NHS Digital

Technical Conformance Testing Guidance

National Record Locator

V0.6 Published October 2019

Information and technology
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Contents

Revision History

Version	Date	Summary of Changes
V0.1	17.09.2019	Initial draft
V0.2	23.09.2019	Clarifications following review
V0.3	24.09.2019	Added screenshots of SCAL and Test Cases and updated retrieval testing guidance
V0.4	26.09.2019	Updated retrieval testing guidance
V0.5	01.10.2019	Embedded triggers replaced with link to github location
V0.6	30.10.2019	Updated testing provider retrieval instructions for v0.7 of the retrieval app Added limitations of TKW validation Changed github locations

Glossary of Terms

Term / Abbreviation	What it stands for
API	Application Programming Interface
Client	Consumer or Provider software supplier
HTTP	HyperText Transfer Protocol
INT	NHS Digital Integration Test Environment. This is one of the PTL environments
NRL	National Record Locator
PTL	Path To Live
SCAL	Supplier Conformance Assessment List
SSP	Spine Secure Proxy
TKW	Toolkit Workbench

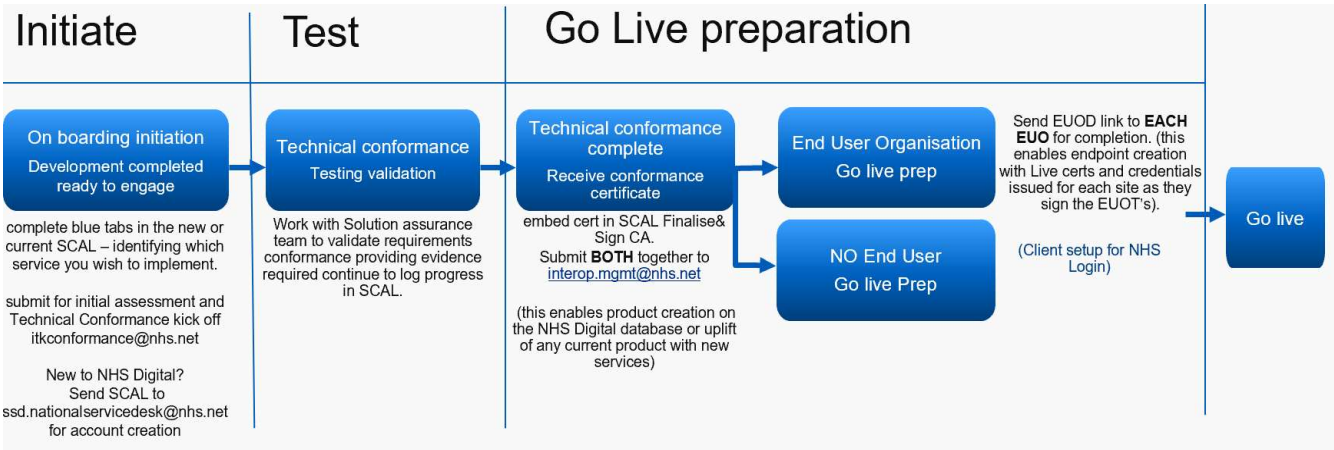
Overview

The National Record Locator (NRL) enables an authorised clinician, care worker and/or administrator, in any health and care setting, to access a patient's information to support that patient's direct care. Further details can be found on the NRL specification.

This document is a guide to conformance testing for solutions integrating with the NRL API.

End to End Process

The end-to-end process for testing and technical conformance is described in the diagram below:



Test Stages

The test stages for completing technical conformance are as follows:

1. Local testing of NRL API interactions using the Toolkit Workbench (TKW)
2. Local testing of Record Retrieval (if in scope) using the Retrieval App
3. Testing NRL API interactions in NHS Digital hosted PTL test environments
4. Testing Record Retrieval via SSP in NHS Digital hosted PTL test environments (if in scope) using the Retrieval App

Further detail and instructions for each testing stage can be found in the sections below.

Note that to test solutions in the NHS Digital hosted PLT test environments, suppliers must have first completed local testing. When local testing evidence has been reviewed and is successful, the NHS Digital Solutions Assurance team will assist in setting up endpoints and certificates to connect to the INT environment.

Conformance Testing Evidence

SCAL

The supplier conformance assessment list (SCAL) maps all the requirements needed to interface with a specific service to the evidence required during the technical conformance process. SCAL evidence consists of both test evidence (see **Test Cases**) and statements.

Category / Requirement	Item	Detail	How requirement will be assessed	Type	Compliant Yes/No (please select) If 'No' please provide detail of mitigating actions or exceptions in the box to the right	Statements Additional Notes / References
Standard Requirement Data Set	Data Set	Below is a list of the data items within the data set for this NHS Digital Service **Do you confirm** that the data to be used by your Product / system is comprised from the items listed / embedded below and that your Product / system will not access other data items using this NHS Digital Service? Dataset for Service: PDS Clinical	Statement	MUST	Please Select.....	
NRL-PR-CP	Provider Requirement	As an NRL Provider, I want to create pointers in NRL, so that authorised users can access information regarding my patients	Please carry out the following tests, and provide evidence in the corresponding folder: TKW TC01 TC02 INT environment TC13 (Logical ID) TC14 (Master ID) TC24 TC25 TC26 Please provide a statement in column G in answer to the following questions: 1. Explain how your system checks the Patient's NHS number is correct 2. Please confirm that your system will only create pointers for the organisation's own ODS code 3. Please confirm that your system will only create pointers for the most recent version of a document or record 4. If Master ID is used, describe how your system ensures that it is unique 5. If a pointer enables content retrieval, explain how your system ensures that the NHS number on the pointer matches that on the	Must	Please Select.....	

Figure 1 SCAL Requirement Example

Test Cases

Clients will be provided with a Test Cases document which details the tests for assessing technical conformance. Each test case details the individual test steps, with expected outcomes and required evidence (see **Evidence Files** below). The test cases cover both local testing and testing in the NHS Digital hosted test environments.

