash icon. It states: 'No recent test sessions have been run from this browser. If you run tests using Inferno on HealthIT.gov, links to the 5 most recent test sessions will be shown here.'

inferno.healthit.gov Redesign

Test Session Interface

1. No changes except for banner on top
2. URLs from previous release are unchanged and should still function

Preview at <https://inferno-qa.healthit.gov>

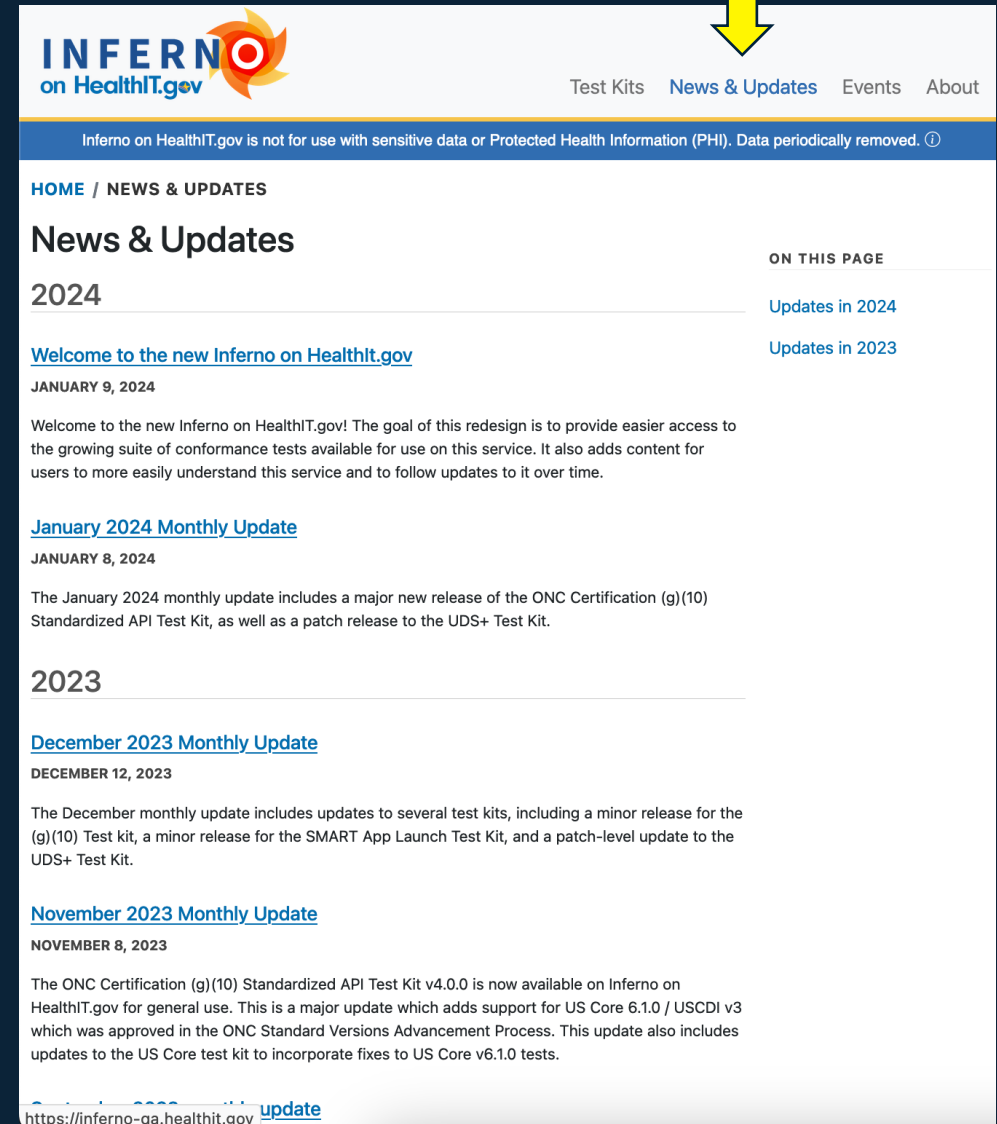
The screenshot shows the HealthIT.gov logo and navigation links (HHS Privacy Policy, HHS Vulnerability Disclosure Policy) at the top. A blue banner states: "Inferno on HealthIT.gov is for demonstration only. Not for use with sensitive data or Protected Health Information (PHI). Data periodically removed." Below this, the page title is "ONC Certification (g)(10) Standardized API v.5.0.0" with a "NEW SESSION" button. The main content area is divided into a left sidebar and a main panel. The sidebar lists test categories: "(g)(10) Standardized API" (selected), "1 Standalone Patient App", "2 Limited Access App", "3 EHR Practitioner App", "4 Single Patient API", "7 Multi-Patient API", "9 Additional Tests" (expanded to show sub-items 9.1-9.10), and "Report". The main panel features a "RUN ALL TESTS" button and introductory text: "The ONC Certification (g)(10) Standardized API Test Kit is a testing tool for Health Level 7 (HL7®) Fast Healthcare Interoperability Resources (FHIR®) services seeking to meet the requirements of the Standardized API for Patient and Population Services criterion § 170.315(g)(10) in the 2015 Edition Cures Update." It provides registration instructions and URLs for SMART App and JWK Set. A list of test options is shown: "1 Standalone Patient App - Full Access", "2 Standalone Patient App - Limited Access", "3 EHR Practitioner App", "4 Single Patient API (US Core 3.1.1)", "7 Multi-Patient Authorization and API", and "9 Additional Tests". The footer includes "INFERNO BUILT WITH V.0.4.26 API" and links for "Report Issue", "Open Source", and "Download".

