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SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

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Conformance of ITU-T H.810 personal health system: Services interface Part 15: FHIR Observation Upload: Health & Fitness Service sender

Recommendation ITU-T H.830.15

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Recommendation ITU-T H.830.15

Conformance of ITU-T H.810 personal health system: Services interface Part 15: FHIR Observation Upload: Health & Fitness Service sender

Summary

Recommendation ITU-T H.830.15 provides a test suite structure (TSS) and the test purposes (TPs) for fast healthcare interoperability resource (FHIR) Observation Upload through the Health & Fitness Service (HFS) sender in the Services interface, based on the requirements defined in the Recommendations of the ITU-T H.810 sub-series, of which Recommendation ITU-T H.810 (2017) is the base Recommendation. The objective of this test specification is to provide a high probability of interoperability at this interface.

Recommendation ITU-T H.830.15 includes an electronic attachment with the protocol implementation conformance statements (PICSs) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
1.0	ITU-T H.830.15	2018-08-29	16	11.1002/1000/13676

Keywords

Conformance testing, Continua Design Guidelines, e-health, Health &Fitness Service, ITU-T H.810, personal connected health devices, Services interface, Capability Exchange, FHIR Observation Upload.

* To access the Recommendation, type the URL http://handle.itu.int/ in the address field of your web browser, followed by the Recommendation's unique ID. For example, http://handle.itu.int/11.1002/1000/11830-en.

FOREWORD

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NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at http://www.itu.int/ITU-T/ipr/.

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Electronic attachment: This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICSs) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.

Introduction

The table below shows the revision history of this test specification.

Version	Date	Revision history
1.0	2018-02-27	Initial release for the inclusion of FHIR Observation Upload for Health & Fitness Service senders.

Recommendation ITU-T H.830.15

Conformance of ITU-T H.810 personal health system: Services interface Part 15: FHIR Observation Upload: Health & Fitness Service sender

1 Scope

The scope of this Recommendation[1] is to provide a test suite structure (TSS) and the test purposes (TPs) for the Services interface based on the requirements defined in the Continua Design Guidelines (CDG) [ITU-T H.810 (2017)]. The objective of this test specification is to provide a high probability of interoperability at this interface.

The TSS and TPs for the services interface have been divided into the parts specified below. This Recommendation covers Part 15.

– Part 1: Web services interoperability. Health & Fitness Service sender
– Part 2: Web services interoperability. Health & Fitness Service receiver
– Part 3: SOAP/ATNA. Health & Fitness Service sender
– Part 4: SOAP/ATNA. Health & Fitness Service receiver
– Part 5: PCD-01 HL7 Messages. Health & Fitness Service sender
– Part 6: PCD-01 HL7 Messages. Health & Fitness Service receiver
– Part 7: Consent Management. Health & Fitness Service sender
– Part 8: Consent Management. Health & Fitness Service receiver
– Part 9: hData Observation Upload. Health & Fitness Service sender
– Part 10: hData Observation Upload. Health & Fitness Service receiver
– Part 11: Questionnaires. Health & Fitness Service sender
– Part 12: Questionnaires. Health & Fitness Service receiver
– Part 13: Capability Exchange. Health & Fitness Service sender
– Part 14: Capability Exchange. Health & Fitness Service receiver
– **Part 15: FHIR Observation Upload. Health & Fitness Service sender**
– Part 16: FHIR Observation Upload. Health & Fitness Service receiver.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T H.810 (2017)] Recommendation ITU-T H.810 (2017), *Interoperability design guidelines for personal health systems*: *Introduction*.

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[1] This Recommendation includes an electronic attachment with the protocol implementation conformance statements (PICS) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A.

[ITU-T H.812] Recommendation ITU-T H.812 (2017), *Interoperability design guidelines for personal connected health systems: Services interface.*

3 Definitions

3.1 Terms defined elsewhere

None.

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AHD Application Hosting Device
ATNA Audit Trail and Node Authentication
BLE Bluetooth Low Energy
BT HDP Bluetooth Health Device Profile
CDG Continua Design Guidelines
CGM Continuous Glucose Monitor
DUT Device Under Test
FHIR Fast Healthcare Interoperability Resources
HFS Health & Fitness Service
HFSS Health & Fitness Service Sender
HFSR Health & Fitness Service Receiver
HL7 Health Level 7
HTTP Hypertext Transfer Protocol
INR International Normalized Ratio
IP Insulin Pump
JSON JavaScript Object Notation
MDS Medical Device System
NFC Near Field Communication
PCD Patient Care Device
PHD Personal Health Device
PHDC Personal Healthcare Device Class
PHG Personal Health Gateway
PICS Protocol Implementation Conformance Statement
PIXIT Protocol Implementation extra Information for Testing
SABTE Sleep Apnoea Breathing Therapy Equipment
SCR Static Conformance Review

SOAP	Simple Object Access Protocol
TLS	Transport Level Security
TP	Test Purpose
TSS	Test Suite Structure
USB	Universal Serial Bus
URI	Uniform Resource Identifier
WS	Web Service
WSI	Web Services Interoperability
XDR	Cross-Enterprise Document Reliable Interchange
XML	extensible Markup Language
ZB	Zigbee

5 Conventions

The key words "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "MAY", "MAY NOT" in this Recommendation are to be interpreted as in [b-ETSI SR 001 262].

– SHALL is equivalent to 'must' or 'it is required to'.

– SHALL NOT is equivalent to 'must not' or 'it is not allowed'.

– SHOULD is equivalent to 'it is recommended to'.

– SHOULD NOT is equivalent to 'it is not recommended to'.

– MAY is equivalent to 'is permitted'.

– MAY NOT is equivalent to 'it is not required that'.

NOTE – The above-mentioned key words are capitalized for illustrative purposes only and they do not appear capitalized within this Recommendation.

Reference is made in the ITU-T H.800-series of Recommendations to different versions of the Continua Design Guidelines (CDG) by a specific designation. The list of terms that may be used in this Recommendation is provided in Table 1.

Table 1 – List of designations associated with the various versions of the CDG

CDG release	Transposed as	Version	Description	Designation
2017	–	7.0	Release 2017 of the CDG including maintenance updates of the CDG 2016 and additional guidelines that cover new functionalities.	–
2016 plus errata	[ITU-T H.810 (2016)]	6.1	Release 2016 plus errata noting all ratified bugs [b-CDG 2016].	–
2016	–	6.0	Release 2016 of the CDG including maintenance updates of the CDG 2015 and additional guidelines that cover new functionalities.	Iris
2015 plus errata	[b-ITU-T H.810 (2015)]	5.1	Release 2015 plus errata noting all ratified bugs [b-CDG 2015]. The 2013 edition of [ITU-T H.810] is split into eight parts in the ITU-T H.810-series.	–
2015	–	5.0	Release 2015 of the CDG including maintenance updates of the CDG 2013 and additional guidelines that cover new functionalities.	Genome
2013 plus errata	[b-ITU-T H.810 (2013)]	4.1	Release 2013 plus errata noting all ratified bugs [b-CDG 2013].	–
2013	–	4.0	Release 2013 of the CDG including maintenance updates of the CDG 2012 and additional guidelines that cover new functionalities.	Endorphin
2012 plus errata	–	3.1	Release 2012 plus errata noting all ratified bugs [b-CDG 2012].	–
2012	–	3.0	Release 2012 of the CDG including maintenance updates of the CDG 2011 and additional guidelines that cover new functionalities.	Catalyst
2011 plus errata	–	2.1	CDG 2011 integrated with identified errata.	–
2011	–	2.0	Release 2011 of the CDG including maintenance updates of the CDG 2010 and additional guidelines that cover new functionalities [b-CDG 2011].	Adrenaline
2010 plus errata	–	1.6	CDG 2010 integrated with identified errata	–
2010	–	1.5	Release 2010 of the CDG with maintenance updates of the CDG Version 1 and additional guidelines that cover new functionalities [b-CDG 2010].	1.5
1.0	–	1.0	First released version of the CDG [b-CDG 1.0].	–

6 Test suite structure

The test procedures (TPs) for the Services interface have been divided into the main subgroups specified below. Annex A describes the TPs for subgroups 1.7.1 and 1.7.2 (shown in bold):

– Group 1: HFS sender (HFSS)

- Group 1.1: Web services interoperability (WSI)
  - Subgroup 1.1.1: Basic profile (BP)
  - Subgroup 1.1.2: Basic security profile (BSP)
  - Subgroup 1.1.3: Reliable messaging (RM)
- Group 1.2: Simple object access protocol (SOAP)
  - Subgroup 1.2.1: SOAP headers (HEAD)
- Group 1.3: Audit trail and node authentication (ATNA)
  - Subgroup 1.3.1: General (GEN)
  - Subgroup 1.3.2: PCD-01 (PCD-01)
  - Subgroup 1.3.3: Consent Management (CM)
- Group 1.4: PCD-01 HL7 messages (PCD-01-DATA)
  - Subgroup 1.4.1: General (GEN)
  - Subgroup 1.4.2: Design guidelines (DG)
  - Subgroup 1.4.3: Pulse oximeter (PO)
  - Subgroup 1.4.4: Blood pressure monitor (BPM)
  - Subgroup 1.4.5: Thermometer (TH)
  - Subgroup 1.4.6: Weighing scales (WEG)
  - Subgroup 1.4.7: Glucose meter (GL)
  - Subgroup 1.4.8: Cardiovascular fitness and activity monitor (CV)
  - Subgroup 1.4.9: Strength fitness equipment (ST)
  - Subgroup 1.4.10: Independent living activity hub (HUB)
  - Subgroup 1.4.11: Adherence monitor (AM)
  - Subgroup 1.4.12: Peak expiratory flow monitor (PF)
  - Subgroup 1.4.13: Body composition analyser (BCA)
  - Subgroup 1.4.14: Basic electrocardiograph (ECG)
  - Subgroup 1.4.15: International normalized ratio (INR)
  - Subgroup 1.4.16: Sleep apnoea breathing therapy equipment (SABTE)
  - Subgroup 1.4.17: Insulin pump (IP)
  - Subgroup 1.4.18: Continuous glucose monitor (CGM)
- Group 1.5: Consent Management (CM)
  - Subgroup 1.5.1: HFS XDR transaction (TRANS)
  - Subgroup 1.5.2: HFS metadata validation (META)
  - Subgroup 1.5.3: HFS consent directive validation (CDV)
- Group 1.6: hData Observation Upload (HDATA)
  - Subgroup 1.6.1: General (GEN)
- Group 1.7: Questionnaires (QUE)
  - Subgroup 1.7.1: General (GEN)
  - Subgroup 1.7.2: CDA validation (CDA)
- Group 1.8: Capability Exchange (CE)
  - Subgroup 1.8.1: General (GEN)
  - Subgroup 1.8.2: hData record format (HRF)

- **Group 1.9: FHIR Observation Upload (FHIR)**
  - **Subgroup 1.9.1: General (GEN)**
  - **Subgroup 1.9.2: FHIR Encoding Guidelines (ENC)**

– Group 2: HFS receiver (HFSR)

- Group 2.1: Web service interoperability (WSI)
  - Subgroup 2.1.1: Basic profile (BP)
  - Subgroup 2.1.2: Basic security profile (BSP)
  - Subgroup 2.1.3: Reliable messaging (RM)
- Group 2.2: SOAP (SOAP)
  - Subgroup 2.2.1: SOAP headers (HEAD)
- Group 2.3: Audit (ATNA)
  - Subgroup 2.3.1: General (GEN)
  - Subgroup 2.3.2: PCD-01 (PCD-01)
  - Subgroup 2.3.3: Consent Management (CM)
- Group 2.4: PCD-01 HL7 messages (PCD-01-DATA)
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  - Subgroup 2.4.5: Thermometer (TH)
  - Subgroup 2.4.6: Weighing scales (WEG)
  - Subgroup 2.4.7: Glucose meter (GL)
  - Subgroup 2.4.8: Cardiovascular fitness and activity monitor (CV)
  - Subgroup 2.4.9: Strength fitness equipment (ST)
  - Subgroup 2.4.10: Independent living activity hub (HUB)
  - Subgroup 2.4.11: Adherence monitor (AM)
  - Subgroup 2.4.12: Peak expiratory flow monitor (PF)
  - Subgroup 2.4.13: Body composition analyser (BCA)
  - Subgroup 2.4.14: Basic electrocardiograph (ECG)
  - Subgroup 2.4.15: International normalized ratio (INR)
  - Subgroup 2.4.16: Sleep apnoea breathing therapy equipment (SABTE)
  - Subgroup 2.4.17: Insulin pump (IP)
  - Subgroup 2.4.18: Continuous glucose monitor (CGM)
- Group 2.5: Consent Management (CM)
  - Subgroup 2.5.1: HFS XDR transaction (TRANS)
  - Subgroup 2.5.2: HFS service validation (SER)
- Group 2.6: hData Observation Upload (HDATA)
  - Subgroup 2.6.1: General (GEN)
  - Subgroup 2.6.2: hData record format (HRF)

- Group 2.7: Questionnaires (QUE)
  - Subgroup 2.7.1: General (GEN)
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  - Subgroup 2.8.1: General (GEN)
  - Subgroup 2.8.2: hData record format (HRF)
- Group 2.9: FHIR Observation Upload (FHIR)
  - Subgroup 2.9.1: General (GEN)

7 Electronic attachment

The protocol implementation conformance statements (PICSs) and the protocol implementation extra information for testing (PIXIT) required for the implementation of Annex A can be downloaded from http://handle.itu.int/11.1002/2000/12067. See [b-HFSR PICS & PIXIT] and [b-HFSS PICS & PIXIT].

