

# Connectathon 2024 Terminology Subtrack Webinar 3

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# Agenda

1

Review of current state

2

Creating FHIR Resources

3

Testing the APIs

4

Questions

5

Next steps



# Country Node

- Components of a country node:
  - HAPI FHIR server
  - IPS Middleware
  - DDVC Middleware
  - LACPass IPS Viewer
  - Snowstorm (FHIR Terminology Server)
    - FHIR API - <http://localhost/fhir>
    - FHIR Swagger doc - <http://localhost/connectathon-swagger>
    - SNOMED CT Browser - <http://localhost/browser>



# What is Snowstorm?

- Snowstorm
  - Open source FHIR Terminology server
  - Advanced features for SNOMED CT (ECL)
  - Standard FHIR API
  - Preloaded with the Spanish Edition (International)
  - Users can load additional terminology content



**SNOWSTORM**  
by SNOMED International



Local Code Systems,  
Value Sets and  
Concept Maps

# HL7 FHIR

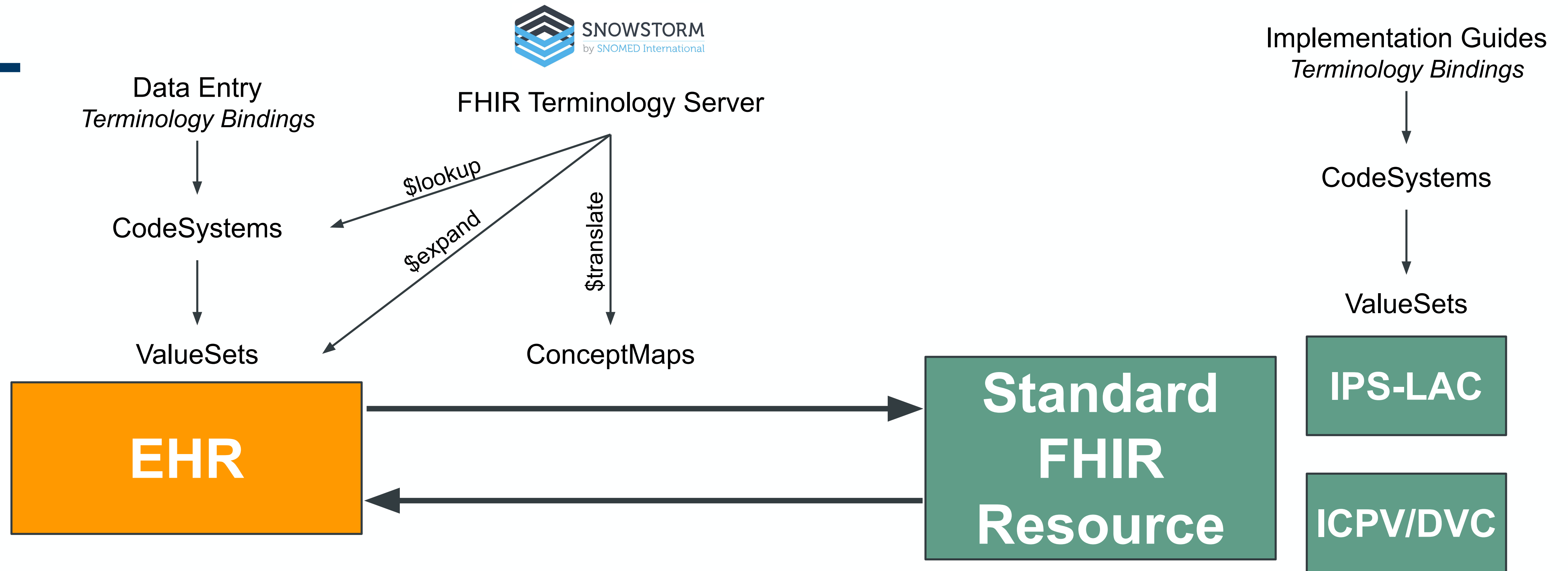
## *Terminology Module*



The main Terminology **Resources** are:

- **CodeSystem**
  - examples: “SNOMED CT International Edition - Sept 2023”, “LOINC v2.75” or “ICD-10 Version:2019”
- **ValueSet**
  - examples: “Nursing Activities Subset” or “Clinical Procedures”
- **ConceptMap**
  - e.g. “SNOMED CT to ICD-10 Map” or “SNOMED CT to MedDRA Map”

# Terminology Subtrack





# Connectathon Value Sets

- Agreed terminology subsets that we will use to demonstrate data exchange
- The sets will be mapped to preferred binding code systems
- Participants that don't use these code systems will map to these codes

	Antecedentes
1	Diabetes Mellitus insulino requiriente
2	Daiabetes Mellitus no insulino requiriente
3	Hipertensión arterial esencial
4	Dislipemia
5	Hiperuricemia
6	Infarto de Miocardio
7	Enfermedad pulmonar obstructiva crónica
8	Lupus eritematoso Sistémico
9	Accidente cerebro vascular
10	Migraña
11	Epilepsia
12	Hipotiroidismo
13	Dermatitis atópica
14	Tabaquismo
15	Sedentarismo
16	Enfermedad renal crónica
17	Tuberculosis
18	Hipoacusia
19	Apnea obstructiva del sueño
20	Trombosis venosa profunda

	Diagnósticos
1	Hipertensión arterial primaria
2	Neumonía bacteriana
3	Asma
4	Artritis reumatoridea
5	Anemia ferropénica
6	Convulsión
7	Trastorno depresivo
8	Cáncer de mama
9	Enfermedad de Párkinson
10	Desnutrición
11	Enfermedad de Crohn
12	Esquizofrenia paranoide
13	Trastorno de ansiedad generalizada
14	Gota
15	Hipotiroidismo congénito
16	Deshidratación aguda
17	Neumotórax espontáneo
18	Úlcera péptica
19	Endocarditis infecciosa
20	Leucemia linfoblástica aguda

	Vacunas
1	Vacuna contra SARS - CoV-2
2	Vacuna antituberculosa (BCG)
3	Vacuna contra tétanos, difteria y tos ferina
4	Vacuna contra fiebre amarilla
5	Vacuna contra Hepatitis B
6	Vacuna contra sarampión, paperas y rubéola
7	Vacuna contra el virus del papiloma humano
8	Vacuna antipoliomelítica oral (VOP)
9	Vacuna contra influenza
10	Vacuna antirrábica
11	Vacuna antineumocócica
12	Vacuna antipoliomelítica inactivada (VIP)
13	Vacuna antimeningocócica
14	Vacuna contra hepatitis A
15	Vacuna contra la fiebre tifoidea
16	Vacuna contra la varicela
17	
18	
19	
20	

	Alergias
1	Alergia a alimentos
2	Alergia a amoxicilina
3	Alergia a analgesicos no esteroideos
4	Alergia al ibuprofeno
5	Alergia al látex
6	Alergia a picadura de insectos
7	Alergia al ácido acetilsalicílico
8	Alergia a cefalosporinas
9	Alergia a sulfonamidas
10	Alergia a quinolonas
11	Alergia a allopurinol
12	Alergia a gentamicina
13	Alergia a medios de contraste
14	Alergia a lidocaína
15	Alergia a corticosteroides
16	Alergia a proteína de leche de vaca
17	Alergia al Huevo
18	Alergia a betabloqueantes
19	Alergia al gluten
20	Alergia a propofol