inferno.healthit.gov Redesign

News & Updates

1. Each deployment will have a news entry providing an overview of what has changed
2. Additional news will be provided as relevant

Preview at <https://inferno-qa.healthit.gov>



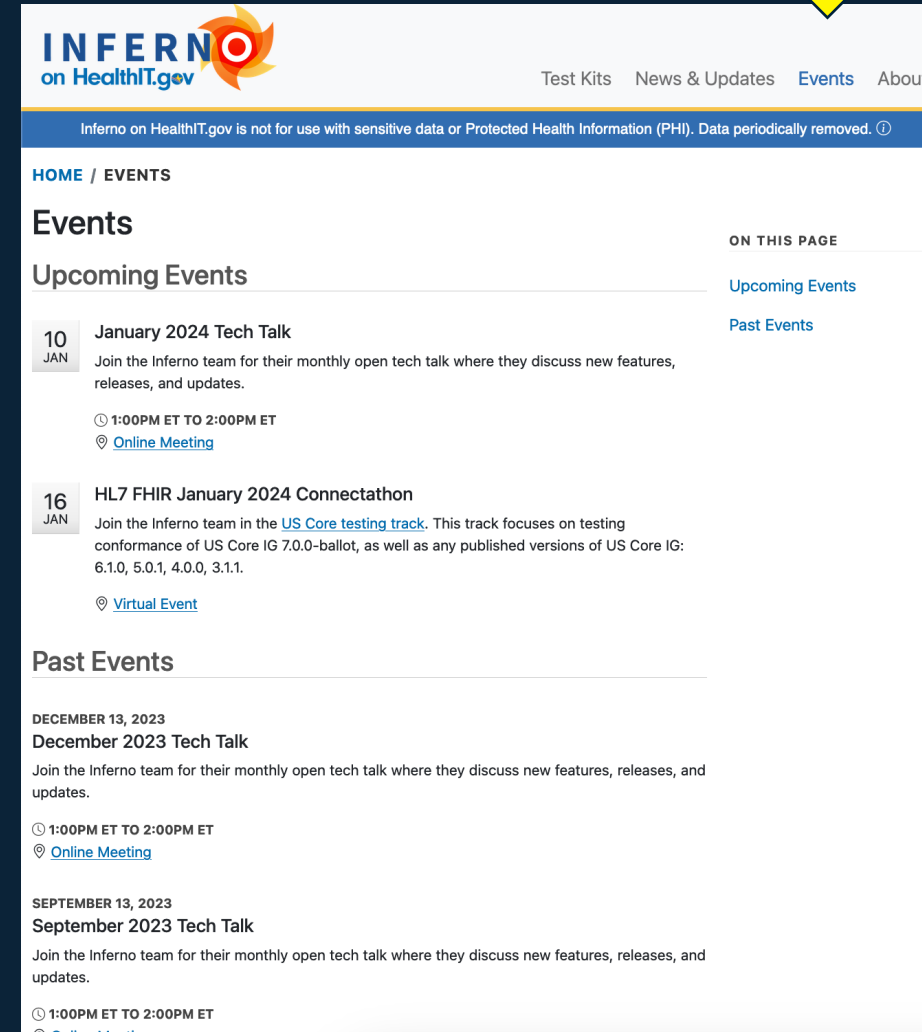
The screenshot shows the 'inferno.healthit.gov' website. The top navigation bar includes 'Test Kits', 'News & Updates', 'Events', and 'About'. A yellow arrow points to the 'News & Updates' link. Below the navigation bar is a blue banner with the text: 'Inferno on HealthIT.gov is not for use with sensitive data or Protected Health Information (PHI). Data periodically removed. ⓘ'. The main content area is titled 'HOME / NEWS & UPDATES' and 'News & Updates'. On the right side, there is a section 'ON THIS PAGE' with links for 'Updates in 2024' and 'Updates in 2023'. The main content is organized by year, starting with '2024'. Under '2024', there are three news entries: 'Welcome to the new Inferno on Healthit.gov' (dated JANUARY 9, 2024), 'January 2024 Monthly Update' (dated JANUARY 8, 2024), and 'December 2023 Monthly Update' (dated DECEMBER 12, 2023). Each entry provides a brief overview of the update. The 'November 2023 Monthly Update' (dated NOVEMBER 8, 2023) is also visible. The URL at the bottom of the page is <https://inferno-qa.healthit.gov/update>.