Test Case/ Step	Env	Description	Expected Outcome	Evidence Required	In Scope?	Pass?	Comments	Business Requirements covered by test case
TC14	INT	Create Pointer - With Master ID						NRL-PR-CP NRL-PR-AP
Step 1		System initiates create with a unique Master ID		N/A				
Step 2		Construct a new Create request conforming to the Create interaction For details on the Create interaction, including examples, see the technical spec: https://developer.nhs.uk/apis/nrl/api_interaction_create.html	The DocumentReference Resource should be populated with the following fields: Patient's NHS Number Custodian **Unique Master ID** Author Record Type Record URL Record MIME Type Pointer Status Record Category Profile Clinical Setting Record Format Record Stability	N/A				
Step 3		Audit log created with details of create request	Audit must contain: ASID HTTP Request Body HTTP Request URL HTTP Verb ODS Code NHS Number Request Datetime User ID For more detail, see the technical specification: https://developer.nhs.uk/apis/nrl/integration_auditing.html	Save extract/screenshot of audit log for this specific test in appropriate folder				
Step 4		Send HTTP POST Request to NRL Receive response from NRL	'RESOURCE_CREATED' OperationOutcome response body Pointer Logical ID in the location response header	Please provide relevant section of the message log				
Step 5		Audit log created with details of response	Audit must contain: HTTP Response Body HTTP Status Code Response Datetime For more detail, see the technical specification: https://developer.nhs.uk/apis/nrl/integration_auditing.html	Save extract/screenshot of audit log for this specific test in appropriate folder (may be included in Step 3 evidence)				

Figure 2 Test Case Example

Scope

The SCAL and Test Cases document will be scoped for each Client. Clients must only complete and submit evidence for requirements and tests that are in scope. If you have any questions about the scope, please contact itkconformance@nhs.net.

Evidence Files

Each test case specifies the evidence which must be submitted to Solutions Assurance. A directory structure is provided to organise the test evidence and ensure that the assurance process is thorough and is completed efficiently.

The structure contains an empty directory for each test case number. The evidence files for each test must be placed in the appropriate directory in the structure.

Submitting Test Evidence

When testing is complete, please submit your SCAL, test cases document and evidence files (in provided structure) to itkconformance@nhs.net. This should be done at 2 stages:

1. After local testing is complete
2. After testing in NHS Digital INT environment is complete

Validation and test reports should be reviewed before submitted evidence to ensure all issues are resolved, where possible.

Testing NRL Interactions (Local)

NRL interactions for managing pointers and pointer retrieval are tested locally using the Toolkit Workbench (TKW).

Toolkit Workbench

The TKW is an application that can be run locally to test conformance of a solution against a defined NHS Digital API specification. The purpose of the TKW is to test and validate both success and error scenarios for API interactions and ensure that audit capabilities are in place.

TKW evidence must be submitted to NHS Digital's Solutions Assurance team before connection to the hosted test environments is set up. For more information, see the **Evidence** section.

Prerequisites

- JRE installed on system the TKW will run on
- Capability to run .bat file (e.g. Windows operating system)

Installing the TKW

1. Download the latest version of the NRL TKW Installer jar file from Github: https://github.com/nhsconnect/FHIR-NRLS-API/tree/develop/content/uploads/onboarding/assurance
2. Install the TKW to your preferred location on your PC by running the installer.

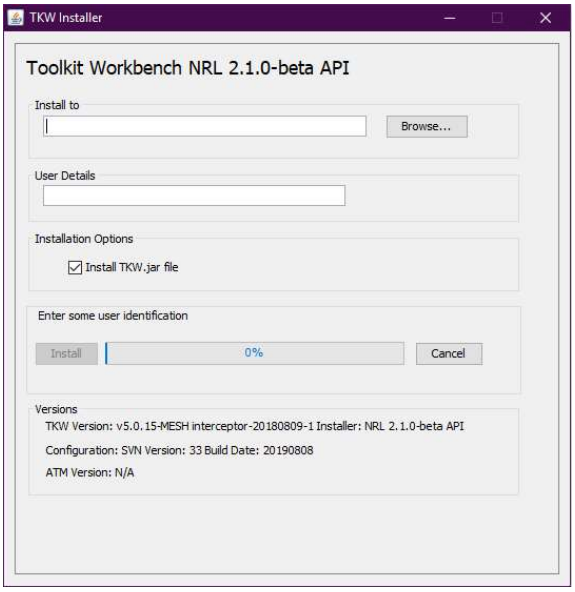


Figure 3 TKW Installer

The a TKW directory will be created in the location specified, with contents as shown in the image below.

Figure 4 TKW Directory

TKW Components

The TKW consists of 3 main components:

1. Simulator – simulates responses from NRL
2. Transmitter – transmits HTTP requests
3. Validator – validates requests sent to the simulator

Simulator

The simulator acts as a stub API responder to simulate responses for NRL interactions. HTTP requests can be sent to the simulator and the appropriate success or error response will be returned.

Triggers

The simulator is configured to respond to a set of triggers. The triggers are defined for success and error scenarios for each interaction as defined on the NRL specification. The SCAL and Test Cases document will list the triggers for which you need to submit evidence (see the **Conformance Testing Evidence** section for further detail). The complete list of NRL triggers can be used for test purposes and it is recommended that the tests for all error scenarios are run.

Note that triggers exist for Consumers to test record retrieval interactions with the SSP, however an empty response body is returned for the success scenario trigger (HTTP 200 status code).