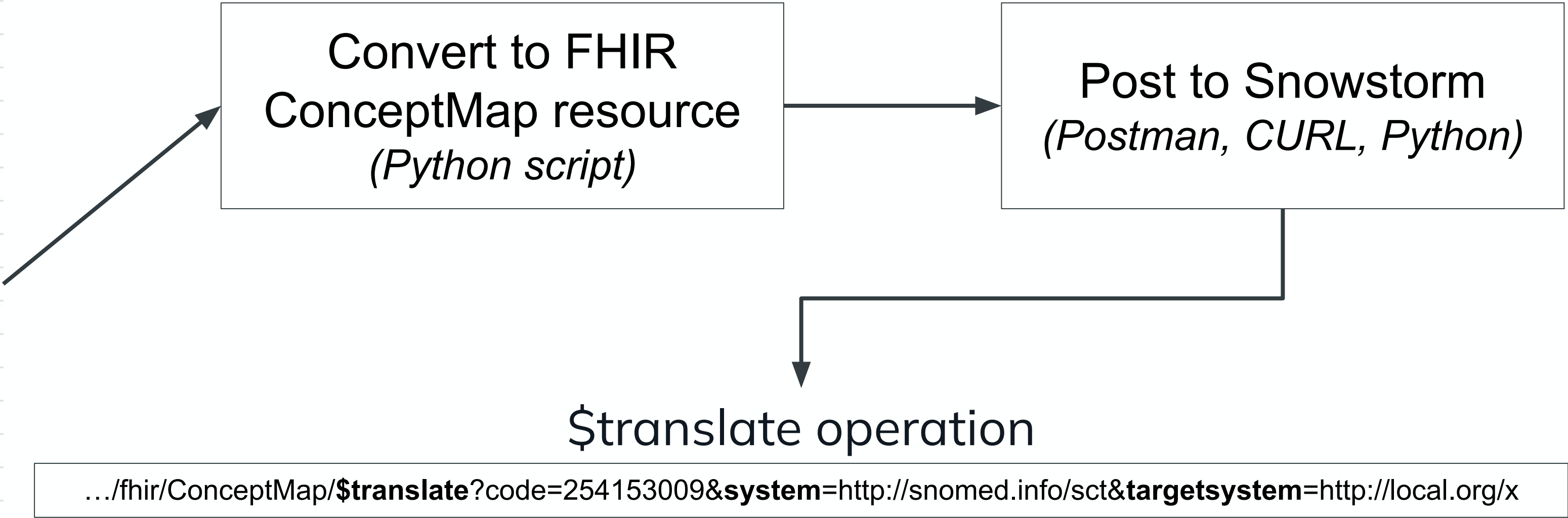
	Medicación
1	Metformina
2	Enalapril
3	Levotiroxina
4	Atorvastatina
5	Insulina glargina
6	Salbutamol
7	Omperazol
8	Warfarina
9	Prednisona
10	Pregabalina
11	Morfina
12	Salbutamol
13	Loratadina
14	Atenolol
15	Carbamazepina
16	Ranitidina
17	Allopurinol
18	Losartán
19	Rivastigmina
20	Acido acetilsalicílico



# Connectathon Value Sets

- Maps will be uploaded to Snowstorm as FHIR ConceptMaps to enable \$translate

	Diagnósticos	Local Code
1	Hipertensión arterial primaria	242
2	Neumonía bacteriana	32234
3	Asma	675678
4	Artritis reumatoridea	3342
5	Anemia ferropénica	8899
6	Convulsión	121
7	Trastorno depresivo	333
8	Cáncer de mama	667
9	Enfermedad de Párkinson	135
10	Desnutrición	987
11	Enfermedad de Crohn	234
12	Esquizofrenia paranoide	567
13	Trastorno de ansiedad generalizada	342
14	Gota	8787
15	Hipotiroidismo congénito	645645
16	Deshidratación aguda	3453
17	Neumotórax espontáneo	89687
18	Úlcera péptica	269
19	Endocarditis infecciosa	443
20	Leucemia linfoblástica aguda	4534





# Creating local codes



Reference concepts

Local Codes (edit)

Standard Codes (provided)

Local CodeSystem  
URI  
(edit)