inferno.healthit.gov Redesign

Events

1. Provides information about upcoming events; such as Tech Talks & Test Event participation
2. Provides a history of events and relevant content

Preview at <https://inferno-qa.healthit.gov>

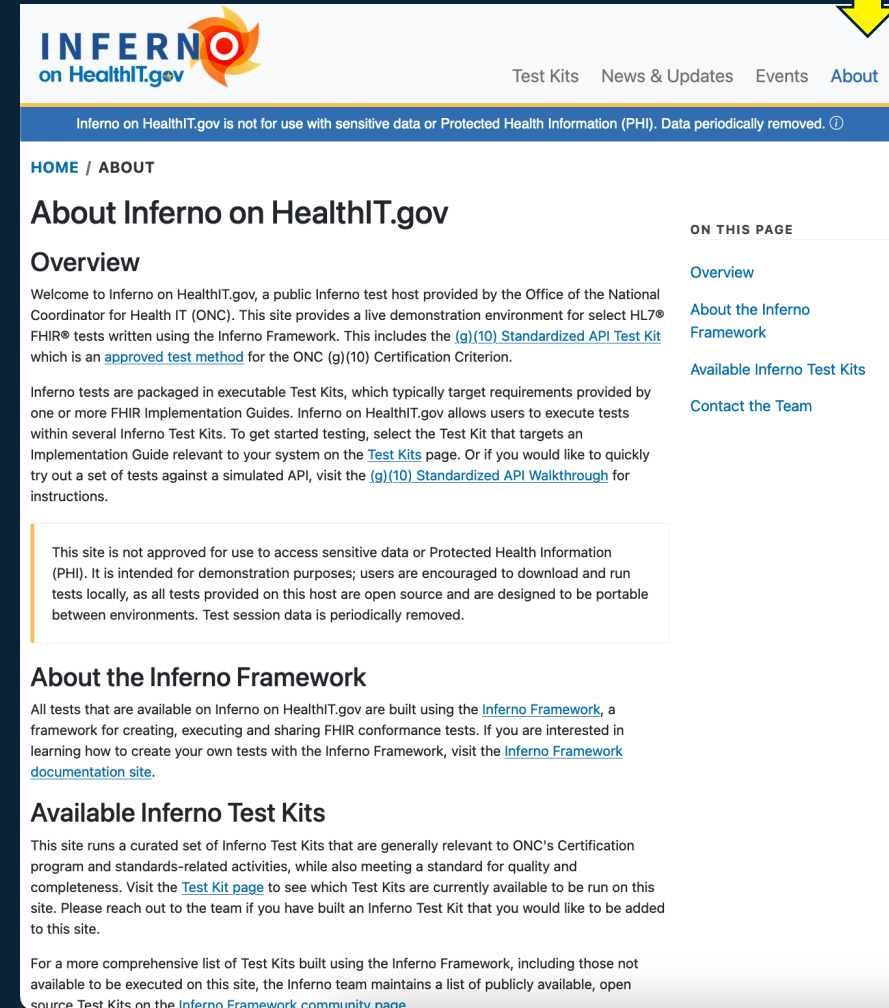


The screenshot shows the 'Events' page on the inferno.healthit.gov website. The page features a header with the 'INFERNO on HealthIT.gov' logo and navigation links for 'Test Kits', 'News & Updates', 'Events', and 'About'. A blue banner below the header states: 'Inferno on HealthIT.gov is not for use with sensitive data or Protected Health Information (PHI). Data periodically removed.' The main content area is titled 'HOME / EVENTS' and 'Events'. It is divided into 'Upcoming Events' and 'Past Events'. Under 'Upcoming Events', there are two entries: 'January 2024 Tech Talk' (10 JAN) and 'HL7 FHIR January 2024 Connectathon' (16 JAN). Under 'Past Events', there are two entries: 'December 2023 Tech Talk' (DECEMBER 13, 2023) and 'September 2023 Tech Talk' (SEPTEMBER 13, 2023). Each event entry includes a brief description, time, and a link to the event. A yellow arrow points to the 'Events' link in the top navigation bar.