Full list of NRL TKW Triggers can be found on Github at the following address:

https://github.com/nhsconnect/FHIR-NRLS-API/tree/develop/content/uploads/onboarding/assurance

Instructions

1. Navigate to *TKW/config/SPINE_NRLS/TestRun*

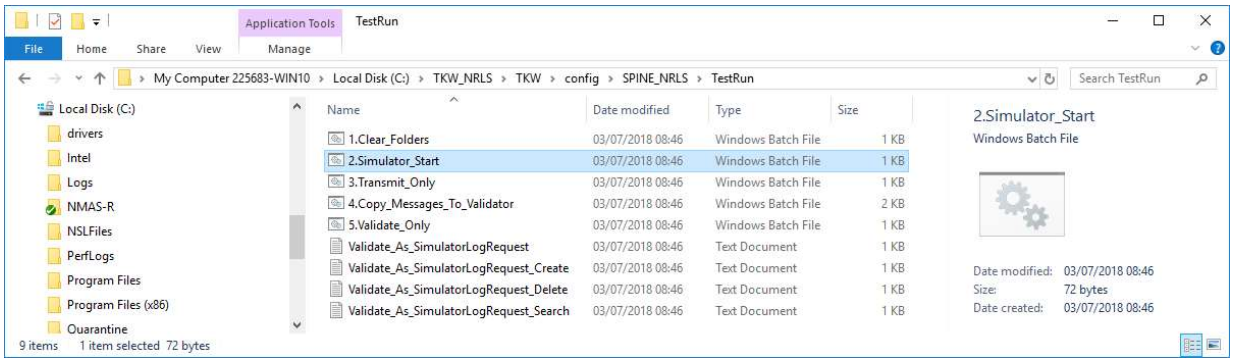


Figure 5 TestRun Directory

2. Run 2.Simulator_Start.bat to run the simulator, you should see a command prompt window open in the background.

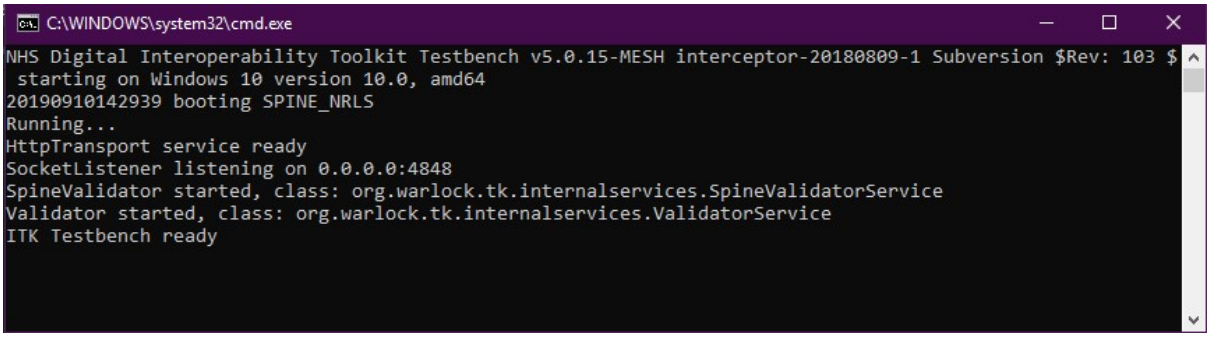


Figure 6 Simulator Command Prompt

3. By default, the simulator listens on http://127.0.0.1:4848. This can be changed in the file *TKW/config/SPINE_NRLS/tkw.properties*

4. HTTP requests can be made to the TKW using the interactions defined on the NRL specification and the variables/parameters defined for each trigger.

Note that the simulator is a stub responder based on the triggers and will not validate all technical requirements for the HTTP request. The request can be validated using the TKW validator as described in the **Validator** section below. Each request should be validated individually.

Request Logs

Each HTTP request to the TKW simulator is logged with the response in the directory *TKW/config/SPINE_NRLS/simulator_saved_messages.* A log file is created for each request.

The request and response logs are required for validation and TKW evidence.

Note that the filenames should remain unchanged in order to work with the TKW validator.

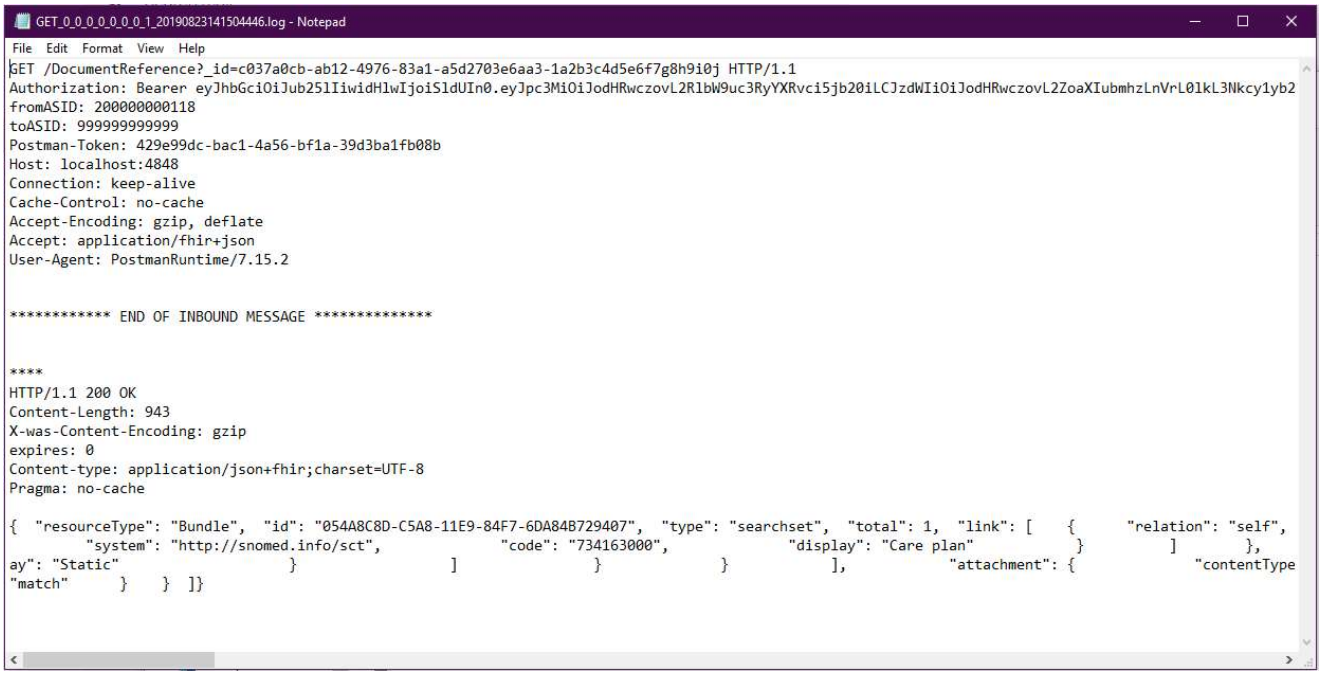


Figure 7 Example Request Log

Validator

The TKW validator tests the HTTP requests against the NRL pointer model and associated business rules, using the simulator request logs. The validator produces a report which identifies issues with conformance to the API specification.