Subsets Conectaton - Test Data 1 .XLSX

File Edit View Insert Format Data Tools Help

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F4 M45

Code	Antecedentes	Local Code	Local Term	ICD-10 Code	IC D-10 Term	SNOMED Code	SNOMED Term
H1	Diabetes Mellitus insulino requiriente	L1	Diabetes Mellitus insulino	M45	Diabetes Mellitus ins	46635009	Diabetes mellitus type 1 (disorder)
H2	Daiabetes Mellitus no insulino requiriente	L2	Daiabetes Mellitus no in	M46	Daiabetes Mellitus no	44054006	Diabetes mellitus type 2 (disorder)
H3	Hipertensión arterial esencial	L3	Hipertensión arterial es	M47	Hipertensión arterial	59621000	Essential hypertension (disorder)
H4	Dislipemia	L4	Dislipemia	M48	Dislipemia	370992007	Dyslipidemia (disorder)
H5	Hiperuricemia	L5	Hiperuricemia	M49	Hiperuricemia	35885006	Hyperuricemia (disorder)
H6	Infarto de Miocardio	L6	Infarto de Miocardio	M50	Infarto de Miocardio	22298006	Myocardial infarction (disorder)
H7	Enfermedad pulmonar obstructiva crónica	L7	Enfermedad pulmonar d	M51	Enfermedad pulmona	13645005	Chronic obstructive pulmonary disease (disorder)
H8	Lupus eritematoso Sistémico	L8	Lupus eritematoso Sisté	M52	Lupus eritematoso Si	55464009	Systemic lupus erythematosus (disorder)
H9	Accidente cerebro vascular	L9	Accidente cerebro vascu	M53	Accidente cerebro va	230690007	Cerebrovascular accident (disorder)
H10	Migraña	L10	Migraña	M54	Migraña	37796009	Migraine (disorder)
H11	Epilepsia	L11	Epilepsia	M55	Epilepsia	84757009	Epilepsy (disorder)
H12	Hipotiroidismo	L12	Hipotiroidismo	M56	Hipotiroidismo	40930008	Hypothyroidism (disorder)
H13	Dermatitis atópica	L13	Dermatitis atópica	M57	Dermatitis atópica	24079001	Atopic dermatitis (disorder)
H14	Tabaquismo	L14	Tabaquismo	M58	Tabaquismo	77176002	Smoker (finding)
H15	Sedentarismo	L15	Sedentarismo	M59	Sedentarismo	415510005	Sedentary lifestyle (finding)
H16	Enfermedad renal crónica	L16	Enfermedad renal cróni	M60	Enfermedad renal crd	709044004	Chronic kidney disease (disorder)
H17	Tuberculosis	L17	Tuberculosis	M61	Tuberculosis	56717001	Tuberculosis (disorder)
H18	Hipoacusia	L18	Hipoacusia	M62	Hipoacusia	15188001	Hearing loss (disorder)
H19	Apnea obstructiva del sueño	L19	Apnea obstructiva del su	M63	Apnea obstructiva de	78275009	Obstructive sleep apnea syndrome (disorder)
H20	Trombosis venosa profunda	L20	Trombosis venosa profu	M64	Trombosis venosa pro	128053003	Deep venous thrombosis (disorder)

Antecedentes Personales Diagnósticos Vacunas Alergias Medicación Procedimientos

The six Sections of the IPS Composition

[Open Spreadsheet →](#)

# Connectathon Value Sets

## 39 FHIR Resources



- **4 CodeSystems** (*SNOMED CT is preloaded*)
  - ICD-10\*, ICD-11\*, Local CodeSystem, RACSEL Reference (\* fragments)
- **23 ValueSets**
  - Full lists + domain lists
- **12 ConceptMaps** (*SNOMED → ICD-10 full map is preloaded*)
  - 4 to local, 4 from local, 4 SCT - ICD bidirectional





# CodeSystem URIs

---

- <http://snomed.info/sct>
- <http://hl7.org/fhir/sid/icd-10>
- <http://id.who.int/icd/release/11/mms>
- <http://racsel.org/connectathon>
- <http://node-x.org/terminology>