inferno.healthit.gov Redesign

About

1. Provides overview of Inferno on HealthIT.gov and the Inferno Framework



INFERNO
on HealthIT.gov

Test Kits News & Updates Events About

Inferno on HealthIT.gov is not for use with sensitive data or Protected Health Information (PHI). Data periodically removed. ⓘ

HOME / ABOUT

About Inferno on HealthIT.gov

Overview

Welcome to Inferno on HealthIT.gov, a public Inferno test host provided by the Office of the National Coordinator for Health IT (ONC). This site provides a live demonstration environment for select HL7® FHIR® tests written using the Inferno Framework. This includes the [\(g\)\(10\) Standardized API Test Kit](#) which is an [approved test method](#) for the ONC (g)(10) Certification Criterion.

Inferno tests are packaged in executable Test Kits, which typically target requirements provided by one or more FHIR Implementation Guides. Inferno on HealthIT.gov allows users to execute tests within several Inferno Test Kits. To get started testing, select the Test Kit that targets an Implementation Guide relevant to your system on the [Test Kits](#) page. Or if you would like to quickly try out a set of tests against a simulated API, visit the [\(g\)\(10\) Standardized API Walkthrough](#) for instructions.

This site is not approved for use to access sensitive data or Protected Health Information (PHI). It is intended for demonstration purposes; users are encouraged to download and run tests locally, as all tests provided on this host are open source and are designed to be portable between environments. Test session data is periodically removed.

About the Inferno Framework

All tests that are available on Inferno on HealthIT.gov are built using the [Inferno Framework](#), a framework for creating, executing and sharing FHIR conformance tests. If you are interested in learning how to create your own tests with the Inferno Framework, visit the [Inferno Framework documentation site](#).

Available Inferno Test Kits

This site runs a curated set of Inferno Test Kits that are generally relevant to ONC's Certification program and standards-related activities, while also meeting a standard for quality and completeness. Visit the [Test Kit page](#) to see which Test Kits are currently available to be run on this site. Please reach out to the team if you have built an Inferno Test Kit that you would like to be added to this site.

For a more comprehensive list of Test Kits built using the Inferno Framework, including those not available to be executed on this site, the Inferno team maintains a list of publicly available, open source Test Kits on the [Inferno Framework community page](#).

ON THIS PAGE

- [Overview](#)
- [About the Inferno Framework](#)
- [Available Inferno Test Kits](#)
- [Contact the Team](#)