Note that requests should be validated individually to supply evidence for separate test cases.

> Please note the validator does not check against the specified value sets for the following attributes of the NRL-DocumentReference-1 profile:
>
> - DocumentReference.class
> - DocumentReference.type
> - DocumentReference.context.practiceSetting

Instructions

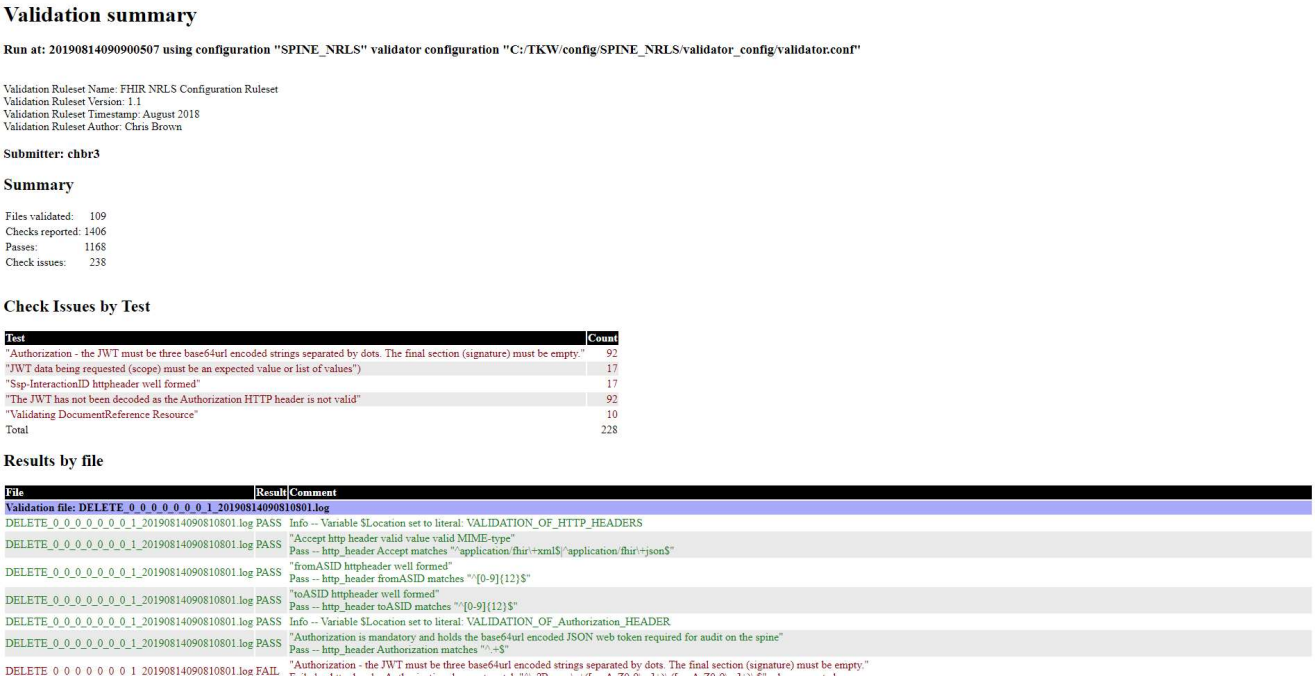
1. Navigate to *TKW/config/SPINE_NRLS/TestRun*
2. Run 4.Copy_Messages_To_Validator.bat to copy the request logs from *TKW/config/SPINE_NRLS/simulator_saved_messages* to *TKW/config/SPINE_NRLS/messages_for_validation*

   The request logs must **not** be copied manually, as this process prepends an interaction ID to each file to determine the validation rules for the interaction.

   Note that this step is only required for success scenarios.
3. Run 5.Validate_Only.bat to validate all request messages in the *TKW/config/SPINE_NRLS/messages_for_validation* directory.

   This step will produce a validation report (.html file) in the *TKW/config/SPINE_NRLS/validator_reports* directory

4. Review the validation report produced in step 3.



Validation summary

Run at: 20190814090900507 using configuration "SPINE_NRLS" validator configuration "C:/TKW/config/SPINE_NRLS/validator_config/validator.conf"

Validation Ruleset Name: FHIR NRLS Configuration Ruleset
Validation Ruleset Version: 1.1
Validation Ruleset Timestamp: August 2018
Validation Ruleset Author: Chris Brown

Submitter: chbr3

Summary

Files validated:	109
Checks reported:	1406
Passes:	1168
Check issues:	238

Check Issues by Test

Test	Count
"Authorization - the JWT must be three base64url encoded strings separated by dots. The final section (signature) must be empty."	92
"JWT data being requested (scope) must be an expected value or list of values")	17
"Ssp-InteractionID httpheader well formed"	17
"The JWT has not been decoded as the Authorization HTTP header is not valid"	92
"Validating DocumentReference Resource"	10
Total	228