In the electronic attachment, letters "C" and "I" in the column labelled "Mandatory" are used to distinguish between "PICSs" and "PIXIT", respectively, during testing. If the cell is empty, the corresponding PICS is "independent". If the field contains a "C", the corresponding PICS is dependent on other PICSs, and the logical expression is detailed in the "SCR_Expression" field. The static conformance review (SCR) is used in the test tool to assert whether the PICS selection is consistent.

Annex A

Test procedures

(This annex forms an integral part of this Recommendation.)

A.1 Test purpose definition conventions

The TPs are defined according to the following rules:

- **TP Id**: This is a unique identifier (TP/<TT>/<DUT>/<GR>/<SGR>/<XX> – <NNN>). It is specified according to the naming convention defined below:

  Each TP identifier is introduced by the prefix "TP".

  - <TT>: This is the test tool that will be used in the test case.
    - HFS: Health & Fitness Services Interface
  - <DUT>: This is the device under test.
    - SEN: HFS sender
    - REC: HFS receiver
  - <GR>: This identifies a group of test cases.
  - <SGR>: This identifies a subgroup of test cases.
  - <XX>: This identifies the type of testing.
    - BV: Valid behaviour test
    - BI: Invalid behaviour test
  - <NNN>: This is a sequential number that identifies the TP.
- **TP label**: This is title of the TP.
- **Coverage**: This contains the specification reference and clause to be checked by the TP.
  - Spec: This indicates the earliest version of the specification from which the testable items to be checked by the TP were included.
  - Testable item: This contains testable items to be checked by the TP.
- **Test purpose**: This is a description of the requirements to be tested.
- **Applicability**: This contains the PICS items that define if a test case is applicable or not for a specific device. When a TP contains an "ALL" in this field it means that it applies to the DUT within that scope of the test (specialization, transport used, etc.).
- **Other PICSs**: This contains additional PICS items (apart from the PICS specified in the Applicability row) which are used within the test case implementation and can modify the final verdict. When this row is empty, it means that only the PICS specified in the Applicability row are used within the test case implementation.
- **Initial condition**: This indicates the state to which the DUT needs to be moved at the beginning of TC execution.
- **Test procedure**: This describes the steps to be followed in order to execute the test case.
- **Pass/Fail criteria**: This provides criteria to decide whether the DUT passes or fails the test case.

A.2 Subgroup 1.9.1: General (GEN)

TP Id		TP/HFS/SEN/FHIR/GEN/BV-000		
TP label		Oauth support		
Coverage	**Spec**	[ITU-T H.812]		
	Testable items	RESTSec 3;M	RESTSec 4;M	RESTSec 5;M
		CommonReq 5;M		
	Spec	[b-HSTP-H812-FHIR]		
	Testable items	PHGCommon 1; M	PHGCommon 2; M	PHGCommon 9; M
		PHGCommon 21; M		
Test purpose		Check that: The PHG) under test is able to retrieve the OAuth Descriptor of the simulated H&FS using the link element of the provided Atom Feed. [AND] The PHG under test uploads a complete FHIR resource bundle using TLS 1.1 and an OAuth v2.0 bearer token to the simulated H&FS using a create or conditional create operation.		
Applicability		C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008)		
Other PICSs				
Initial condition		Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. The H&FS supports all available OAuth 2.0 authorization grant types (so they are listed in the grantTypes element of its OAuthDescriptor). Simulated H&FS has no previously stored resources.		
Test procedure		1. Ask the PHG under test to retrieve the OAuthDescriptor of the simulated H&FS. 2. The PHG obtains the root file of the H&FS, and retrieves the OAuthDescriptor via the link element in the Atom Feed provided by the root file. 3. Ask the PHG under test to upload an Observation resource as a complete bundle to the simulated H&FS. 4. The PHG uses a create or conditional create operation (HTTP POST) to upload the bundle to the simulated H&FS using TLS 1.1 and a valid OAuth 2.0 bearer token obtained using one of the available authorization grant types. 5. The H&FS accepts the request and returns <HTTP 201> (Created) and a Location header, which contains the new Logical Id and Version Id of the created resources versions.		
Pass/fail criteria		• PHG correctly retrieves the OAuthDescriptor in step 2. • PHG uploads the resource bundle as described in step 4, so the simulated H&FS can accept the operation.		
Notes				

TP Id		TP/HFS/SEN/FHIR/GEN/BV-001
TP label		JSON Web Token support
Coverage	**Spec**	[ITU-T H.812]

	Testable items	RESTSec 3;M	RESTSec 4;M	RESTSec 5;M
		CommonReq 5;M		
	Spec	[b-HSTP-H812-FHIR]		
	Testable items	PHGCommon 9; M	PHGCommon 3; M	PHGCommon 4; M
		PHGCommon 6; M	PHGCommon 7; M	PHGCommon 8; M
		PHGCommon 21; M		

Test purpose	Check that: The PHG under test is able to retrieve the OAuth Descriptor of the simulated H&FS using the link element of the provided Atom Feed. [AND] The PHG using a bearer JWT shall issue an access token request with the appropriate parameters and values and shall issue the JWT with the specified claims. [AND] The PHG under test uploads a complete FHIR resource bundle using TLS 1.1 and the JSON Web Token to the simulated H&FS using a create or conditional create operation.
Applicability	C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008) AND C_SEN_FHIR_001
Other PICSs	
Initial condition	Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. The H&FS supports JWT authorization grant type (so the string "rfc7523" is included in the grantTypes element of its OAuthDescriptor). Simulated H&FS has no previously stored resources.
Test procedure	1. Ask the PHG under test to retrieve the OAuthDescriptor of the simulated H&FS. 2. The PHG obtains the root file of the H&FS, and retrieves the OAuthDescriptor via the link element in the Atom Feed provided by the root file and checks that the string "rfc7523" is included in the grantTypes element. 3. Ask the PHG to upload a complete FHIR resource bundle including an observation using the extension (JWT) authorization grant type to provide a valid JWT. 4. When the PHG performs the upload check that: • The PHG uses a create or conditional create operation using HTTP POST. • The PHG sends a grant_type value of: "urn:ietf:params:oauth:granttype:jwt-bearer". • The PHG contains a single valid JWT, and: • It contains an "iat" (issued at) claim that identifies the time at which the claim was issued. • It contains a "jti" (JWT ID) claim that provides a unique identifier for the token. 5. The H&FS accepts the request and returns <HTTP 201> (Created) and a Location header, which contains the new Logical Id and Version Id of the created resources versions.
Pass/fail criteria	• PHG correctly retrieves the OAuthDescriptor in step 2 and checks for JWT support. • PHG uploads the resource bundle as described in step 4, so the simulated H&FS can accept the operation.
Notes	

TP Id		TP/HFS/SEN/FHIR/GEN/BV-002		
TP label		FHIR API for FHIR Operation Client		
Coverage	**Spec**	[ITU-T H.812]		
	Testable items	RESTSec 3;M	RESTSec 4;M	RESTSec 5;M
		CommonReq 5;M		
	Spec	[b-HSTP-H812-FHIR]		
	Testable items	PHGCommon 11; M	PHGCommon 12; M	PHGCommon 16; C
		PHGCommon 17; C	PHGCommon 18; C	PHGCommon 19; M
		PHGCommon 21; M	PHGCommon 24; M	FOCReq 2; M
Test purpose		Check that: A PHG client shall not specify the Logical ID for the Patient Resource when performing a single-resource create or a conditional create of the Patient Resource The PHG client shall provide the Patient Designator information in the Patient Resource. Additionally, in the created resource, the Patient.identifier.*system* shall be a URI set to the health care identification system and the Patient.identifier.*value* shall be set to the patient identifier component of the Patient Descriptor. [AND] If a conditional create operation is used, the search parameter of the "If-None-Exist" header shall be the healthcare identification system and the patient identifier placed in the Patient.identifier element. [AND] A PHG client shall specify the Logical ID for the Patient Resource when performing a single-resource update [AND] If the Patient Resource Logical ID is to be created by the PHG, the PHG shall specify the Logical ID as the concatenation of field values: *Patient.identifier.value-Patient.identifier.system*. [AND] When a DeviceComponent Resource is uploaded the PHG shall use the FHIR update or conditional create operations. [AND] When an Observation Resource is uploaded the PHG shall use the create or conditional create operations [AND] A PHG shall format measurement payloads in JSON or XML, and can send single resources or complete bundles.		
Applicability		C_SEN_000 AND C_SEN_GEN_007		
Other PICSs				
Initial condition		Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.		

Test procedure	1. Ask the PHG to upload a new single FHIR Patient Resource to the simulated H&FS using TLS 1.1 and an OAuth 2.0 bearer token or JWT. 2. Check that the request is a create or conditional create operation using HTTP POST and that, in the request: • The PHG client does not specify a Logical ID. • The PHG client provides the Patient Designator information in the Patient Resource so that the H&FS can provide a Logical ID. • In the created Patient Resource, the Patient.identifier.*system* shall be a URI set to the health care identification system. • In the created Patient Resource, the Patient.identifier.*value* is set to the patient identifier component of the Patient Descriptor. • If a conditional create operation is used, the search parameter of the "If-None-Exist" header shall be the healthcare identification system and the patient identifier placed in the Patient.identifier element 3. The simulated H&FS accepts the operation and returns <HTTP 201> (created) and a Location header, which contains the Logical Id and Version Id of the created resource 4. Ask the PHG to perform an update on the previously uploaded FHIR Patient Resource in the simulated H&FS using TLS 1.1 and an OAuth 2.0 bearer token or a valid JWT. 5. Check that the request is an update operation using HTTP PUT and that: • The PHG client specifies the previously provided Logical ID. 6. The simulated H&FS accepts the operation, updates the Patient Resource and returns an <HTTP 200> (OK) status code. 7. Ask the PHG to upload a new single FHIR Patient Resource to the simulated H&FS using TLS 1.1 and an OAuth 2.0 bearer token or JWT, including the generation of a new Logical ID. 8. Check that the request is an update operation using HTTP PUT and that: • The PHG-created Logical ID concatenation of field values: *Patient.identifier.value*-*Patient.identifier.system* where: ▪ The italicized strings represent the values associated with the named fields. ▪ If the original string is longer than 64 characters, it is truncated to 64 characters (by removing characters from the end of the string). ▪ If this original string contains any characters other than A-Z, a-z, 0-9, "-", or ".", they are replaced by a ".". 9. The simulated H&FS accepts the operation and returns <HTTP 201> (created). 10. Ask the PHG to upload a new single FHIR DeviceComponent Resource (linked to the Patient Resource created in step 9) to the simulated H&FS using TLS 1.1 and an OAuth 2.0 bearer token or JWT. 11. Check that the request is an update operation using HTTP PUT or a conditional create operation using HTTP POST. 12. The H&FS creates the resource and returns <HTTP 201> (Created) and a Location header, which contains the new Logical Id and Version Id of the created resource version 13. Ask the PHG to upload a new FHIR Observation Resource (linked to the DeviceComponent Resource created in step 9) to the simulated H&FS using TLS 1.1 and an OAuth 2.0 bearer token or JWT. 14. Check that the request is a create or a conditional create operation using HTTP POST. 15. The H&FS creates the resource and returns <HTTP 201> (Created) and a Location header, which contains the new Logical Id and Version Id of the created resource version 16. Ask the PHG to upload a complete FHIR bundle in JSON format including a new Observation resource to the simulated H&FS using TLS 1.1 and an OAuth 2.0 bearer token or JWT. 17. Check that the request is a create or a conditional create operation using HTTP POST.