Preview at <https://inferno-qa.healthit.gov>

Preview at https://inferno-framework.github.io/index_new.html

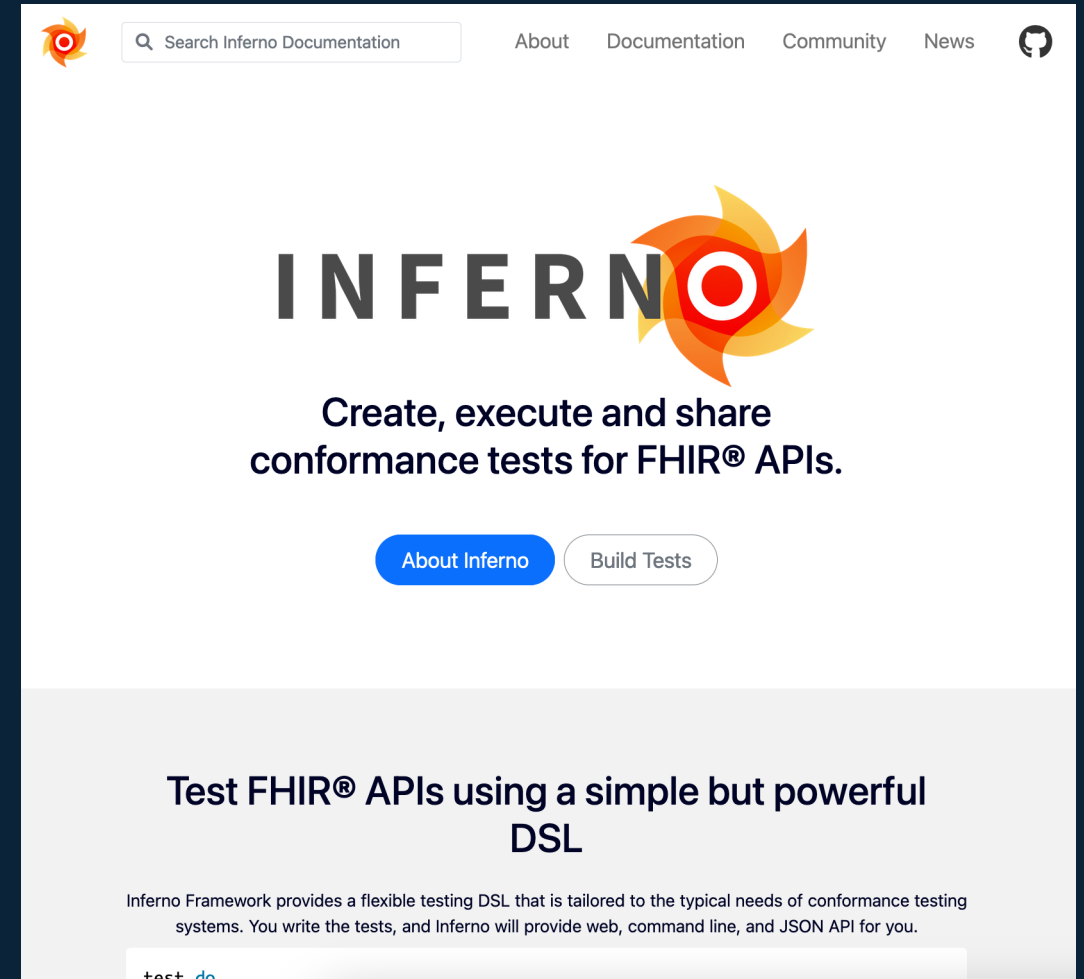
Inferno Framework Home

Inferno Documentation and Community Hub

inferno-framework.github.io

Overview

1. Provides documentation on how to use Inferno to create and run tests; and how to participate in development
2. Not a host for executing tests