Results by file

File	Result	Comment
Validation file: DELETE_0_0_0_0_0_0_0_1_20190814090810801.log		
DELETE_0_0_0_0_0_0_0_1_20190814090810801.log	PASS	Info -- Variable $Location set to literal: VALIDATION_OF_HTTP_HEADERS
DELETE_0_0_0_0_0_0_0_1_20190814090810801.log	PASS	"Accept http header valid value valid MIME-type" Pass -- http_header Accept matches "^application/fhir\+xml$\|^application/fhir\+json$"
DELETE_0_0_0_0_0_0_0_1_20190814090810801.log	PASS	"fromASID httpheader well formed" Pass -- http_header fromASID matches "^[0-9]{12}$"
DELETE_0_0_0_0_0_0_0_1_20190814090810801.log	PASS	"toASID httpheader well formed" Pass -- http_header toASID matches "^[0-9]{12}$"
DELETE_0_0_0_0_0_0_0_1_20190814090810801.log	PASS	Info -- Variable $Location set to literal: VALIDATION_OF_Authorization_HEADER
DELETE_0_0_0_0_0_0_0_1_20190814090810801.log	PASS	"Authorization is mandatory and holds the base64url encoded JSON web token required for audit on the spine" Pass -- http_header Authorization matches "^.+$"
DELETE_0_0_0_0_0_0_0_1_20190814090810801.log	FAIL	"Authorization - the JWT must be three base64url encoded strings separated by dots. The final section (signature) must be empty."

Figure 8 Example Validation Report

The validation report includes a summary and count of test issues and detail of the test results for each HTTP request. Any issues should be addressed before submitted test evidence to NHS Digital.

Install Integrity Check

An integrity check can be run to test the install of the TKW. This is done using the transmitter to send a test request to the TKW.

Transmitter

The TKW transmitter can be used to send HTTP requests to test an endpoint. The request details can be configured in the file *TKW/config/SPINE_NRLS/tkw.properties*.

On installing the TKW, the configuration is set to test the Search by Subject trigger with patient NHS Number 9462205655.

Integrity Check Instructions

1. Navigate to *TKW/config/SPINE_NRLS/TestRun*
2. Run 2.Simulator_Start.bat to run the simulator, you should see a command prompt window open in the background.
3. Run 3.Transmit_Only.bat to run the transmitter and send the test HTTP request to the simulator
4. Run 4.Copy_Messages_To_Validator.bat to copy the request logs from *TKW/config/SPINE_NRLS/simulator_saved_messages* to *TKW/config/SPINE_NRLS/messages_for_validation*
5. Run 5.Validate_Only.bat to validate the request message

This step will produce a validation report (.html file) in the *TKW/config/SPINE_NRLS/validator_reports* directory

Testing NRL Interactions (INT)

When local testing has been completed successfully and reviewed by the NHS Digital Solutions Assurance team, suppliers can begin testing solutions in the NHS Digital INT environment.

The Solutions Assurance team will assist with setting up access to the INT environment by providing endpoints and the required certificates.

Evidence for testing in INT will need to be submitted:

1. Completion of Test Cases document
2. Evidence files (placed in appropriate directory in the provided structure)

See the **Conformance Testing Evidence** section above for further detail.

Note that some test cases may require the involvement of the NHS Digital Solutions Assurance team to check the test environment database and audit logs. All other tests in scope must be completed with evidence submitted before it can be arranged for these tests to take place.

Testing Provider Record Retrieval (Local and INT)

Local testing for Provider record retrieval is performed direct on the client endpoint. Testing in INT is done via the SSP to the client endpoint.

Provider Record Retrieval endpoints can be tested using the NRL Retrieval App. The app is a package that uses Newman to transmit an HTTP request to your record endpoints and can be configured to test solutions both locally and in the NHS Digital INT environment.

Note that evidence of local testing will need to be submitted and reviewed before testing in the INT environment takes place.

Tests

The test package runs two tests:

- Success scenario (HTTP 200 status code)
- Error scenario (Error HTTP status code)

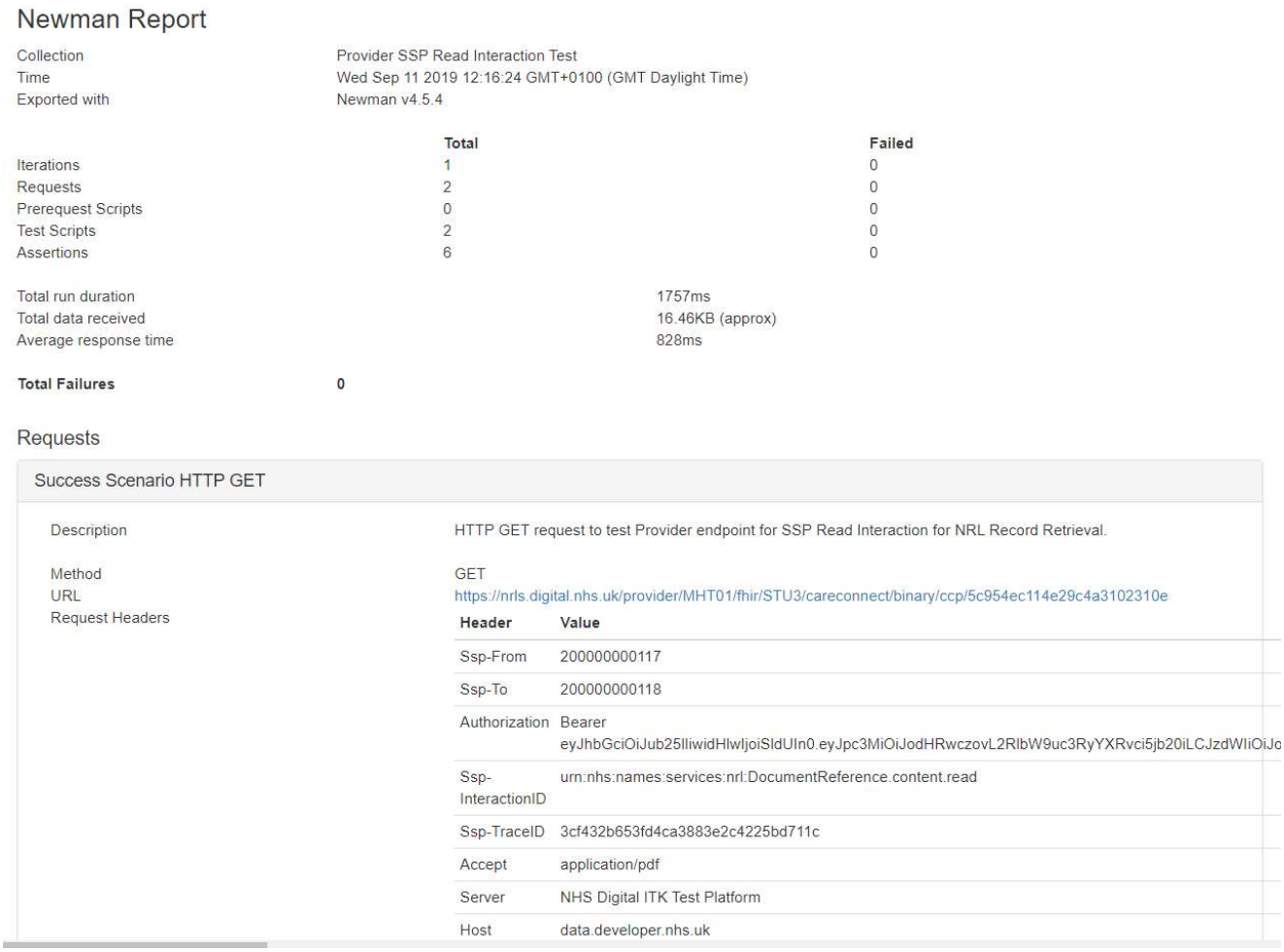
To run the tests, two endpoint URLs are required:

1. A success URL which returns a response body that contains a record/document in a supported format (see the Retrieval Formats page on the technical specification) and HTTP 200 status code
2. An error URL which returns a response body that contains appropriate diagnostics and the associated error HTTP status code e.g. HTTP 404 – record not found.

The URLs will need to be configured in the test package (see the **Configuration** section below).

Test Report

On successful execution of the tests, the package will generate an HTML report (fig 9 example) in the ***nhsdigital-nrl-retrieval/reports*** directory.



Newman Report

Collection	Provider SSP Read Interaction Test
Time	Wed Sep 11 2019 12:16:24 GMT+0100 (GMT Daylight Time)
Exported with	Newman v4.5.4

	Total	Failed
Iterations	1	0
Requests	2	0
Prerequest Scripts	0	0
Test Scripts	2	0
Assertions	6	0

Total run duration	1757ms
Total data received	16.46KB (approx)
Average response time	828ms

Total Failures 0

Requests

Success Scenario HTTP GET

Description	HTTP GET request to test Provider endpoint for SSP Read Interaction for NRL Record Retrieval.
Method	GET
URL	https://nrls.digital.nhs.uk/provider/MHT01/fhir/STU3/careconnect/binary/ccp/5c954ec114e29c4a3102310e
Request Headers	

Header	Value
Ssp-From	200000000117
Ssp-To	200000000118
Authorization	Bearer eyJhbGciOiJub25lIiwidHlwIjoiSldUIn0.eyJpc3MiOiJodHRwczovL2RlbW9uc3RyYXRvci5jb20iLCJzdWIiOiJo
Ssp-InteractionID	urn:nhs:names:services:nrl:DocumentReference.content.read
Ssp-TraceID	3cf432b653fd4ca3883e2c4225bd711c
Accept	application/pdf
Server	NHS Digital ITK Test Platform
Host	data.developer.nhs.uk

Figure 9 Example Record Retrieval Test Report

Prerequisites

- NodeJS (v7.3.0 or higher)

The required dependencies for running the test will be installed as part of the test execution. If the dependencies are already installed, this step will be skipped.

Installation

Download and extract the retrieval test package ***nhsdigital-nrl-retrieval-v7.zip*** from Github:

https://github.com/nhsconnect/FHIR-NRLS-API/tree/develop/content/uploads/onboarding/assurance

Configuration

The retrieval test package must be configured for your setup by changing the properties in the ***client.configuration.json*** file. This file can be found in the root of the extracted ***nhsdigital-nrl-retrieval*** folder (see fig 10).

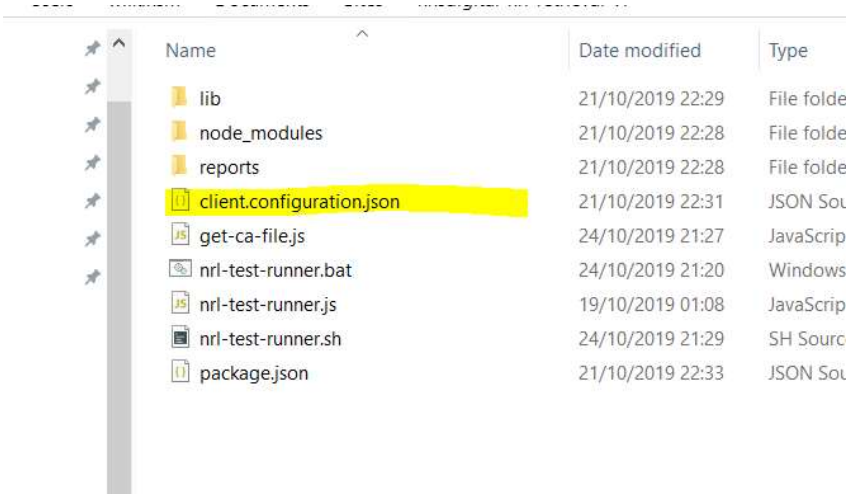


Figure 10 Contents of Retrieval App package

The full set of configuration options are listed in the table in the appendix. This table includes details of how the test package can be configured for testing in the NHS Digital INT environment.