	18. The H&FS creates the resource and returns <HTTP 201> (Created) and a Location header, which contains the new Logical Id and Version Id of the created resource version
Pass/fail criteria	• Simulated H&FS accepts the requests as described in steps 2, 5, 8, 11, 14 and 17.
Notes	

TP Id		TP/HFS/SEN/FHIR/GEN/BV-003		
TP label		FHIR API for FHIR Operation Reporting Client		
Coverage	**Spec**	[ITU-T H.812]		
	Testable items	RESTSec 3;M	RESTSec 4;M	RESTSec 5;M
		CommonReq 5;M		
	Spec	[b-HSTP-H812-FHIR]		
	Testable items	PHGCommon 13; M	PHGCommon 14; M	PHGCommon 15; M
		PHGCommon 16; C	PHGCommon 19; M	PHGCommon 21; M
		FORCReq 1; M	FORCReq 2; M	
Test purpose		Check that: When uploading to a FHIR Observation Reporting Server the measurement shall be uploaded as an http POST operation with the payload containing a complete FHIR transaction bundle. [AND] Within a transaction bundle the FHIR operation on the Patient Resource shall be either update or conditional create The update shall only be used when the Logical ID of the Patient Resource is known. [AND] A PHG shall specify a temporary Logical ID for the Patient Resource being created or conditionally created in a Transaction Bundle if the Patient Resource is referenced by another resource in the transaction Bundle (i.e. a DeviceComponent resource). The PHG client shall provide the Patient Designator information in the Patient Resource [AND] When a DeviceComponent Resource is uploaded in a bundle, the PHG shall use the FHIR update or conditional create operations. [AND] When an Observation Resource is uploaded in a bundle, the PHG shall use the create or conditional create operations [AND] A PHG implementing only a FHIR Observation Reporting Client shall be able to upload measurements to an H&FS advertising a FHIR Observation Server Continua Certified Capability Class or FHIR Observation Reporting Server Continua Certified Capability Class.		
Applicability		C_SEN_000 AND C_SEN_GEN_008		
Other PICSs				
Initial condition		Simulated H&FS supports FHIR Observation Reporting Server and Capability Exchange Continua Certified Capability Classes, so it can accept FHIR resource bundles using TLS		

	1.1security and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.
Test procedure	1. Ask the PHG to upload a new FHIR Patient Resource within a complete FHIR bundle to the simulated H&FS using TLS 1.1 and an OAuth 2.0 bearer token or JWT. 2. Check that the request is a create or conditional create operation using HTTP POST and that, in the request: • A temporary Logical ID for the Patient Resource being created is specified in the transaction bundle. • The Patient Designator information is provided in the Patient Resource. 3. The simulated H&FS accepts the operation and returns <HTTP 201> (created) and a Location header, which contains the Logical Id and Version Id of the created resources. 4. Ask the PHG to upload a new FHIR DeviceComponent Resource within a complete FHIR bundle to the simulated H&FS using TLS 1.1 and an OAuth 2.0 bearer token or JWT. 5. Check that the request is an update operation using HTTP PUT or a conditional create operation using HTTP POST. 6. The simulated H&FS accepts the operation and returns <HTTP 201> (created) and a Location header, which contains the Logical Id and Version Id of the created resources. 7. Ask the PHG to upload a new FHIR Observation Resource within a complete FHIR bundle to the simulated H&FS using TLS 1.1 and an OAuth 2.0 bearer token or JWT. 8. Check that the request is a create or conditional create operation using HTTP POST. 9. The simulated H&FS accepts the operation and returns <HTTP 201> (created) and a Location header, which contains the Logical Id and Version Id of the created resources. 10. The simulated H&FS is re-configured to support only FHIR Observation Server Continua Certified Capability Class. 11. Ask the PHG under test to retrieve the root file and OAuthDescriptor of this new configuration. 12. Ask the PHG to upload a new FHIR Observation Resource within a complete FHIR bundle to the simulated H&FS using TLS 1.1 and an OAuth 2.0 bearer token or JWT. 13. Check that the request is a create or conditional create operation using HTTP POST. 14. The simulated H&FS accepts the operation and returns <HTTP 201> (created) and a Location header, which contains the Logical Id and Version Id of the created resources.
Pass/fail criteria	• Simulated H&FS accepts the requests as described in steps 2, 5, 8, and 13.
Notes	

A.2 Subgroup 1.9.2: FHIR Encoding Guidelines (ENC)

TP Id		TP/HFS/SEN/FHIR/ENC/BV-000		
TP label		PHG Properties Encoding		
Coverage	**Spec**	[b-HSTP-H812-FHIR]		
	Testable items	PHGFHIR 1; M	PHGFHIR 2; M	PHGFHIR 3; C
		PHGFHIR 4; M	PHGFHIR 5; M	PHGFHIR 6; M
		PHGFHIR 7; O	PHGFHIR 8; C	PHGFHIR 9; C

		PHGFHIR 10; M	PHGFHIR 11; M	PHGFHIR 12; M
		PHGFHIR 13; M	PHGFHIR 14; M	PHGFHIR 15; O
		PHGFHIR 16; O	PHGCommon 28; M	
Test purpose		Check that: The FHIR resource representing the PHG Properties is properly encoded.		
Applicability		C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008)		
Other PICSs				
Initial condition		Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.		
Test procedure		1. Ask the PHG to upload a FHIR resource bundle that contains a PHG FHIR resource. 2. In the PHG FHIR resource check that: a) resourceType is set to "DeviceComponent". b) DeviceComponent.*id* (logical id) is present. IF the PHG performs a FHIR "update interaction" the value of DeviceComponent.*id* shall be: "[system Id as 16-digit HEX string].[transport address]", where the transport address is • a 12-digit HEX string for Bluetooth without the 0x prefix • a 16-digit HEX string for ZigBee without the 0x prefix • a 4-digit VID HEX string followed by a 4-digit PID HEX string for USB separated by a dot without the 0x prefix. • If the transport address is not known, it shall be set to all 0s. c) DeviceComponent.meta.*profile* (profile) is present and it is set to "placeholder/phgDeviceComponent". d) DeviceComponent.identifier is present and: • DeviceComponent.identifier.*use* shall be set to "official". • DeviceComponent.identifier.*system* shall be set to "urn:oid:1.2.840.10004.1.1.1.0.0.1.0.0.1.2680". • DeviceComponent.identifier.*value* shall be set to a16-digit HEX string without the 0x prefix and with each byte separated by dashes (PHG System Id). e) DeviceComponent.type is present and: • DeviceComponent.type.coding.*code* shall be set to "531981" • DeviceComponent.type.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.type.coding.*display* shall include "MDC_MOC_VMS_MDS_AHD" plus optional text. • If an alternative coding is used this shall occur first. f) DeviceComponent.productionSpecification may be present, and if it present then: • DeviceComponent.productionSpecification.specType.coding.*code* shall be set to "531969" OR "531970" OR "531971" OR "531972" OR "531973" OR "531974" OR "531975" OR "531976" OR "531977" OR "531978". • DeviceComponent.productionSpecification.specType.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.productionSpecification.coding.*display* is strongly recommended and, if present, its value shall be the reference id of the value of		

	DeviceComponent.productionSpecification.coding.*code* (in parentheses) plus optional text: "MDC_ID_MODEL_NUMBER" (531969) OR "MDC_ID_MODEL_MANUFACTURER" (531970) OR "MDC_ID_PROD_SPEC_UNSPECIFIED" (531971) OR "MDC_ID_PROD_SPEC_SERIAL" (531972) OR "MDC_ID_PROD_SPEC_PART" (531973) OR "MDC_ID_PROD_SPEC_HW" (531974) OR "MDC_ID_PROD_SPEC_SW" (531975) OR "MDC_ID_PROD_SPEC_FW" (531976) OR "MDC_ID_PROD_SPEC_PROTOCOL" (531977) OR "MDC_ID_PROD_SPEC_GMDN" (531978). • If an alternative coding is also used, this coding element (11073) shall occur first g) IF the Production Specification is present and is one of: Unspecified (unspecified), Serial number (serial-number), Part number (part-number), Hardware revision (hardware-revision), Software revision (software-revision), Firmware revision (firmware-revision) or Protocol (protocol), THEN an additional productionSpecification.specType.coding entry MUST be added to the productionSpecification in f) and: • DeviceComponent.productionSpecification.specType.coding.*code* shall be set to "unspecified" OR "serial-number" OR "part-number" OR "hardware-revision" OR "software-revision" OR "firmware-revision" OR "protocol". • DeviceComponent.productionSpecification.specType.coding.*system* shall be set to "http://hl7.org/fhir/specification-type". • DeviceComponent.productionSpecification.*productionSpec* shall be present and shall be the production spec value. h) The Continua Version is present as a DeviceComponent.productionSpecification with: • DeviceComponent.productionSpecification.specType.coding.*code* shall be set to "532352". • DeviceComponent.productionSpecification.specType.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.productionSpecification.coding.*display* is strongly recommended, if present, its value shall be "MDC_REG_CERT_DATA_CONTINUA_VERSION" plus any optional text. • DeviceComponent.productionSpecification.*productionSpec* shall be present and shall be the Continua (major version).(minor version). i) The List of Continua Certified Transports and Specializations shall be present as a DeviceCompoment.property, and: • DeviceComponent.property.type.coding.*code* shall be set to "532353". • DeviceComponent.property.type.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.type.coding.*display* is strongly recommended, if present, its value shall be "MDC_REG_CERT_DATA_CONTINUA_CERT_DEV_LIST" plus any optional text. • For each certified specialization there shall be a DeviceCompoment.property.valueCodeableConcept with: ▪ DeviceComponent.property.valueCodeableConcept.coding.*code* shall be set to Tcode * 8192 +16-bit mdc profile code – 4096, where: ✓Tcode may be 0 (Continua version 1.0) OR 1 (USB) OR 2 BT HDP) OR 3 (ZB) OR 4 (BLE) OR 5 (NFC). ✓16-bit mdc profile code is the MDC_DEV_*_SPEC_PROFILE_* term code representing the specialization. ▪ DeviceCompoment.property.valueCodeableConcept.coding.*system* shall be set to "placeholder/fhir/reg-cert-codes". ▪ DeviceComponent.property.type.coding.*display* is optional.

	j) The List of Continua Certified H&FS Interfaces shall be present as a DeviceCompoment.property, and: • DeviceComponent.property.type.coding.*code* shall be set to "532355". • DeviceComponent.property.type.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.type.coding.*display* is strongly recommended and, if present, its value shall be "MDC_REG_CERT_DATA_CONTINUA_AHD_CERT_LIST" plus optional text • For each certified interface there shall be a DeviceCompoment.property.valueCodeableConcept with: ▪ DeviceCompoment.property.valueCodeableConcept.coding.*code* shall be set to 0 (PCD-01 web services) OR 1 (Consent enabled PCD-01 web service) OR 2 (Capability exchange) OR 3 (PCD-01 upload using hData) OR 4 (Consent enabled PCD-01 using hData) OR 5 (Questionnaire CDA) OR 6 (Authenticated Persistent Sessions) OR 7 (FHIR resource upload). ▪ DeviceCompoment.property.valueCodeableConcept.coding.*system* shall be set to "placeholder/fhir/reg-cert-wan-codes". ▪ DeviceComponent.property.type.coding.*display* is strongly recommended and its value shall be one of (it shall match the code): "observation-upload-soap" (0) OR "consent-enabled-soap" (1) OR "capabilities" (2) OR "observation-upload-hdata" (3) OR "consent-enabled-hdata" (4) OR "questionnaire" (5) OR "aps" (6) OR "observation-upload-fhir" (7). k) The Regulation Status shall be present as a DeviceCompoment.property, and: • DeviceComponent.property.type.coding.*code* shall be set to "532354.0" • DeviceComponent.property.type.coding.*system* shall be set to ."placeholder/fhir/IEEE.ASN1". • DeviceComponent.property.type.coding.*display* is strongly recommended and, if present, its value shall be "regulation-bit-field" plus any optional text • DeviceCompoment.property.valueCodeableConcept.coding.*code* shall be set to "y" (if set) "n" (if cleared). • DeviceCompoment.property.valueCodeableConcept.coding.*system* shall be set to "http://hl7.org/fhir/v2/0136". • DeviceComponent.property.type.coding.*display* shall be set to "unregulated" or "regulated" plus any optional text. l) Time synchronization shall be present as a DeviceCompoment.property, and: • DeviceComponent.property.name.coding.*code* shall be set to "68220". • DeviceComponent.property.name.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.name.coding.*display* is strongly recommended and, if present, its value shall be "MDC_TIME_SYNC_PROTOCOL" plus optional text. • If an alternative coding is also used, this coding element shall occur first. • DeviceCompoment.property.valueCodeableConcept.coding.*code* shall be set 32-bit code of time synchronization method if synchronized otherwise 532224 (MDC_TIME_SYNC_NONE). • DeviceCompoment.property.valueCodeableConcept.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.type.coding.*display* is strongly recommended. If present, it shall be set to reference id of synchronization code (see *Table* A-29 of [b-HSTP-H812-FHIR]) plus any additional optional text • If an alternative coding is also used, this coding element shall occur first. m) Time synchronization accuracy may be present as a DeviceCompoment.property, and, if present:

	• DeviceComponent.property.name.coding.*code* shall be set to "68221". • DeviceComponent.property.name.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.name.coding.display is strongly recommended, and, if present, its value shall be "MDC_TIME_SYNC_ACCURACY" plus any optional text. • If an alternative coding is also used, this coding element shall occur first. • DeviceComponent.property.valueQuantity.*value* shall be the accuracy in microseconds. • DeviceCompoment.property.valueQuantity.*unit* shall be set to "us" (UCUM). • DeviceComponent.property.valueQuantity.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.valueQuantity.*code* shall be set to "264339". n) Time resolution encoding may be present as a DeviceCompoment.property, and, if present: • DeviceComponent.property.name.coding.*code* shall be set to "68226". • DeviceComponent.property.name.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.name.coding.*display* is strongly recommended and, if present, its value shall be "MDC_TIME_RES_BO" plus any optional text. • If an alternative coding is also used, this coding element shall occur first. • DeviceCompoment.property.valueQuantity.*value* shall be the resolution in microseconds. • DeviceCompoment.property.valueQuantity.*unit* shall be set to "us" (UCUM). • DeviceComponent.property.valueQuantity.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.valueQuantity.*code* shall be set to "264339".
Pass/Fail criteria	• FHIR resource encoding for the PHG properties is as specified in [b-HSTP-H812-FHIR].
Notes	

TP Id		TP/HFS/SEN/FHIR/ENC/BV-001		
TP label		Sensor Properties Encoding		
Coverage	**Spec**	[b-HSTP-H812-FHIR]		
	Testable items	SensorFHIR 1; M	SensorFHIR 2; C	SensorFHIR 3; M
		SensorFHIR 4; C	SensorFHIR 5; M	SensorFHIR 6; M
		SensorFHIR 7; M	SensorFHIR 8; M	SensorFHIR 9; O
		SensorFHIR 10; C	SensorFHIR 11; C	SensorFHIR 12; M
		SensorFHIR 13; M	SensorFHIR 14; M	SensorFHIR 15; O
		SensorFHIR 16; O	SensorFHIR 17; O	SensorFHIR 18; O
		SensorFHIR 19; C	SensorFHIR 20; O	SensorFHIR 21; O
		SensorFHIR 22; O	PHGCommon 29; M	

Test purpose	Check that: The FHIR resource representing the Sensor Properties is properly encoded.
Applicability	C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008)
Other PICSs	
Initial condition	Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.
Test procedure	1. Ask the PHG to upload a FHIR resource bundle that contains a Sensor FHIR resource. 2. In the Sensor FHIR resource check that: a) resourceType is set to "DeviceComponent". b) DeviceComponent.*id* (logical id) is present. IF the Logical Id is set by a FHIR "update interaction" the value of DeviceComponent.*id* shall be:"[system Id as 16-digit HEX string].[transport address]", where the transport address is • a 12-digit HEX string for Bluetooth without the 0x prefix • a 16-digit HEX string for ZigBee without the 0x prefix • a 4-digit VID HEX string followed by a 4-digit PID HEX string for a USB separated by a dot without the 0x prefix. • If the transport address is not known, it shall be set to all 0's. • If the system Id is not known, which may happen with some badly behaved BTLE devices, the 16-digit HEX string shall be set to all 0s. c) For the top-level DeviceComponent resource, DeviceComponent.identifier shall be present and: • DeviceComponent.identifier.*use* shall be set to "official". • DeviceComponent.identifier.*system* shall be set to "urn:oid:1.2.840.10004.1.1.1.0.0.1.0.0.1.2680". • DeviceComponent.identifier.*value* shall be set to a16-digit HEX string without the 0x prefix and with each byte separated by dashes. • if an additional identifier is used this one shall be first (multiple identifiers are allowed) d) For the top-level DeviceComponent resource, DeviceComponent.meta.*profile* shall be present and its value shall be "placeholder/placeholder/phdParentDeviceComponent" e) For the top-level DeviceComponent resource, DeviceComponent.type shall be present and: • DeviceComponent.type.coding.*code* shall be set to: ▪ 8 * 2^16 + System-Type-Spec-List[0].type for a device with a single specialization OR ▪ 528834 for a multi-specialization device • DeviceComponent.type.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.type.coding.*display* is strongly recommended and it shall contain: ▪ "MDC_DEV_*_SPEC_PROFILE_*" plus optional text for a device with a single specialization OR ▪ "MDC_DEV_SPEC_PROFILE_HYDRA" plus optional text for a multi-specialization device • If an alternative coding is also used, this coding element shall occur first

	f) For the top-level DeviceComponent resource, DeviceComponent.meta.*parent* shall be present and shall point to a PHG-DeviceComponent. g) For the top-level DeviceComponent resource, Production Specification may be present as a DeviceComponent.productionSpecification element, and: • DeviceComponent.productionSpecification.specType.coding.*code* shall be set to "531969" OR "531970" OR "531971" OR "531972" OR "531973" OR "531974" OR "531975" OR "531976" OR "531977" OR "531978". • DeviceComponent.productionSpecification.specType.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.productionSpecification.coding.*display* is strongly recommended and, if present, its value shall be the reference id of the value of DeviceComponent.productionSpecification.coding.*code* (in parentheses) plus optional text: "MDC_ID_MODEL_NUMBER" (531969) OR "MDC_ID_MODEL_MANUFACTURER" (531970) OR "MDC_ID_PROD_SPEC_UNSPECIFIED" (531971) OR "MDC_ID_PROD_SPEC_SERIAL" (531972) OR "MDC_ID_PROD_SPEC_PART" (531973) OR "MDC_ID_PROD_SPEC_HW" (531974) OR "MDC_ID_PROD_SPEC_SW" (531975) OR "MDC_ID_PROD_SPEC_FW" (531976) OR "MDC_ID_PROD_SPEC_PROTOCOL" (531977) OR "MDC_ID_PROD_SPEC_GMDN" (531978). • If an alternative coding is also used, this coding element (11073) shall occur first • DeviceComponent.productionSpecification.*productionSpec* shall be present and shall be the production spec value h) IF the Production Specification is present and is one of: Unspecified (unspecified), Serial number (serial-number), Part number (part-number), Hardware revision (hardware-revision), Software revision (software-revision), Firmware revision (firmware-revision) or Protocol (protocol), THEN an additional productionSpecification.specType.coding entry MUST be added to the productionSpecification in g) and: • DeviceComponent.productionSpecification.specType.coding.*code* shall be set to "unspecified" OR "serial-number" OR "part-number" OR "hardware-revision" OR "software-revision" OR "firmware-revision" OR "protocol". • DeviceComponent.productionSpecification.specType.coding.*system* shall be set to "http://hl7.org/fhir/specification-type". • DeviceComponent.productionSpecification.*productionSpec* shall be present and shall be the production spec value. i) For the top-level DeviceComponent resource, the Continua Version is present as a DeviceComponent.productionSpecification with: • DeviceComponent.productionSpecification.specType.coding.*code* shall be set to "532352". • DeviceComponent.productionSpecification.specType.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.productionSpecification.coding.*display* is strongly recommended, if present, its value shall be "MDC_REG_CERT_DATA_CONTINUA_VERSION" plus any optional text. • DeviceComponent.productionSpecification.*productionSpec* shall be present and shall be the Continua (major version).(minor version). j) For the top-level DeviceComponent resource, the list of Continua Certified Transports and Specializations shall be present as a DeviceCompoment.property, and: • DeviceComponent.property.type.coding.*code* shall be set to "532353". • DeviceComponent.property.type.coding.*system* shall be set to "urn.iso.std.iso:11073:10101".

	• DeviceComponent.property.type.coding.*display* is strongly recommended, if present, its value shall be "MDC_REG_CERT_DATA_CONTINUA_CERT_DEV_LIST" plus any optional text. • For each certified specialization there shall be a DeviceCompoment.property.valueCodeableConcept with: ▪ DeviceComponent.property.valueCodeableConcept.coding.*code* shall be set to Tcode * 8192 +16-bit mdc profile code – 4096, where: ✓Tcode may be 0 (Continua version 1.0) OR 1 (USB) OR 2 (BT HDP) OR 3 (ZB) OR 4 (BLE) OR 5 (NFC). ✓16-bit MDC profile code is the MDC_DEV_*_SPEC_PROFILE_* term code representing the specialization. ▪ DeviceCompoment.property.valueCodeableConcept.coding.*system* shall be set to "placeholder/fhir/reg-cert-codes". ▪ DeviceComponent.property.type.coding.*display* is optional. k) For the top-level DeviceComponent resource, the Regulation Status shall be present as a DeviceCompoment.property, and: • DeviceComponent.property.type.coding.*code* shall be set to "532354.0" • DeviceComponent.property.type.coding.*system* shall be set to ."placeholder/fhir/IEEE.ASN1". • DeviceComponent.property.type.coding.*display* is strongly recommended and, if present, its value shall be "regulation-bit-field" plus any optional text. • DeviceCompoment.property.valueCodeableConcept.coding.*code* shall be set to "y" (if set) "n" (if cleared). • DeviceCompoment.property.valueCodeableConcept.coding.*system* shall be set to "http://hl7.org/fhir/v2/0136". • DeviceComponent.property.type.coding.*display* shall be set to "unregulated" or "regulated" plus any optional text. l) For the top-level DeviceComponent resource, time synchronization shall be present as a DeviceCompoment.property, and: • DeviceComponent.property.name.coding.*code* shall be set to "68220". • DeviceComponent.property.name.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.name.coding.*display* is strongly recommended and, if present, its value shall be "MDC_TIME_SYNC_PROTOCOL" plus optional text. • If an alternative coding is also used, this coding element shall occur first. • DeviceCompoment.property.valueCodeableConcept.coding.*code* shall be set 32-bit code of time synchronization method if synchronized otherwise 532224 (MDC_TIME_SYNC_NONE). • DeviceCompoment.property.valueCodeableConcept.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.type.coding.*display* is strongly recommended. If present, it shall be set to reference id of synchronization code (see Table A-29 of [b-HSTP-H812-FHIR]) plus any additional optional text • If an alternative coding is also used, this coding element shall occur first. m) For the top-level DeviceComponent resource, time synchronization accuracy may be present as a DeviceCompoment.property and, if present: • DeviceComponent.property.name.coding.*code* shall be set to "68221". • DeviceComponent.property.name.coding.*system* shall be set to "urn.iso.std.iso:11073:10101".