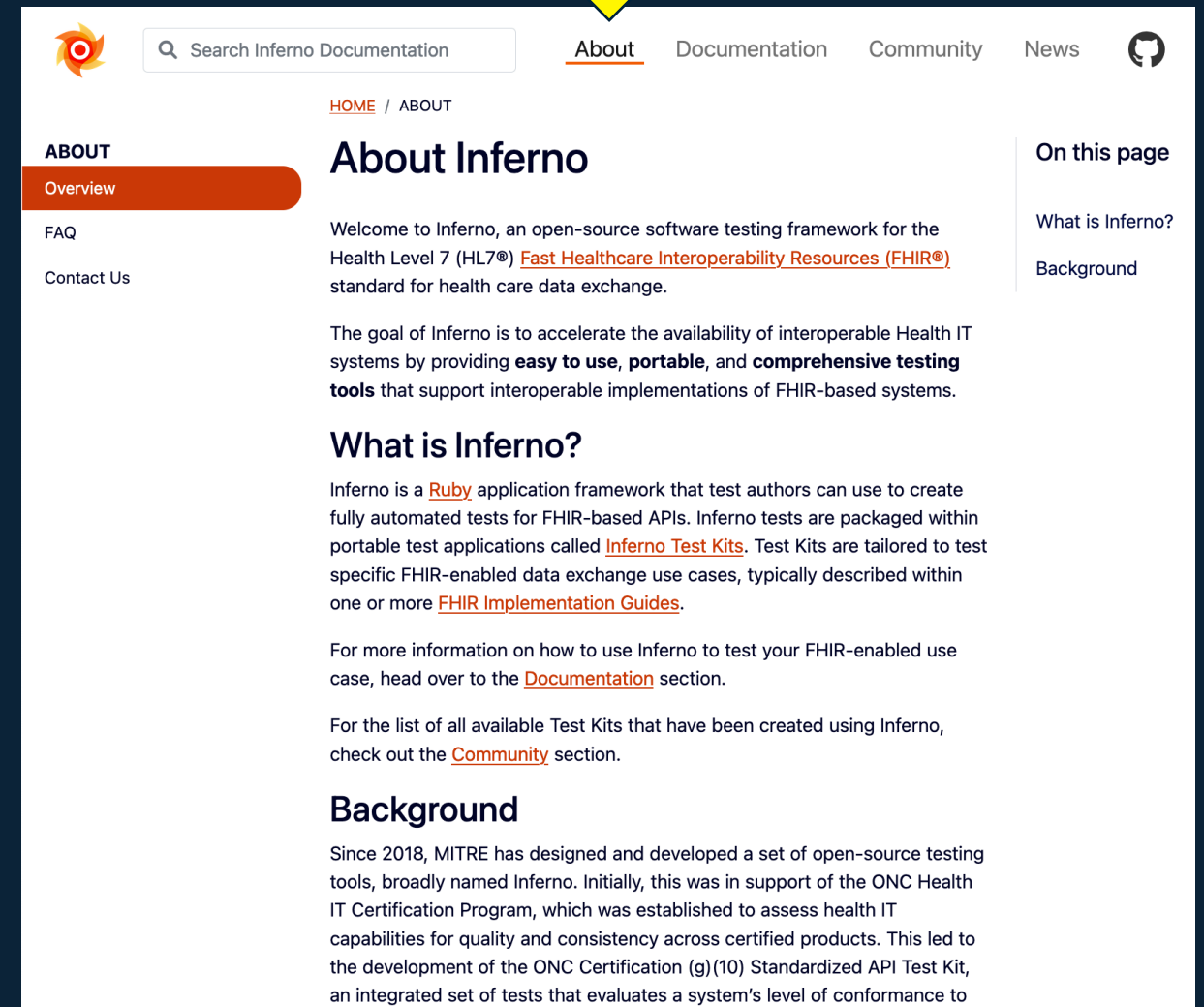


Preview at https://inferno-framework.github.io/index_new.html

inferno-framework.github.io

About

1. Explanatory content for Inferno
2. Provides FAQ
3. Contact Information



The screenshot shows the 'About' page of the Inferno framework. The page features a navigation bar with a search box and links for 'About', 'Documentation', 'Community', and 'News'. A yellow arrow points to the 'About' link. The main content area includes a sidebar with 'ABOUT' (Overview, FAQ, Contact Us) and a main section titled 'About Inferno'. The 'About Inferno' section contains a welcome message, a description of the framework's goal, and a 'What is Inferno?' section. The 'Background' section at the bottom describes the framework's development by MITRE.

About Inferno

Welcome to Inferno, an open-source software testing framework for the Health Level 7 (HL7®) [Fast Healthcare Interoperability Resources \(FHIR®\)](#) standard for health care data exchange.

The goal of Inferno is to accelerate the availability of interoperable Health IT systems by providing **easy to use**, **portable**, and **comprehensive testing tools** that support interoperable implementations of FHIR-based systems.

What is Inferno?

Inferno is a [Ruby](#) application framework that test authors can use to create fully automated tests for FHIR-based APIs. Inferno tests are packaged within portable test applications called [Inferno Test Kits](#). Test Kits are tailored to test specific FHIR-enabled data exchange use cases, typically described within one or more [FHIR Implementation Guides](#).

For more information on how to use Inferno to test your FHIR-enabled use case, head over to the [Documentation](#) section.

For the list of all available Test Kits that have been created using Inferno, check out the [Community](#) section.