An example configuration file with all options can be found in the package at ***nhsdigital-nrl-retrieval/lib/client.configuration.json.tmpl***

Please note; the extracted app contains a default configuration file that will invoke tests against the NRL Reference Implementation. Please change the configuration to those of your own environment and endpoints.

Instructions

The tests are triggered on the command line using the following instructions:

1) Navigate to the root directory of the test package (*nhsdigital-nrl-retrieval)* using the **cd** command.
   This directory contains the test runner file that needs to be run to start the app.
   For Unix the test runner file is **nrl-test-runner.sh**
   For Windows/DOS the test runner file is **nrl-test-runner.bat**

   Unix Users. Please note; for those running on unix please ensure you update the permissions on the nrl-test-runner.sh file before running i.e.
   `chmod +x nrl-test-runner.sh`

2) Run the above mentioned script (.sh or .bat version)
   This will start the application where you will be guided through setup and running of the tests.

3) The first screen on start will ask to install the dependencies if they have not been installed before (see fig 11). Skip to step 5 if dependencies have been installed previously.

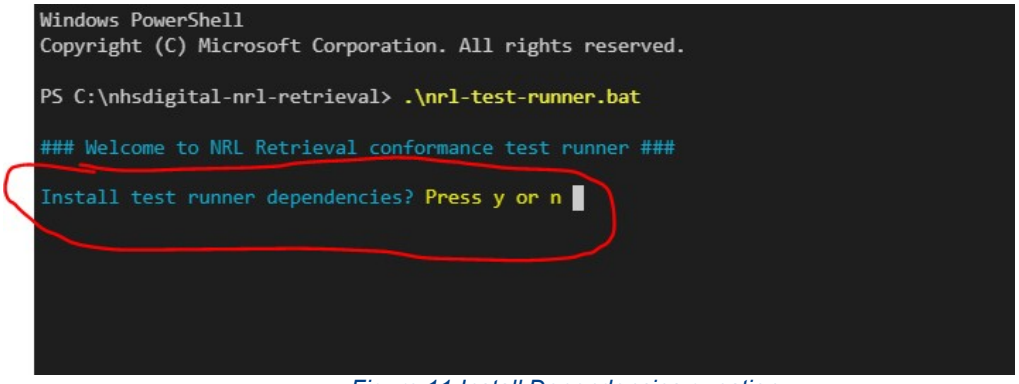


Figure 11 Install Dependencies question

4) Typing **y** will start the install (see fig 12)

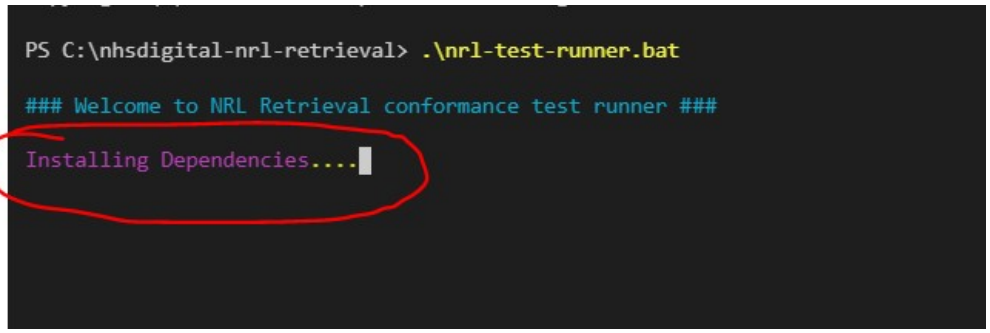


Figure 12 Installing Dependencies progress

5) Once installation of the dependencies is complete the screen will update to show installation was successful. You will then be asked to run the conformance tests (see fig 13)

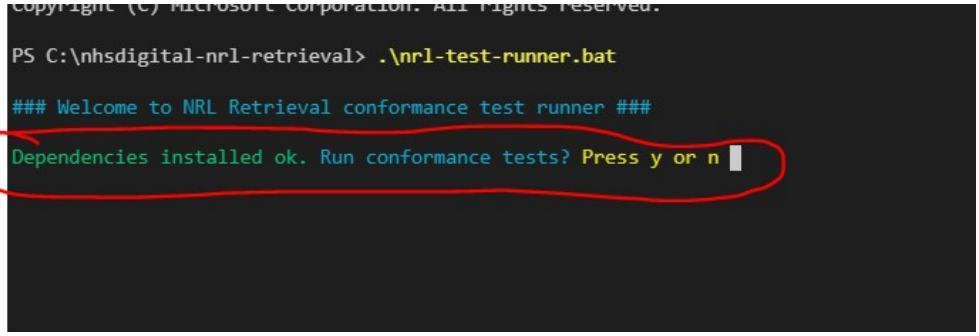


Figure 13 Dependencies installed ok

6) Typing **y** to run the tests will start the tests and show a progress bar (see fig 14)

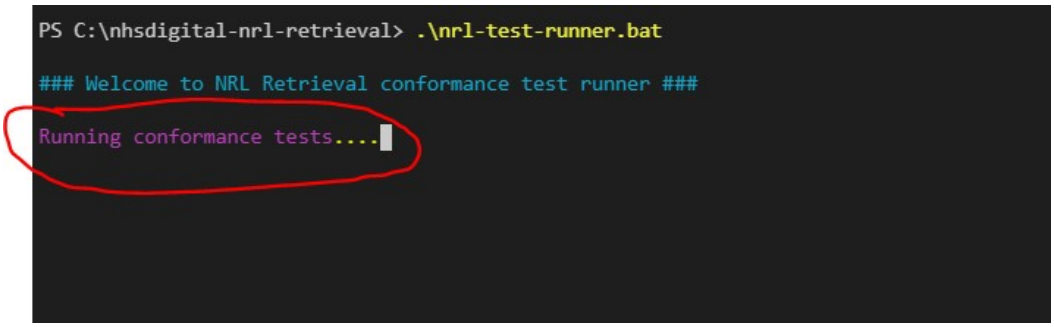


Figure 14 Running tests

7) Once complete the screen will update to confirm the tests executed successfully (see fig 15)