	• DeviceComponent.property.name.coding.*display* is strongly recommended, and, if present, its value shall be "MDC_TIME_SYNC_ACCURACY" plus any optional text. • If an alternative coding is also used, this coding element shall occur first. • DeviceComponent.property.valueQuantity.*value* shall be the accuracy in microseconds. • DeviceCompoment.property.valueQuantity.*unit* shall be set to "us" (UCUM). • DeviceComponent.property.valueQuantity.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.valueQuantity.*code* shall be set to "264339". n) For the top-level DeviceComponent resource, the sensor time capabilities may be reported as a DeviceCompoment.property and, if present: • DeviceComponent.property.type.coding.*code* shall be set to "68219.i". • DeviceComponent.property.type.coding.*system* shall be set to "placeholder/fhir/IEEE.ASN1" (placeholder). • DeviceComponent.property.type.coding.*display* is strongly recommended and, if present, its value shall be the ASN.1 name from Table A-32 of [b-HSTP-H812-FHIR], plus any optional text. • DeviceCompoment.property.valueCodeableConcept.coding.*code* shall be set "y" (if set) "n" (if cleared). • DeviceCompoment.property.valueCodeableConcept.coding.*system* shall be set to "http://hl7.org/fhir/v2/0136". • DeviceComponent.property.type.coding.*display* is an optional text o) For the top-level DeviceComponent resource, time resolution encoding may be present as a DeviceCompoment.property, and, if present: • DeviceComponent.property.name.coding.*code* shall be set to "68226". • DeviceComponent.property.name.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.name.coding.*display* is strongly recommended and, if present, its value shall be "MDC_TIME_RES_BO" plus any optional text. • If an alternative coding is also used, this coding element shall occur first. • DeviceCompoment.property.valueQuantity.*value* shall be the resolution in microseconds. • DeviceCompoment.property.valueQuantity.*unit* shall be set to "us" (UCUM). • DeviceComponent.property.valueQuantity.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.property.valueQuantity.*code* shall be set to "264339". p) If there are multiple specializations or when there are specialization sub-profiles, there will be a child DeviceComponent resource for each specialization or sub-profile in which: • DeviceComponent.meta.*profile* shall be present and its value shall be "placeholder/placeholder/phdChildDeviceComponent". • DeviceComponent.*parent* shall be present and shall point to its parent DeviceComponent resource. • DeviceComponent.type.coding.*code* shall be present and contain the specialization or sub-profile information. • DeviceComponent.type.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • DeviceComponent.type.coding.*display* is strongly recommended and, if present, it shall contain the MDC code for the specialization or sub-profile plus optional text.

q) MDS Battery-Level may reported in an Observation resource. If present, it will be encoded as shown below:

- Observation.*identifier* is optional (value is always current).
- Observation.*status* shall be set to "final".
- Observation.code.coding.*code* shall be set to "67996".
- Observation.code.coding.*system* shall be set to "urn.iso.std.iso:11073:10101".
- Observation.code.coding.*display* is strongly recommended and, if present, it shall be set to "MDC_ATTR_VAL_BATT_CHARGE" plus optional text.
- If an alternative coding is also used, this coding element shall occur first
- Observation.*subject* shall contain a reference to the Patient Resource
- Observation.*effectiveDateTime* shall contain the time of the PHG including offset to UTC at which the battery attribute was read or the value was received.
- Observation.valueQuantity.*value* shall be Battery-Level.*value.*
- Observation.valueQuantity.*unit* is strongly recommended to be present and shall be "%".
- Observation.valueQuantity.*system* shall be set to "urn.iso.std.iso:11073:10101".
- Observation.valueQuantity.*code* shall be set to "262688".
- Observation.*device* shall point to the parent DeviceComponent resource.

r) MDS Remaining-Battery-Time may be reported in an Observation resource, if present, it will be encoded as shown below:

- Observation.*identifier* is optional (value is always current).
- Observation.*status* shall be set to "final".
- Observation.code.coding.*code* shall be set to "67956".
- Observation.code.coding.*system* shall be set to "urn.iso.std.iso:11073:10101".
- Observation.code.coding.*display* is strongly recommended, and, if present, it shall be set to "MDC_ATTR_TIME_BATT_REMAIN" plus optional text.
- If an alternative coding is also used, this coding element shall occur first.
- Observation.*subject* shall contain a reference to the Patient Resource.
- Observation.*effectiveDateTime* shall contain the time of the PHG including offset to UTC at which the battery time remaining attribute was read or the value was received.
- Observation.valueQuantity.*value* shall be the Remaining-Battery-Time.*value*
- Observation.valueQuantity.*unit* is strongly recommended and shall be either min (minutes), hr (hours), or days.
- Observation.valueQuantity.*system* shall be set to "urn.iso.std.iso:11073:10101"
- Observation.valueQuantity.*code* shall be set to 4*2^16 + Remaining-Battery-Time.*unit* (where Remaining-Battery-Time.*unit* is MDC_DIM_MIN (minutes), MDC_DIM_HR (hours), or MDC_DIM_DAY (days)).
- Observation.*device* shall point to the parent DeviceComponent resource.

s) MDS Power-Status may be reported in an Observation resource. If present, it will be encoded as shown below:

- Observation.*identifier* is optional (value is always current).
- Observation.*status* shall be set to "final".
- Observation.code.coding.*code* shall be set to "67925".
- Observation.code.coding.*system* shall be set to "urn.iso.std.iso:11073:10101".
- Observation.code.coding.*display* is strongly recommended and, if present, it shall be set to "MDC_ATTR_POWER_STAT" plus optional text.

	• If an alternative coding is also used, this coding element shall occur first. • Observation.*subject* shall contain a reference to the Patient Resource. • Observation.*effectiveDateTime* shall contain the time of the PHG including offset to UTC at which the battery time remaining attribute was read or the value was received. • Observation.value[x] shall not be reported. • Observation.*device* shall point to the parent DeviceComponent resource. • For each bit that is defined and reported there is an Observation.component element (only set values shall be reported): ▪ Observation.component.code.coding.*code* shall be set to *ASN1code* = *nomenclatureCode*.*bitPosition* (Table A-46 of [b-HSTP-H812-FHIR]), where: ✓*bitsValue* = Enum-Observed-Value-Basic-Bit-Str or (16-bits) = Enum-Observed-Value-Simple-Bit-Str or (32-bits) = Enum-Observed-Value-EnumVal.enum-bit-str (always 32 bit) ✓*nomenclatureCode* = procedure from Measurement Type section ✓bitPosition = Mder Bit to be reported from 0 to 15/31 ▪ Observation.component.code.coding.*system* shall be set to "placeholder/fhir/IEEE.ASN1" ▪ Observation.component.code.coding.*display* is optional and if present shall be "onMains" OR "onBattery" OR "chargingFull" OR "chargingTrickle" OR "chargingOff". ▪ Observation.component.valueCodeableConcept.code.coding.*code* shall be set "y" if set, "n" if cleared. ▪ Observation.component.valueCodeableConcept.code.coding.*system* shall be set to "http://hl7.org/fhir/v2/0136". ▪ Observation.component.valueCodeableConcept.code.coding.display is optional text.
Pass/Fail criteria	• FHIR resource encoding for the Sensor properties is as specified in [b-HSTP-H812-FHIR].
Notes	

TP Id		TP/HFS/SEN/FHIR/ENC/BV-002		
TP label		Coincident Time Stamp Encoding		
Coverage	**Spec**	[b-HSTP-H812-FHIR]		
	Testable items	CoincTS 1; O	CoincTS 2; C	CoincTS 3; M
		CoincTS 4; M	CoincTS 5; C	CoincTS 6; C
		CoincTS 7; C	CoincTS 8; C	PHGCommon 30; M
Test purpose		Check that: The FHIR resource representing the Coincident Time Stamp is properly encoded.		
Applicability		C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008)		
Other PICSs				

Initial condition	Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.
Test procedure	1. Ask the PHG to upload a FHIR resource bundle that contains a Coincident Time Stamp FHIR resource. 2. In the Coincident Time Stamp FHIR resource check that: a) resourceType is set to "Observation". b) If a logical id is needed, the Observation.*id* shall be populated with a temporary id. c) Observation.*status* shall be set to "final". d) Observation.meta.*profile* shall be set to "placeholder/phdCoincidentTimeStampObservation". e) If the sensor uses Absolute Time, the coincident time stamp shall be encoded as follows: • Observation.code.coding.*code* shall be set to "67975". • Observation.code.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • Observation.code.coding.*display* is strongly recommended, and, if present, it shall be set to "MDC_ATTR_TIME_ABS" plus optional text. • If an alternative coding is also used, this coding element shall occur first. • Observation.*effectiveDateTime* shall contain the current time of the PHG including offset to UTC at the time of reading the sensor current time. • Observation.*valueDateTime* shall contain the date-and-Time converted to a FHIR dateTime data type: ▪ This element is absent if there is a time fault. ▪ This element is set to the *effectiveDateTime* if the PHG set the sensor time and the set is successful f) If the sensor uses Base Offset Time, the coincident time stamp shall be encoded as follows: • Observation.code.coding.*code* shall be set to "68226". • Observation.code.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • Observation.code.coding.*display* is strongly recommended, and, if present, it shall be set to "MDC_ATTR_TIME_BO" plus optional text. • If an alternative coding is also used, this coding element shall occur first. • Observation.*effectiveDateTime* shall contain the current time of the PHG including offset to UTC at the time of reading the sensor current time. • Observation.*valueDateTime* shall contain the Base-Offset-Time converted to a FHIR dateTime data type: ▪ This element is absent if there is a time fault. ▪ This element is set to the effectiveDateTime if the PHG set the sensor time and the set is successful. g) If the sensor uses Relative Time, the coincident time stamp shall be encoded as follows: • Observation.code.coding.*code* shall be set to "67983". • Observation.code.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • Observation.code.coding.*display* is strongly recommended, and, if present, it shall be set to "MDC_ATTR_TIME_REL" plus optional text • If an alternative coding is also used, this coding element shall occur first.

	• Observation.*effectiveDateTime* shall contain the current time of the PHG including offset to UTC at the time of reading the sensor current time. • If there is no time fault: ▪ Observation.valueQuantity.*value* shall be set to Relative-Time * 125 (to convert to microseconds) ▪ Observation.valueQuantity.*unit* shall be set to "us" ▪ Observation.valueQuantity.*system* shall be set to "urn.iso.std.iso:11073:10101". ▪ Observation.valueQuantity.*code* shall be set to "264339" h) If the sensor uses High Resolution Relative Time, the coincident time stamp shall be encoded as follows: • Observation.code.coding.*code* shall be set to "68072". • Observation.code.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • Observation.code.coding.*display* is strongly recommended and, if present, it shall be set to ""MDC_ATTR_TIME_REL_HI_RES" plus optional text. • If an alternative coding is also used, this coding element shall occur first • Observation.*effectiveDateTime* shall contain the current time of the PHG including offset to UTC at the time of reading the sensor current time. • If there is no time fault: ▪ Observation.valueQuantity.*value* shall be set to HiRes-Relative-Time which is in microseconds ▪ Observation.valueQuantity.*unit* shall be set to "us". ▪ Observation.valueQuantity.*system* shall be set to "urn.iso.std.iso:11073:10101". ▪ Observation.valueQuantity.*code* shall be set to "264339".
Pass/Fail criteria	• FHIR resource encoding for the Coincident Time Stamp is as specified in [b-HSTP-H812-FHIR].
Notes	

TP Id		TP/HFS/SEN/FHIR/ENC/BV-003		
TP label		Measurements Encoding: general and specific metric attributes		
Coverage	**Spec**	[b-HSTP-H812-FHIR]		
	Testable items	MeasGen 1; M	MeasGen 2; M	MeasGen 3; O
		MeasGen 4; O	MeasGen 5; O	MeasGen 6; C
		MeasGen 7; M	MeasGen 8; M	MeasGen 9; M
		MeasGen 10; C	MeasGen 11; C	MeasGen 12; C
		MeasGen 13; C	MeasGen 14; C	MeasGen 15; C
		MeasPOX 1; C	MeasPOX 2; C	MeasPOX 3; C
		MeasAM 1; C	MeasCGM 1; C	MeasCGM 2; C
		MeasCGM 3; C	PHGCommon 31;M	

Test purpose	Check that: General and specific metric attributes in an FHIR Measurement are properly encoded.
Applicability	C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008)
Other PICSs	
Initial condition	Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.
Test procedure	1. Ask the PHG to upload a FHIR resource bundle that contains a Measurement FHIR resource. 2. In the Measurement FHIR resource check that: a) resourceType is set to "Observation". b) Measurement Type shall be present and shall be coded as: • Observation.code.coding.*code* shall be set to *partition* * 2^16 + *termCode*, where ▪ *termCode* = Type.*code* ▪ *partition* = Type.*partition* ▪ IF Metric-Id or Nu-Observed-Value or Enum-Observed-Value attribute exists: ✓IF Nu-Observed-Value or Enum-Observed-Value exists: *termCode* = Nu-Observed-Value.*metric-id* OR *termCode* = Enum_Observed-Value.*metric-id* ELSE IF Metric-Id is present: *termCode* = Metric-Id ✓IF Metric-Id-Partition exists: *partition* = Metric-Id-Partition • Observation.code.coding.*system* shall be set to "urn.iso.std.iso:11073:10101". • Observation.code.coding.display is strongly recommended and, if present, it shall be set to Reference Id for the code plus optional text. • If an alternative coding is also used, this coding element shall occur first. • If the measurement type is a vital sign, FHIR requires a translation to LOINC, which shall come second, and will be encoded as follows: • Observation.code.coding.*code* shall be set to the LOINC code for the above vital sign. • Observation.code.coding.*system* shall be set to "http://loinc.org". • Observation.code.coding.*display* is optional text. c) The PHG may report non-relative time stamps (Absolute, Base Offset and PHG Received), and it will encode them as follows if there is no Measure-Active-Period attribute: • Observation.*effectiveDateTime* shall be present and set to *effectiveDateTime* = *finalTimeStamp*, where: ▪ IF Absolute-Time-Stamp: *finalTimeStamp* = Absolute-Time-Stamp encoded as YYYY-MM-DDTHH:MM:SS[.ss] +/-ZZ:zz, where +/-ZZ:zz is the offset from local time to UTC obtained from the PHG, and [.ss] shall be excluded if the time stamp has no fractional seconds or the time resolution is >= to one second. ▪ IF Base-Offset-Time-Stamp: *finalTimeStamp* = Base-Offset-Time-Stamp encoded as YYYY-MM-DDTHH:MM:SS[.ss] +/-ZZ:zz , where [.ss] shall be excluded if the time stamp has no fractional seconds or the time resolution is >= to one second.