Background

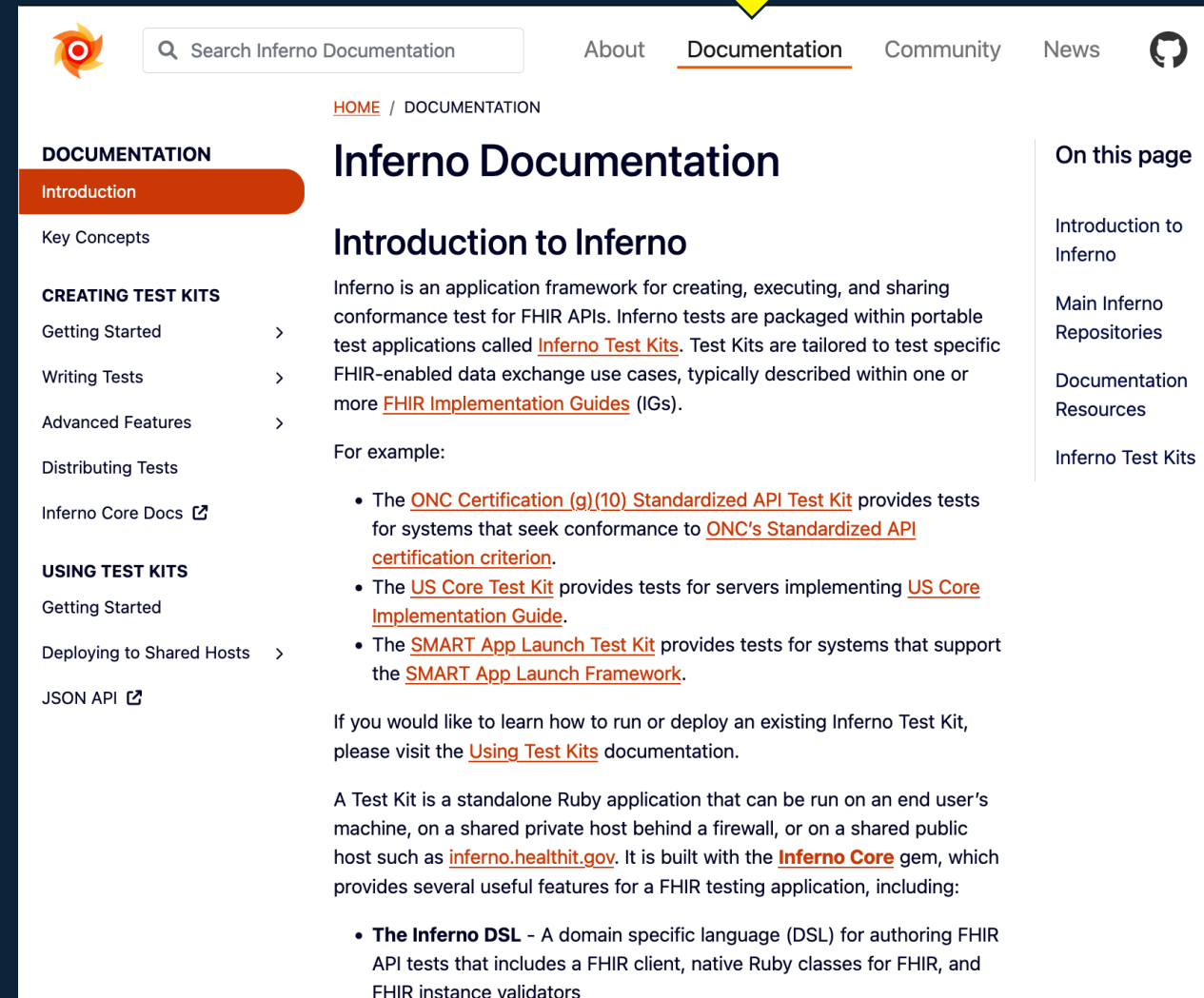
Since 2018, MITRE has designed and developed a set of open-source testing tools, broadly named Inferno. Initially, this was in support of the ONC Health IT Certification Program, which was established to assess health IT capabilities for quality and consistency across certified products. This led to the development of the ONC Certification (g)(10) Standardized API Test Kit, an integrated set of tests that evaluates a system's level of conformance to

Preview at https://inferno-framework.github.io/index_new.html

inferno-framework.github.io

Documentation

1. Approximately equivalent to what is currently on inferno-framework.github.io
2. Reorganized for clarity and some content added



The screenshot shows the Inferno Documentation website. A yellow arrow points to the 'Documentation' link in the top navigation bar. The page layout includes a sidebar on the left with sections: DOCUMENTATION (Introduction, Key Concepts), CREATING TEST KITS (Getting Started, Writing Tests, Advanced Features, Distributing Tests, Inferno Core Docs), USING TEST KITS (Getting Started, Deploying to Shared Hosts), and JSON API. The main content area is titled 'Inferno Documentation' and 'Introduction to Inferno'. It describes Inferno as an application framework for creating, executing, and sharing conformance tests for FHIR APIs. It lists several test kits: the ONC Certification (g)(10) Standardized API Test Kit, the US Core Test Kit, and the SMART App Launch Test Kit. A section titled 'Using Test Kits' provides instructions on how to run or deploy an existing test kit.

Preview at https://inferno-framework.github.io/index_new.html

inferno-framework.github.io

Community

1. Describes how to contribute and participate in development of Inferno
2. Provides discoverability for Test Kits built with Inferno



The screenshot shows the 'Test Kit Registry' page on the Inferno Framework website. The page features a navigation menu with 'Community' highlighted, a search bar, and a sidebar with links to 'Welcome', 'Resources', and 'Code of Conduct'. The main content area includes a table of test kits with columns for 'Test Kit', 'Source Code', and 'Public Host'. A 'Contact Us' section is located at the bottom.