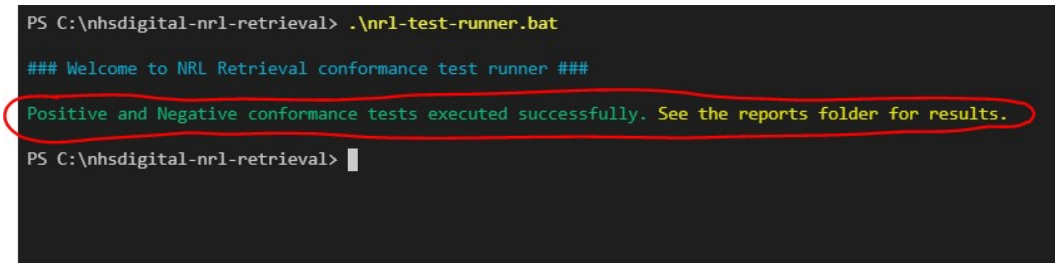


Figure 15 Conformance Tests Completed

8) On successful execution of the tests, a HTML test report will be generated in the ***nhsdigital-nrl-retrieval/reports*** directory (see fig 16).

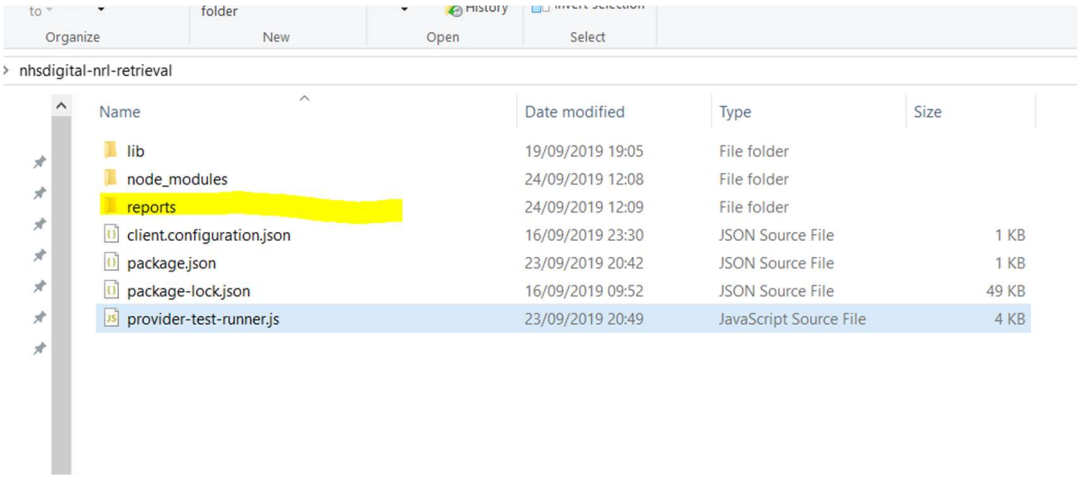


Figure 16 Reports folder highlighted

9) As detailed in the scoped test cases pack, please provide the generated reports plus other logs details as described for the test case.

Appendix

Record Retrieval Test Package Configuration Options

Option	Type	Details	Optionality
successEndpoint	URL	This will be the full url intended to be included on the NRL pointer. You will need to prefix this value with the SSP_BASE_PATH when testing within the INT environment.	Required
errorEndpoint	URL	This will be the full url intended to be included on the NRL pointer. You will need to prefix this value with the SSP_BASE_PATH when testing within the INT environment.	Required
fromAsid	Number	This is the Consumer ASID value. For local and INT testing you are free to use your own ASID value. If you have not yet been assigned an ASID please generate a 12 digit number for local testing. Use your INT assigned ASID value when testing within the INT environment.	Required
toAsid	Number	A 12 digit number for local testing, or your INT assigned ASID value if you have one. Your INT assigned ASID value when testing within the INT environment.	Required
odsCode	String	This will be the same ODS code registered against your ASID value.	Required
userProfileId	String	For testing purposes this can be any unique string value.	Required
sspInteractionId	String	Fixed value of: urn:nhs:names:services:nrl:DocumentReference.content.read	Required
sspTraceId	String	This is a required HTTP Header. If a value is not supplied then a UUID will be generated by the application.	Optional
sslClientCert	URI	The path to your client certificate, which is required for testing within the INT environment. Please note NHS Digital certificates will need to be installed in their respective trust store before running these test.	Optional

sslClientKey	URI	This is the path to your private client key, which is required for testing within the INT environment.	Optional
sslClientPassphrase	String	Required for testing within the INT environment if the certificate requires a password.	Optional
sslCACert	URI	This is the path to your root certificate (CA and Sub CA certificates will need to be concatenated into one) **CAUTION.** When setting this config value the NODE_EXTRA_CA_CERTS environment variable is modified to the value you have define. This will replace any value that it may have been previously set to.	Optional
sslInsecure	Boolean	Set this to true to bypass client certificate validation against the root CA certificate. A warning will be presented when running the app. If sslCACert is set with a value then sslInsecure has no effect.	Optional
jwtOverride.iss	String	Value will be defaulted if not supplied	Optional
jwtOverride.sub	URI	Value will be defaulted if not supplied using the userProfileId value	Optional
jwtOverride.aud	String	Value will be defaulted if not supplied	Optional
jwtOverride.exp	Number	Value will be defaulted if not supplied	Optional
jwtOverride.iat	Number	Value will be defaulted if not supplied	Optional
jwtOverride.reason_for_request	String	Value will be defaulted if not supplied	Optional
jwtOverride.scope	String	Value will be defaulted if not supplied	Optional
jwtOverride.requesting_system	URI	Value will be defaulted if not supplied using the fromAsid value	Optional
jwtOverride.requesting_organization	URI	Value will be defaulted if not supplied using the odsCode value	Optional
jwtOverride.requesting_user	URI	Value will be defaulted if not supplied using the userProfileId value	Optional