# Are ids unique in local code lists?

Subsets Conectaton - Test Data 1 .XLSX

File Edit View Insert Format Data Tools Help

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F4 M45

	A	B	C	D	E	F	G	H	I	J
1		Local Code System	<a href="http://node-x.org/terminology">http://node-x.org/terminology</a>							
2										
3		Code	Antecedentes	Local Code	Local Term	ICD-10 Code	IC D-10 Term	SNOMED Code	SNOMED Term	
4		H1	Diabetes Mellitus insulino requiriente	L1	Diabetes Mellitus insulino	M45	Diabetes Mellitus ins	46635009	Diabetes mellitus type 1 (disorder)	
5		H2	Daiabetes Mellitus no insulino requeriente	L2	Daiabetes Mellitus no in	M46	Daiabetes Mellitus no	44054006	Diabetes mellitus type 2 (disorder)	
6		H3	Hipertensión arterial esencial	L3	Hipertensión arterial es	M47	Hipertensión arterial	59621000	Essential hypertension (disorder)	
7		H4	Dislipemia	L4	Dislipemia	M48	Dislipemia	370992007	Dyslipidemia (disorder)	
8		H5	Hiperuricemia	L5	Hiperuricemia	M49	Hiperuricemia	35885006	Hyperuricemia (disorder)	
9		H6	Infarto de Miocardio	L6	Infarto de Miocardio	M50	Infarto de Miocardio	22298006	Myocardial infarction (disorder)	
10		H7	Enfermedad pulmonar obstructiva crónica	L7	Enfermedad pulmonar o	M51	Enfermedad pulmona	13645005	Chronic obstructive pulmonary disease (disorder)	
11		H8	Lupus eritematoso Sistémico	L8	Lupus eritematoso Sisté	M52	Lupus eritematoso Si	55464009	Systemic lupus erythematosus (disorder)	
12		H9	Accidente cerebro vascular	L9	Accidente cerebro vascu	M53	Accidente cerebro va	230690007	Cerebrovascular accident (disorder)	
13		H10	Migraña	L10	Migraña	M54	Migraña	37796009	Migraine (disorder)	
14		H11	Epilepsia	L11	Epilepsia	M55	Epilepsia	84757009	Epilepsy (disorder)	
15		H12	Hipotiroidismo	L12	Hipotiroidismo	M56	Hipotiroidismo	40930008	Hypothyroidism (disorder)	
16		H13	Dermatitis atópica	L13	Dermatitis atópica	M57	Dermatitis atópica	24079001	Atopic dermatitis (disorder)	
17		H14	Tabaquismo	L14	Tabaquismo	M58	Tabaquismo	77176002	Smoker (finding)	
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19		H16	Enfermedad renal crónica	L16	Enfermedad renal cróni	M60	Enfermedad renal cr	709044004	Chronic kidney disease (disorder)	
20		H17	Tuberculosis	L17	Tuberculosis	M61	Tuberculosis	56717001	Tuberculosis (disorder)	
21		H18	Hipoacusia	L18	Hipoacusia	M62	Hipoacusia	15188001	Hearing loss (disorder)	
22		H19	Apnea obstructiva del sueño	L19	Apnea obstructiva del su	M63	Apnea obstructiva de	78275009	Obstructive sleep apnea syndrome (disorder)	
23		H20	Trombosis venosa profunda	L20	Trombosis venosa profu	M64	Trombosis venosa pr	128053003	Deep venous thrombosis (disorder)	
24										
25										

+ ≡ Antecedentes Personales Diagnósticos Vacunas Alergias Medicación Procedimientos

Single local code system

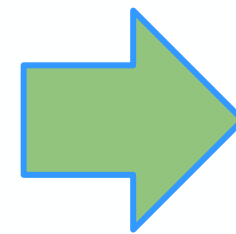
One code system for each domain

[Open Spreadsheet →](#)