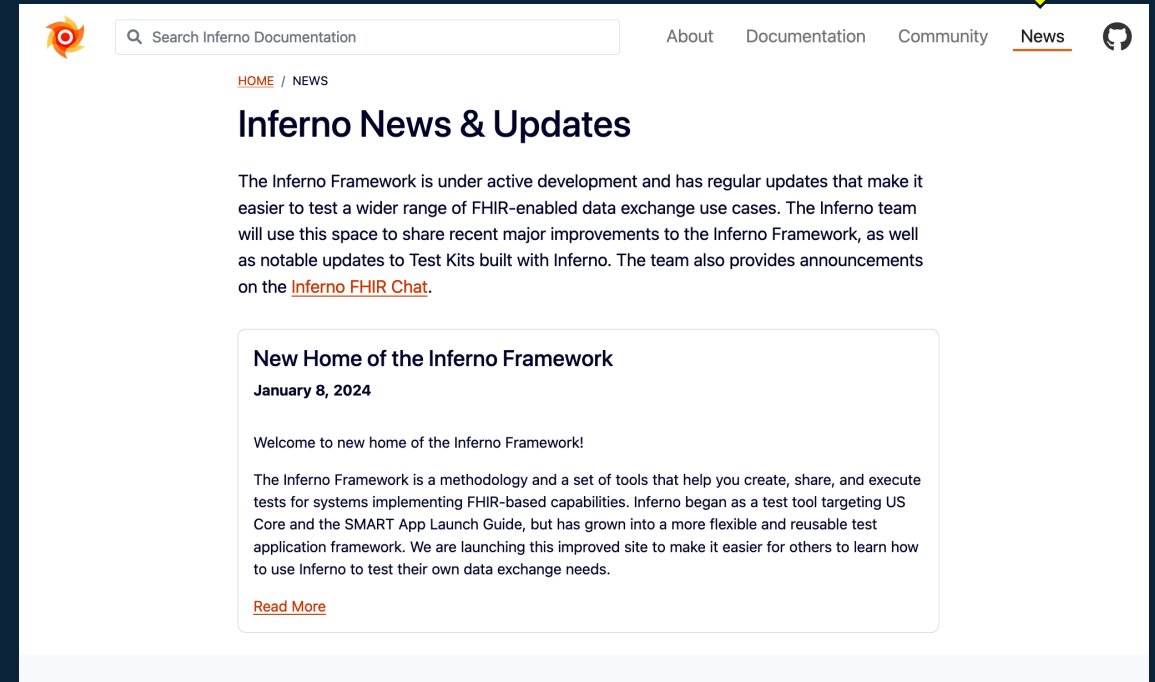
Test Kit	Source Code	Public Host
ONC Certification (g)(10) Standardized API Test Kit	GitHub Repository	Hosted by ONC
At-Home In-Vitro Test Kit	GitHub Repository	Hosted by ONC
CARIN IG for Blue Button® Test Kit	GitHub Repository	Hosted by ONC
FAST Security Test Kit	GitHub Repository	Hosted by ONC
International Patient Access Test Kit	GitHub Repository	Hosted by ONC
International Patient Summary Test Kit	GitHub Repository	Hosted by ONC
SMART App Launch Test Kit	GitHub Repository	Hosted by ONC
SMART Health Cards: Vaccination & Testing Test Kit	GitHub Repository	Hosted by ONC
SMART Scheduling Links Test Kit	GitHub Repository	Hosted by ONC
TLS Test Kit	GitHub Repository	N/A
UDS+ Test Kit	GitHub Repository	Hosted by ONC
US Core Test Kit	GitHub Repository	Hosted by ONC

Preview at https://inferno-framework.github.io/index_new.html

inferno-framework.github.io

News

1. Provides updates made to components of Inferno and foundational test kits



Preview at https://inferno-framework.github.io/index_new.html

Redesign: Feedback welcome!

- <https://inferno-qa.healthit.gov>
- https://inferno-framework.github.io/index_new.html
- Expected to be deployed February 13

- Redesign intended to be unintrusive
- Please let us know if you have concerns

Open Discussion / Feedback

Resources and Contact Information

- <https://inferno.healthit.gov/>
 - General materials & live demonstration server
- <https://github.com/onc-healthit/onc-certification-g10-test-kit/>
 - ONC Certification tests repository, downloads, issues
 - “Watch” repository to receive alerts (new releases, etc)
 - Note: this repository is specific to ONC Certification testing
- <https://groups.google.com/forum/#!forum/inferno-testing>
 - Announcements & community discussion
- inferno@groups.mitre.org (or rscanlon@mitre.org)
- Also, FHIR Zulip Chat: <https://chat.fhir.org/#narrow/stream/179309-inferno>

Upcoming Meetings

- Next Inferno Tech Talk: **Wednesday February 14** at 1 PM ET
- Please reach out with questions & issues