- IF there is no time stamp: *finalTimeStamp* = PHG time of reception encoded as YYYY-MM-DDTHH:MM:SS.sss +/-ZZ:zz

d) The PHG may report non-relative time stamps (Absolute, Base Offset and PHG-Received), and it will encode them as follows if there is a Measure-Active-Period attribute:

- Observation.effectivePeriod.*Start* shall be present and set to *start* = *finalTimeStamp*, where:
  - IF Absolute-Time-Stamp: *finalTimeStamp* = Absolute-Time-Stamp encoded as YYYY-MM-DDTHH:MM:SS[.ss] +/-ZZ:zz, where +/-ZZ:zz is the offset from local time to UTC obtained from the PHG, and [.ss] shall be excluded if the time stamp has no fractional seconds or the time resolution is >= to one second.
  - IF Base-Offset-Time-Stamp: *finalTimeStamp* = Base-Offset-Time-Stamp encoded as YYYY-MM-DDTHH:MM:SS[.ss] +/-ZZ:zz, where [.ss] shall be excluded if the time stamp has no fractional seconds or the time resolution is >= to one second.
- Observation.effectivePeriod.*End* shall be present and set to *finalTimeStamp* + Measure-Active-Period with precision indicated by the Mder FLOAT, and encoded as a FHIR dateTime data type.

e) The PHG may report relative time stamps, and it will encode them as follows:

- If there is no Measure-Active-Period attribute:
  - Observation.effectivePeriod.*effectiveDateTime* shall be set to *wallclockMeasurementTime* from Table A-54 of [b-HSTP-H812-FHIR].
- If there is a Measure-Active-Period attribute:
  - Observation.effectivePeriod.*Start* shall be present and set to *start* = *wallclockMeasurementTime* from Table A-54 of [b-HSTP-H812-FHIR].
  - Observation.effectivePeriod.*End* shall be present and set to *end* = *wallclockDurationTime* from Table A-54 of [b-HSTP-H812-FHIR].

f) If there is a time stamp reported by the sensor, there shall be an Observation.related.*target* element pointing to the appropriate Coincident Time Stamp Observation resource.

g) Observation.identifier.*value* shall be present and set as in section A.6.7 [b-HSTP-H812-FHIR].

h) Observation.*status* shall be present and set to "final" or "preliminary" (if a measurement status of "early indication").

i) Observation.*device* shall point to the top-level DeviceComponent resource.

j) If an error or special value is reported in the observation, one of the following elements will be encoded with values according to Table A-57 of [b-HSTP-H812-FHIR]:

- Observation.value[x]
- Observation.dataAbsentReason

k) If PHG reports a Source-Handle-Reference or Source-Handle-Reference-List attribute, it shall encode it as:

- Observation.related.*target* set to the URL to Observation being referenced.

l) If Supplemental Types attribute is present, then for each supplemental types there is an Observation.component element, encoded as:

- Observation.component.code.coding.*code* shall be present ant set to "68193".
- Observation.component.code.coding.system shall be set to "urn:iso:std:iso:11073:10101".
- Observation.component.code.coding.*display* is strongly recommended. If present, it shall be set to "MDC_ATTR_SUPPLEMENTAL_TYPES" plus any optional text.
- If an alternative coding system is used, this element shall occur first.

	• Observation.component.valueCodeableConcept.coding.*code* shall be set to Supplemental-Types[n].*partition* * 2^16 + SupplementalTypes[n].*termCode.* • Observation.component.valueCodeableConcept.coding.*system* shall be set to "urn:iso:std:iso:11073:10101". • Observation.component.valueCodeableConcept.coding.*display* is strongly recommended. If present, it shall be set to the reference id corresponding to the code plus optional text • If an alternative coding system is used, this element shall occur first. m) If Accuracy attribute is present, it shall be encoded as an Observation.component element: • Observation.component.code.coding.*code* shall be present ant set to "67914". • Observation.component.code.coding.*system* shall be set to "urn:iso:std:iso:11073:10101". • Observation.component.code.coding.*display* is strongly recommended. If present, it shall be set to "MDC_ATTR_NU_ACCUR_MSMT" plus any optional text. • If an alternative coding system is used, this element shall occur first • Observation.component.valueQuantity.*value* shall be set to the Accuracy decoded from the FLOAT with the precision given by the respective Mder encoding. • Observation.component.valueQuantity.*units* is strongly recommended. If present, it shall be set to the UCUM string for the unit code. • Observation.component.valueQuantity.*system* shall be set to "urn:iso:std:iso:11073:10101". • Observation.component.valueQuantity.*code* shall be set to Observation.valueQuantity.*code* or in the compound case the unit code associated with the compound value. n) If Relative Time Stamp attribute is present, it shall be encoded as an Observation.component element: • Observation.component.code.coding.*code* shall be present ant set to "67985". • Observation.component.code.coding.*system* shall be set to "urn:iso:std:iso:11073:10101". • Observation.component.code.coding.*display* is strongly recommended. If present, it shall be set to "MDC_ATTR_TIME_STAMP_REL" plus any optional text. • If an alternative coding system is used, this element shall occur first. • Observation.component.valueQuantity.*value* shall be set to Relative-Time-Stamp * 125. • Observation.component.valueQuantity.*units* shall be set to "us" (microseconds). • Observation.component.valueQuantity.*system* shall be set to "urn:iso:std:iso:11073:10101". • Observation.component.valueQuantity.*code* shall be set to "264339". o) If HiRes Relative Time Stamp attribute is present, it shall be encoded as an Observation.component element: • Observation.component.code.coding.*code* shall be present ant set to "68073". • Observation.component.code.coding.*system* shall be set to "urn:iso:std:iso:11073:10101". • Observation.component.code.coding.*display* is strongly recommended. If present, it shall be set to "MDC_ATTR_TIME_STAMP_REL_HI_RES" plus any optional text. • If an alternative coding system is used, this element shall occur first.

	• Observation.component.valueQuantity.*value* shall be set HiRes-Time-Stamp. • Observation.component.valueQuantity.units shall be set to "us". • Observation.component.valueQuantity.system shall be set to "urn:iso:std:iso:11073:10101". • Observation.component.valueQuantity.code shall be set to "264339". 3. Ask the PHG to upload a new FHIR resource bundle that contains a Pulse Oximeter Measurement FHIR resource in which the sensor reports Alert-Op-State, Current-Limits and Alert-Op-Text attributes. 4. In the Measurement FHIR resource check that: a) If Alert-Op-State attribute is present, it shall be encoded as follows: • For each bit to be mapped there is an Observation.component element, encoded as: ▪ Observation.component.code.coding.*code* shall be present ant set to "68746.0" OR "68746.1" OR "68746.2". ▪ Observation.component.code.coding.*system* shall be set to "placeholder/fhir/IEEE.ASN1". ▪ Observation.component.code.coding.*display* is strongly recommended. If present, it shall be set to "lim-alert-off" OR "lim-low-off " OR "lim-high-off" plus optional text. ▪ Observation.component.valueCodeableConcept.coding.*code* shall be set to "y" if set, "n" if cleared. ▪ Observation.component.valueCodeableConcept.coding.*system* shall be set to "http://hl7.org/fhir/v2/0136". ▪ Observation.component.valueCodeableConcept.coding.*display* is some optional text. b) If Current-Limits attribute is present, it shall be encoded as an Observation.component element as follows: • Observation.component.code.coding.*code* shall be present ant set to "67892". • Observation.component.code.coding.*system* shall be set to "placeholder/fhir/IEEE.ASN1". • Observation.component.code.coding.*display* is strongly recommended. If present, it shall be set to "MDC_ATTR_LIMIT_CURR" plus optional text. • Observation.component.valueRange.low.*value* shall be set to Current-Limits.*lower* coded to a FHIR decimal with the precision of the Mder FLOAT • Observation.component.valueRange.low.*unit* is strongly recommended, if present shall be set to UCUM code of the Unit-Code attribute. • Observation.component.valueRange.low.*system* shall be set to "urn:iso:std:iso:11073:10101". • Observation.component.valueRange.low.*code* shall be set to 4*2^16 + Unit-Code • Observation.component.valueRange.high.*value* shall be set to Current-Limits.*upper* coded to a FHIR decimal with the precision of the Mder FLOAT. • Observation.component.valueRange.high.*unit* is strongly recommended, if present shall be set to UCUM code of the Unit-Code attribute. • Observation.component.valueRange.high.*system* shall be set to 4*2^16 + Unit-Code. • Observation.component.valueRange.high.*code* shall be set to 4*2^16 + Unit-Code. c) If Alert-Op-Text attribute is present, it shall be encoded as an Observation.component as follows: • Observation.component.code.coding.*code* shall be present ant set to "68104".

	• Observation.component.code.coding.*system* shall be set to ""urn:iso:std:iso:11073:10101". • Observation.component.code.coding.*display* is strongly recommended. If present, it shall be set to ""MDC_ATTR_AL_OP_TEXT_STRING" plus optional text. • If an alternative coding system is used, this element shall occur first. • Observation.*valueString* shall contain the information from the Alert-Op-Text.*lower_text* and Alert-Op-Text.*upper_text* presented in an application dependent manner. 5. Ask the PHG to upload a new FHIR resource bundle that contains a Medication Monitor Measurement FHIR resource in which the sensor reports the Context-Key attribute. 6. In the Measurement FHIR resource check that: a) If Context-Key attribute is present, it shall be encoded as an Observation.component element as follows: • Observation.component.code.coding.*code* shall be present ant set to "68216". • Observation.component.code.coding.*system* shall be set to "urn:iso:std:iso:11073:10101". • Observation.component.code.coding.*display* is strongly recommended. If present, it shall be set to "MDC_ATTR_CONTEXT_KEY" plus optional text. • Observation.component.valueCodeableConcept.coding.*code* shall be set to the Context-Key as a 16-digit Hexadecimal string. • Observation.component.valueCodeableConcept.coding.*system* shall be set to "urn:oid:1.2.840.10004.1.1.1.0.0.1.0.0.1.2680". • Observation.component.valueCodeableConcept.coding.*display* is some optional text. 7. Ask the PHG to upload a new FHIR resource bundle that contains a Continuous Glucose Monitor Measurement FHIR resource in which the sensor reports the Measurement-Confidence-95, Threshold-Notification-Text-String and Measurement Status alert attributes. 8. In the Measurement FHIR resource check that: a) If Measurement-Confidence-95 attribute is present, it shall be encoded as an Observation.component element as follows: • Observation.component.code.coding.*code* shall be present ant set to "526988". • Observation.component.code.coding.system shall be set to "placeholder/fhir/IEEE.ASN1". • Observation.component.code.coding.*display* is strongly recommended. If present, it shall be set to "MDC_ATTR_ MSMT_CONFIDENCE_95" plus optional text. • Observation.component.valueRange.low.*value* shall be set to Measurement-Confidence-95.*lower* coded to a FHIR decimal with the precision of the Mder FLOAT. • Observation.component.valueRange.low.*unit* is strongly recommended, if present shall be set to UCUM code of the Unit-Code attribute. • Observation.component.valueRange.low.system shall be set to "urn:iso:std:iso:11073:10101". • Observation.component.valueRange.low.*code* shall be set to 4*2^16 + Unit-Code. • Observation.component.valueRange.high.*value* shall be set to Measurement-Confidence-95.upper coded to a FHIR decimal with the precision of the Mder FLOAT. • Observation.component.valueRange.high.*unit* is strongly recommended, if present shall be set to UCUM code of the Unit-Code attribute