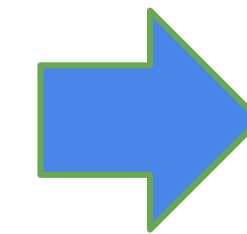


# Conversion with split code system flag

## 66 FHIR Resources



- **9 CodeSystems** (*SNOMED CT is preloaded*)
  - ICD-10\*, ICD-11\*, Local CodeSystem (split x 6), RACSEL Reference (\* fragments)
- **23 ValueSets**
  - Full lists + domain lists
- **34 ConceptMaps** (*SNOMED → ICD-10 full map is preloaded*)
  - 4 to local (+11), 4 from local (+11), 4 SCT - ICD bidirectional



FHIR Package

# CodeSystem URIs

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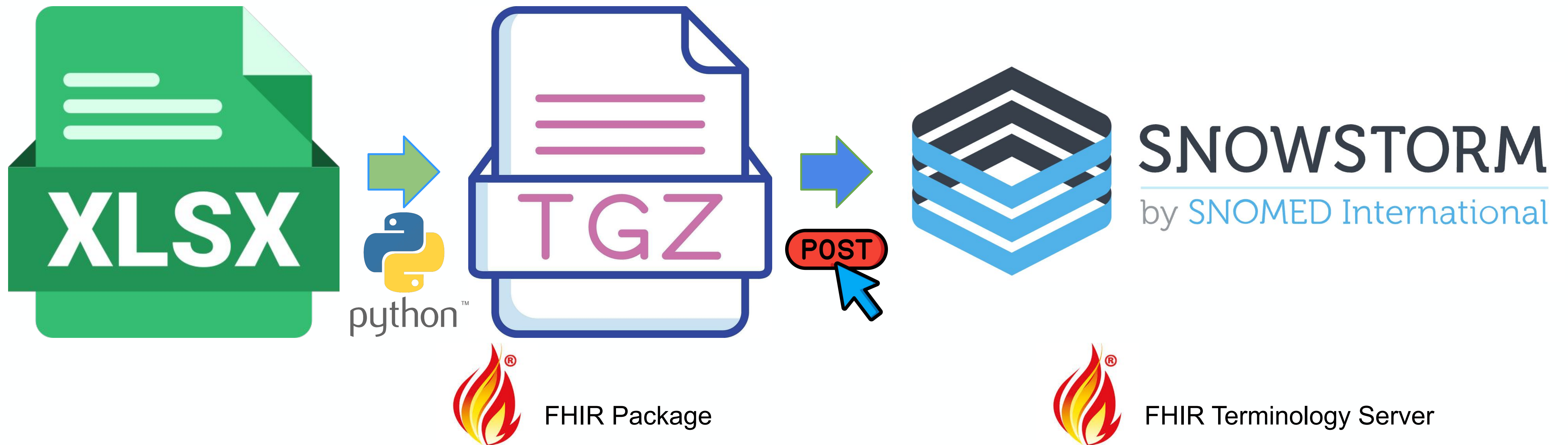
- <http://snomed.info/sct>
- <http://hl7.org/fhir/sid/icd-10>
- <http://id.who.int/icd/release/11/mms>
- <http://racsel.org/connectathon>
- <http://node-x.org/terminology/antecedentes>
- <http://node-x.org/terminology/diagnosis>
- <http://node-x.org/terminology/vacunas>
- <http://node-x.org/terminology/alergias>
- <http://node-x.org/terminology/medicacion>
- <http://node-x.org/terminology/procedimientos>



# ValueSet URIs


- Examples:
  - <http://racsel.org/fhir/ValueSet/alergias-local-vs> (Local Code System, Allergies)
  - <http://racsel.org/fhir/ValueSet/alergias-vs> (SNOMED CT, Allergies)
  - <http://racsel.org/fhir/ValueSet/cie10-vs> (ICD-10, all)
  - <http://racsel.org/fhir/ValueSet/cie11-vs> (ICD-11, all)
  - <http://racsel.org/fhir/ValueSet/snomed-vs> (SNOMED CT, all)
  - ...