	• Observation.component.valueRange.high.*system* shall be set to "urn:iso:std:iso:11073:10101". • Observation.component.valueRange.high.*code* shall be set to 4*2^16 + Unit-Code. b) IF Alert-Op-Text attribute is present, it may be included in the Observation.*text* element or it may be encoded as an Observation.component as follows: • Observation.component.code.coding.*code* shall be present ant set to "68232". • Observation.component.code.coding.*system* shall be set to ""urn:iso:std:iso:11073:10101". • Observation.component.code.coding.*display* is strongly recommended. If present, it shall be set to "MDC_ATTR_THRES_NOTIF_TEXT_STRING" plus optional text. • Observation.*valueString* shall contain the Threshold-Notification-Text-String. c) If Measurement Status Alert attribute is present, it shall be encoded as follows: • For each bit to be mapped there is an Observation.component element, encoded as: ▪ Observation.component.code.coding.*code* shall be present ant set to "133447.14" or "133447.15". ▪ Observation.component.code.coding.*system* shall be set to "placeholder/fhir/IEEE.ASN1". ▪ Observation.component.code.coding.*display* is strongly recommended. If present, it shall be set to "msmt-state-in-alarm" OR "msmt-state-al-inhibited " plus optional text. ▪ Observation.component.valueCodeableConcept.coding.*code* shall be set to "y" if set, "n" if cleared. ▪ Observation.component.valueCodeableConcept.coding.*system* shall be set to "http://hl7.org/fhir/v2/0136". ▪ Observation.component.valueCodeableConcept.coding.*display* may be present as some optional text.
Pass/Fail criteria	• FHIR resource encoding for general and specific metric attributes of ISO/IEEE 11073 measurements is as specified in [b-HSTP-H812-FHIR].
Notes	

TP Id		TP/HFS/SEN/FHIR/ENC/BV-004		
TP label		Measurements Encoding: non-compound numeric values		
Coverage	**Spec**	[b-HSTP-H812-FHIR]		
	Testable items	MeasNCNum 1; M	MeasNCNum 2; M	PHGCommon 31;M
		MeasGen 2; M		
Test purpose		Check that: The FHIR resource representing a measurement with a non-compound numeric value is properly encoded.		
Applicability		C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008)		
Other PICSs				

Initial condition	Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.
Test procedure	1. Ask the PHG to upload a FHIR resource bundle that contains a Measurement FHIR resource with a non-compound numeric value 2. In the Measurement FHIR resource check that: 3. Once the measurement is received, the simulated H&FS checks that an Observation resource ("resourceType":"Observation") with Observation.meta.*profile* = "placeholder/phdNumericObservation" is present. 4. In this resource, check that: a) Observation.code is present and: • Observation.code.coding.*code* is present and set to $partition * 2^{16} + termcode$, where: ▪ *termCode* = Type.*code* ▪ *partition* = Type.*partition* ▪ IF Nu-Observed-Value exists then *termcode* = Nu-Observed-Value.*metric-id* ELSE IF *Metric-Id* is present then *termcode* = *Metric-Id*. ▪ IF *Metric-Id-Partition* is present then *partition* = *Metric-Id-Partition.* • Observation.code.coding.*system* is present and its value is "urn.iso.std.iso:11073:10101". • Observation.code.coding.*display* is strongly recommended, and its value is the Reference Id for the code plus optional text. • If an alternative coding is also used, this coding element shall occur first. IF the measurement type is a vital sign, FHIR requires a translation to LOINC, so: b) A second Observation.code.coding is present and: • Observation.code.coding.*code* is present and set to the LOINC code for the vital sign (see Table A-40 of [b-HSTP-H812-FHIR]). • Observation.code.coding.*system* is present and its value is "http://loinc.org". • Observation.code.coding.*display* is optional and it contains optional text. • This coding element shall occur second. IF there is no error or no special value is reported: c) Observation.valueQuantity is present • Observation.valueQuantity.*value* is present and it contains a <string> representing the value of Basic-Nu-Observed-Value, Simple-Nu-Observed-Value or Nu-Observed-Value decoded from SFLOAT or FLOAT with the precision given by the respective Mder encoding (see Table A-42 of [b-HSTP-H812-FHIR]). • Observation.valueQuantity.*unit* is strongly recommended and it contains the UCUM string for the unit code. • Observation.valueQuantity.*code* is present and its value is $4 * 2^{16} + unitTermCode$, where ▪ *unitTermCode* = Unit-Code ▪ IF Nu-Observed-Value is reported THEN *unitTermCode* = Nu-Observed-Value.*unit.* • Observation.valueQuantity.*system* is present and its value is "urn.iso.std.iso:11073:10101". • Observation.valueQuantity.*display* is strongly recommended and its value shall contain a reference id for the code plus optional code.

	IF there is an error or a special value is reported: d) Observation.dataAbsentReasonis present • Observation.dataAbsentReason.coding.*code* is present and its value is one of the FHIR codes defined in "https://www.hl7.org/fhir/valueset-observation-valueabsentreason.html". • Observation.dataAbsentReason.coding.*system* is present and its value is "http://hl7.org/fhir/data-absent-reason". • Observation.dataAbsentReason.coding.*display* is optional and its value some optional text.
Pass/Fail criteria	• FHIR resource encoding for the Observation resource is as described in step 4. • If the dataAbsentReason is present, the valueQuantity shall be absent • If the valueQuantity is present, the dataAbsentReason shall be absent
Notes	This encoding applies to Basic-Nu-Observed-Value (contains an Mder SFLOAT), Simple-Nu-Observed-Value (contains an Mder FLOAT) or Nu-Observed-Value (value element is an Mder FLOAT)

TP Id		TP/HFS/SEN/FHIR/ENC/BV-005		
TP label		Measurements Encoding: compound numeric values		
Coverage	**Spec**	[b-HSTP-H812-FHIR]		
	Testable items	MeasCNum 1; M	MeasCNum 2; M	MeasCNum 3; M
		PHGCommon 31;M	MeasGen 2; M	
Test purpose		Check that: The FHIR resource representing a measurement with a compound numeric value is properly encoded.		
Applicability		C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008)		
Other PICSs				
Initial condition		Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.		
Test procedure		1. Ask the PHG to upload a FHIR resource bundle that contains a Measurement FHIR resource containing a compound numeric value. 2. Once the measurement is received, the simulated H&FS checks that an Observation resource ("resourceType":"Observation") with Observation.meta.*profile* = "placeholder/phdCompoundNumericObservation" is present. 3. In this resource check that a) Observation.code is present and: • Observation.code.coding.*code* is present and set to $partition * 2^{16} + termcode$, where: ▪ *termCode* = Type.*code.* ▪ *partition* = Type.*partition.*		

	• Observation.code.coding.*system* is present and its value is "urn.iso.std.iso:11073:10101". • Observation.code.coding.*display* is strongly recommended, and its value is the Reference Id for the code plus optional text. • If an alternative coding is also used, this coding element shall occur first. IF the measurement type is a vital sign, FHIR requires a translation to LOINC, so: b) A second Observation.code.coding is present and: • Observation.code.coding.code is present and set to the LOINC code for the vital sign (see Table A-40 of [b-HSTP-H812-FHIR]). • Observation.code.coding.system is present and its value is "http://loinc.org". • Observation.code.coding.display is optional and it contains optional text. • This coding element shall occur second. c) Observation.value[x] shall not be encoded. d) Observation.dataAbsentReason shall not be encoded. In this resource, check that for each of the N sub-values of the Metric-Id list: e) An Observation.component is present. f) Observation.component.code is present and: • Observation.component.code.coding.*code* is present and set to $partition * 2^{16} + termcode$, where: ▪ *termCode* = Metric-Id-List[n].value ▪ *partition* = Type.*partition* ▪ IF Compound-Nu-Observed-Value exits then *termcode* = Compound-Nu-Observed-Value[n].*metric-id.* ▪ IF *Metric-Id-Partition* is present then *partition* = *Metric-Id-Partition.* • Observation.component.code.coding.*system* is present and its value is "urn.iso.std.iso:11073:10101". • Observation.component.code.coding.*display* is strongly recommended, and its value is the Reference Id for the code plus optional text. • If an alternative coding is also used, this coding element shall occur first. IF the measurement type is a vital sign, FHIR requires a translation to LOINC, so: g) A second Observation.component.code.coding is present and: • Observation.component.code.coding.*code* is present and set to the LOINC code for the vital sign (see Table A-40 of [b-HSTP-H812-FHIR]). • Observation.component.code.coding.*system* is present and its value is "http://loinc.org". • Observation.component.code.coding.*display* is optional and it contains optional text. • This coding element shall occur second. IF there is no error or no special value is reported: h) Observation.component.valueQuantity is present • Observation.component.valueQuantity.*value* is present and it contains a <string> representing the value of Compound-*-Nu-Observed-Value[n].value decoded from the SFLOAT or FLOAT with the precision given by the respective Mder encoding (see Table A-42 of [b-HSTP-H812-FHIR]). • Observation.component.valueQuantity.*unit* is strongly recommended and it contains the UCUM string for the unit code. • Observation.component.valueQuantity.*code* is present and its value is $4 * 2^{16} + unitTermCode$, where

	▪ *unitTermCode* = Unit-Code ▪ IF Compound-Nu-Observed-Value is reported THEN *unitTermCode* = Compound-Nu-Observed-Value[n].*unit.* • Observation.component.valueQuantity.*system* is present and its value is "urn.iso.std.iso:11073:10101". IF there is an error or a special value is reported: i) Observation.component.dataAbsentReasonis present. • Observation.component.dataAbsentReason.coding.*code* is present and its value is one of the FHIR codes defined in https://www.hl7.org/fhir/valueset-observation-valueabsentreason.html. • Observation.component.dataAbsentReason.coding.*system* is present and its value is "http://hl7.org/fhir/data-absent-reason". • Observation.component.dataAbsentReason.coding.*display* is optional and its content is some optional text.
Pass/Fail criteria	• The Observation.code is obtained from Type attribute. • There is an Observation.component element for each of the N sub-entries of the compound numeric value. • These component elements shall occur before any additional component elements. • FHIR resource encoding for each Observation.component is as described in step 3. • For every component, if the dataAbsentReason is present, the valueQuantity shall be absent, and if the valueQuantity is present, the dataAbsentReason shall be absent
Notes	This encoding applies to Compound-Basic-Nu-Observed-Value (contains N Mder SFLOATs), Compound-Simple-Nu-Observed-Value (contains N Mder FLOATs), or Compound-Nu-Observed-Value (contains N Mder FLOATs)

TP Id		TP/HFS/SEN/FHIR/ENC/BV-006		
TP label		Measurements Encoding: enumeration OID values		
Coverage	**Spec**	[b-HSTP-H812-FHIR]		
	Testable items	MeasEnumOID 1; M	MeasEnumOID 2; M	PHGCommon 31;M
		MeasGen 2; M		
Test purpose		Check that: The FHIR resource representing a measurement with an enumeration OID value is properly encoded.		
Applicability		C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008)		
Other PICSs				
Initial condition		Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.		
Test procedure		1. Ask the PHG to upload a FHIR resource bundle that contains a Measurement FHIR resource containing an enumeration OID value.		

	2. Once the measurement is received, the simulated H&FS checks that an Observation resource ("resourceType":"Observation") with Observation.meta.*profile* = "placeholder/phdCodedEnumerationObservation" is present. 3. In this resource, check that: a) Observation.code is present and: • Observation.code.coding.*code* is present and set to $partition * 2^{16} + termcode$, where: ▪ *termCode* = Type.*code.* ▪ *partition* = Type.*partition.* ▪ IF Enum-Observed-Value exists then *termCode* = Enum_Observed-Value.*metric-id.* ▪ IF *Metric-Id* is present then *termcode* = *Metric-Id*. ▪ IF *Metric-Id-Partition* is present then *partition* = *Metric-Id-Partition.* • Observation.code.coding.*system* is present and its value is "urn.iso.std.iso:11073:10101". • Observation.code.coding.*display* is strongly recommended, and its value is the Reference Id for the code plus optional text. • If an alternative coding is also used, this coding element shall occur first. IF the measurement type is a vital sign, FHIR requires a translation to LOINC, so: b) A second Observation.code.coding is present and: • Observation.code.coding.*code* is present and set to the LOINC code for the vital sign (see Table A-40 of [b-HSTP-H812-FHIR]). • Observation.code.coding.*system* is present and its value is "http://loinc.org". • Observation.code.coding.*display* is optional and it contains optional text. • This coding element shall occur second. IF there is no error: c) Observation.valueCodeableConcept is present • Observation.valueCodeableConcept.coding.*code* is present and its value is $partition * 2^{16} + enumTermCode$, where ▪ *partition* = Type.*partition* ▪ *enumTermCode* = Enum-Observed-Value-Simple-OID OR Enum-Observed-Value-EnumVal.*enum-obj-id*. ▪ IF Enum-Observed-Value-Partition exists THEN *partition* = Enum-Observed-Value-Partition. • Observation.valueCodeableConcept.coding.*system* is present and its value is "urn.iso.std.iso:11073:10101". • Observation.valueCodeableConcept.coding.*display* is strongly recommended and its value shall contain a reference id for the code plus optional code. IF there is an error: d) Observation.dataAbsentReason is present • Observation.dataAbsentReason.coding.*code* is present and its value is one of the FHIR codes defined in https://www.hl7.org/fhir/valueset-observation-valueabsentreason.html • Observation.dataAbsentReason.coding.*system* is present and its value is "http://hl7.org/fhir/data-absent-reason". • Observation.dataAbsentReason.coding.*display* is optional and its value some optional text.
Pass/Fail criteria	• FHIR resource encoding for the Observation resource is as described in step 3. • If the dataAbsentReason is present, the valueCodeableConcept shall be absent

	• If the valueCodeableConcept is present, the dataAbsentReason shall be absent
Notes	This encoding applies to Enum-Observed-Value-Simple-OID or an Enum-Observed-Value whose EnumVal element indicates that it is an OID

TP Id		TP/HFS/SEN/FHIR/ENC/BV-007		
TP label		Measurements Encoding: enumeration BIT values		
Coverage	**Spec**	[b-HSTP-H812-FHIR]		
	Testable items	MeasEnumBIT 1; M	MeasEnumBIT 2; M	MeasEnumBIT 3; M
		MeasEnumBIT 4; M	PHGCommon 31;M	MeasGen 2; M
Test purpose		Check that: The FHIR resource representing a measurement with an enumeration BIT value is properly encoded.		
Applicability		C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008)		
Other PICSs				
Initial condition		Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.		
Test procedure		1. Ask the PHG to upload a FHIR resource bundle that contains a Measurement FHIR resource containing an enumeration BIT value. 2. Once the measurement is received, the simulated H&FS checks that an Observation resource ("resourceType":"Observation") with Observation.meta.*profile* = "placeholder/phdBitsEnumerationObservation" is present. 3. In this resource, check that: a) Observation.code is present and: • Observation.code.coding.*code* is present and set to $partition * 2^{16} + termcode$, where: ▪ *termCode* = Type.*code* ▪ *partition* = Type.*partition* ▪ IF Enum-Observed-Value exists then *termCode* = Enum_Observed-Value.*metric-id.* ▪ IF *Metric-Id* is present then *termcode* = *Metric-Id*. ▪ IF *Metric-Id-Partition* is present then *partition* = *Metric-Id-Partition.* • Observation.code.coding.system is present and its value is "urn.iso.std.iso:11073:10101". • Observation.code.coding.display is strongly recommended, and its value is the Reference Id for the code plus optional text. • If an alternative coding is also used, this coding element shall occur first. IF the measurement type is a vital sign, FHIR requires a translation to LOINC, so: b) A second Observation.code.coding is present and: • Observation.code.coding.*code* is present and set to the LOINC code for the vital sign (see Table A-40 of [b-HSTP-H812-FHIR]).		

	• Observation.code.coding.*system* is present and its value is "http://loinc.org". • Observation.code.coding.display is optional and it contains optional text. • This coding element shall occur second. c) Observation.value[x] shall not be encoded. d) Observation.dataAbsentReason shall not be encoded In this resource, check that for each of the bit settings to be mapped: e) An Observation.component is present. f) Observation.component.code. is present and: • Observation.component.code.coding.*code* is present and set *ASN1code* computedfromTable A-46 of [b-HSTP-H812-FHIR]. • Observation.component.code.coding.*system* is present and its value is "placeholder/fhir/IEEE.ASN1". • Observation.component.code.coding.display is optional and it contains ASN.1 name if known plus optional text. g) Observation.component.valueCodeableConcept is present • Observation.componentvalueCodeableConcept.coding.*code* is present and its value is "y" if set or "n" if cleared. • Observation.component.valueCodeableConcept.coding.*system* is present and its value is http://hl7.org/fhir/v2/0136 • Observation.component.valueCodeableConcept.coding.*display* is optional and contains optional text. IF there is an error, the PHG may map the measurement. If mapped: h) Observation.dataAbsentReason is present • Observation.dataAbsentReason.coding.*code* is present and its value is one of the FHIR codes defined in https://www.hl7.org/fhir/valueset-observation-valueabsentreason.html • Observation.dataAbsentReason.coding.*system* is present and its value is "http://hl7.org/fhir/data-absent-reason". • Observation.dataAbsentReason.coding.*display* is optional and its value some optional text. The PHG may map an unsupported bit setting. If mapped, for each unsupported bit setting to be mapped: i) An Observation.component is present. j) Observation.component.code is present and: • Observation.component.code.coding.*code* is present and set *ASN1code* computedfromTable A-46 of [b-HSTP-H812-FHIR]. • Observation.component.code.coding.*system* is present and its value is "placeholder/fhir/IEEE.ASN1". • Observation.component.code.coding.display is optional and it contains ASN.1 name if known plus optional text. k) Observation.component.valueCodeableConcept is not present l) Observation.component.dataAbsentReason is present • Observation.component.dataAbsentReason.coding.*code* is present and its value is one of the FHIR codes defined in https://www.hl7.org/fhir/valueset-observation-valueabsentreason.html • Observation.component.dataAbsentReason.coding.*system* is present and its value is "http://hl7.org/fhir/data-absent-reason". • Observation.component.dataAbsentReason.coding.*display* is optional and its value some optional text.

Pass/Fail criteria	• All components listed shall occur before any additional component elements. • FHIR resource encoding for each component of the Observation resource is as described in step 3.
Notes	This encoding applies to Enum-Observed-Value-Basic-Bit-Str or an Enum-Observed-Value-Simple-Bit-Str or an Enum-Observed-Value whose EnumVal element indicates it is a BITs-string

TP Id		TP/HFS/SEN/FHIR/ENC/BV-008		
TP label		Measurements Encoding: enumeration String values		
Coverage	**Spec**	[b-HSTP-H812-FHIR]		
	Testable items	MeasEnumStr 1; M	MeasEnumStr 2; M	PHGCommon 31;M
		MeasGen 2; M		
Test purpose		Check that: The FHIR resource representing a measurement with an enumeration String value is properly encoded.		
Applicability		C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008)		
Other PICSs				
Initial condition		Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.		
Test procedure		1. Ask the PHG to upload a FHIR resource bundle that contains a Measurement FHIR resource containing an enumeration String value. 2. Once the measurement is received, the simulated H&FS checks that an Observation resource ("resourceType":"Observation") with Observation.meta.*profile* = "placeholder/phdStringEnumerationObservation" is present. 3. In this resource, check that: a) Observation.code is present and: • Observation.code.coding.*code* is present and set to $partition * 2^{16} + termcode$, where: ▪ *termCode* = Type.*code.* ▪ *partition* = Type.*partition.* ▪ IF Enum-Observed-Value exists then *termCode* = Enum_Observed-Value.*metric-id.* ▪ IF *Metric-Id* is present then *termcode* = *Metric-Id*. ▪ IF *Metric-Id-Partition* is present then *partition* = *Metric-Id-Partition.* • Observation.code.coding.system is present and its value is "urn.iso.std.iso:11073:10101". • Observation.code.coding.display is strongly recommended, and its value is the Reference Id for the code plus optional text. • If an alternative coding is also used, this coding element shall occur first. IF the measurement type is a vital sign, FHIR requires a translation to LOINC, so:		

	b) A second Observation.code.coding is present and: • Observation.code.coding.*code* is present and set to the LOINC code for the vital sign (see Table A-40 of [b-HSTP-H812-FHIR]). • Observation.code.coding.*system* is present and its value is "http://loinc.org". • Observation.code.coding.*display* is optional and it contains optional text. • This coding element shall occur second. IF there is no error: c) Observation.valueString is present • Observation.valueString.*value* is present and its value is *Enum-Observed-Value-Simple-Str* or = Enum-Observed-Value-EnumVal.*enum-text-string* IF there is an error: d) Observation.dataAbsentReason is present • Observation.dataAbsentReason.coding.*code* is present and its value is one of the FHIR codes defined in https://www.hl7.org/fhir/valueset-observation-valueabsentreason.html • Observation.dataAbsentReason.coding.*system* is present and its value is "http://hl7.org/fhir/data-absent-reason". • Observation.dataAbsentReason.coding.*display* is optional and its value some optional text.
Pass/Fail criteria	• FHIR resource encoding for the Observation resource is as described in step 3. • If the dataAbsentReason is present, the valueString shall be absent • If the valueStringis present, the dataAbsentReason shall be absent
Notes	This encoding applies to Enum-Observed-Value-Simple-Str or an Enum-Observed-Value whose EnumVal element indicates that it is a string.

TP Id		TP/HFS/SEN/FHIR/ENC/BV-009		
TP label		Measurements Encoding: RTSA values		
Coverage	**Spec**	[b-HSTP-H812-FHIR]		
	Testable items	MeasRTSA 1; M	MeasRTSA 2; M	PHGCommon 31;M
		MeasGen 2; M		
Test purpose		Check that: The FHIR resource representing a measurement with RTSA value is properly encoded.		
Applicability		C_SEN_000 AND (C_SEN_GEN_007 OR C_SEN_GEN_008)		
Other PICSs				
Initial condition		Simulated H&FS supports FHIR Observation Server and Capability Exchange Continua Certified Capability Classes, so it has an FHIR API that can accept a FHIR Observation Upload that requires TLS 1.1 and an authentication token. PHG under test has already retrieved the OAuthDescriptor via the link element in the Atom Feed and has an OAuth 2.0 bearer token or valid JSON Web token to access operation in the FHIR API exposed by the H&FS.		
Test procedure		1. Ask the PHG to upload a FHIR resource bundle that contains a Measurement FHIR resource containing a RTSA value.		

	2. Once the measurement is received, the simulated H&FS checks that an Observation resource ("resourceType":"Observation") with Observation.meta.*profile* = "placeholder/phdRtsaObservation" is present. 3. In this resource, check that: a) Observation.code is present and: • Observation.code.coding.*code* is present and set to $partition * 2^{16} + termcode$, where: ▪ *termCode* = Type.*code.* ▪ *partition* = Type.*partition.* ▪ IF *Metric-Id* is present then *termcode* = *Metric-Id*. ▪ IF *Metric-Id-Partition* is present then *partition* = *Metric-Id-Partition.* • Observation.code.coding.*system* is present and its value is "urn.iso.std.iso:11073:10101". • Observation.code.coding.*display* is strongly recommended, and its value is the Reference Id for the code plus optional text. • If an alternative coding is also used, this coding element shall occur first. IF the measurement type is a vital sign, FHIR requires a translation to LOINC, so: b) A second Observation.code.coding is present and: • Observation.code.coding.*code* is present and set to the LOINC code for the vital sign (see Table A-40 of [b-HSTP-H812-FHIR]). • Observation.code.coding.*system* is present and its value is "http://loinc.org". • Observation.code.coding.*display* is optional and it contains optional text. • This coding element shall occur second. IF there is no error: c) Observation.valueSampledData is present and: • Observation.valueSampledData.*period* shall be present. Its value may be set to Sample-Period / 8 (time between samples in milliseconds). • Observation.valueSampledData.*factor* shall be present. Its value may be set to scaleFactor from Table A-51 of [b-HSTP-H812-FHIR] as a decimal given the precision of the FLOAT. • Observation.valueSampledData.*dimensions* shall be set to Sa-Specification.array-size (number of samples). • Observation.valueSampledData.*data[i]* shall be set to saObsVal[i] from Table A-51 of [b-HSTP-H812-FHIR] converted to strings separated by a space, unsigned if significantBits from Table A-51 of [b-HSTP-H812-FHIR] is 255 or signed otherwise. • Observation.valueSampledData.origin.*value* shall be present. Its value may be set to offset from Table A-51 of [b-HSTP-H812-FHIR] as a decimal given the precision of the FLOAT. • Observation.valueSampledData.origin.*unit* is strongly recommended, if present, it shall be set to the UCUM code string corresponding to the Unit-Code. • Observation.valueSampledData.origin.system shall be set to "urn:iso:std:iso:11073:10101". • Observation.valueSampledData.origin.code shall be set to 4*2^16 + Unit-Code IF there is an error: d) Observation.dataAbsentReason is present • Observation.dataAbsentReason.coding.*code* is present and its value is one of the FHIR codes defined in https://www.hl7.org/fhir/valueset-observation-valueabsentreason.html

	• Observation.dataAbsentReason.coding.*system* is present and its value is "http://hl7.org/fhir/data-absent-reason". • Observation.dataAbsentReason.coding.*display* is optional and its value some optional text.
Pass/Fail criteria	• FHIR resource encoding for the Observation resource is as described in step 3. • If the dataAbsentReason is present, the valueSampledData shall be absent • If the valueSampledData is present, the dataAbsentReason shall be absent
Notes	

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