# Conversion with split code system flag





# Using the terminology

 Swagger  
Supported by SMARTBEAR

/api-docs

Explore

## FHIR Resources API

1.0.0 OAS3

/api-docs

API for FHIR CodeSystem, ValueSet, and ConceptMap

Servers

http://localhost:8080/fhir

default

GET /CodeSystem Get a list of CodeSystems

GET /ValueSet Get a list of ValueSets

GET /ConceptMap Get a list of ConceptMaps

GET /ValueSet/\$expand Expand a ValueSet

GET /ConceptMap/\$translate Translate a concept using a ConceptMap

GET /CodeSystem/\$lookup Lookup a code in a CodeSystem

GET /ValueSet/\$validate-code Validate a code against a ValueSet

# Data entry

- Search in the Local Allergies Value Set matching "amox"

GET

/ValueSet/\$expand

Expand a ValueSet

^

Parameters

Cancel

Name	Description
<b>url</b> <small>★ required</small> string (query)	The URL of the ValueSet to expand <b>Examples:</b> <div>Alergias Local ValueSet</div> <div>http://racsel.org/fhir/ValueSet/alergias-local-v</div>
filter string (query)	Filter the expansion by code or display <div>amox</div>

[http://localhost/fhir/ValueSet/\\$expand?url=http%3A%2F%2Fracsel.org%2Ffhir%2FValueSet%2Falergias-local-vs&filter=amox](http://localhost/fhir/ValueSet/$expand?url=http%3A%2F%2Fracsel.org%2Ffhir%2FValueSet%2Falergias-local-vs&filter=amox)



# Data entry

- Search in the SNOMED Allergies Value Set matching "amox"

**GET** `/ValueSet/$expand` Expand a ValueSet

Parameters

Cancel

Name	Description
<b>url</b> <small>* required</small> string <i>(query)</i>	The URL of the ValueSet to expand <b>Examples:</b> <div>Alergias ValueSet</div> <div>http://racsel.org/fhir/ValueSet/alergias-vs</div>
filter string <i>(query)</i>	Filter the expansion by code or display <div>amox</div>

[http://localhost/fhir/ValueSet/\\$expand?url=http%3A%2F%2Fracsel.org%2Ffhir%2FValueSet%2Falergias-vs&filter=amox](http://localhost/fhir/ValueSet/$expand?url=http%3A%2F%2Fracsel.org%2Ffhir%2FValueSet%2Falergias-vs&filter=amox)

# Mapping between Code Systems

- Find the SNOMED code for my local Allergy code "L62"

GET /ConceptMap/\$translate Translate a concept using a ConceptMap

Parameters Cancel

Name	Description
<b>code</b> * required string (query)	The code to translate <input type="text" value="L62"/>
<b>system</b> * required string (query)	The system of the code to translate Examples: <input type="text" value="[Modified value]"/> <input type="text" value="http://node-x.org/terminology/alergias"/>
<b>targetsystem</b> * required string (query)	The target system for the translation Examples: <input type="text" value="SNOMED CodeSystem"/> <input type="text" value="http://snomed.info/sct"/>

[http://localhost/fhir/ConceptMap/\\$translate?code=L62&system=http%3A%2F%2Fnode-x.org%2Fterminology%2Falergias&targetsystem=http%3A%2F%2Fsnomed.info%2Fsct](http://localhost/fhir/ConceptMap/$translate?code=L62&system=http%3A%2F%2Fnode-x.org%2Fterminology%2Falergias&targetsystem=http%3A%2F%2Fsnomed.info%2Fsct)



# Mapping between Code Systems

- Find the ICD-10 code for my local Allergy code "L21"

GET /ConceptMap/\$translate Translate a concept using a ConceptMap

Parameters Cancel

Name	Description
<b>code</b> * required string (query)	The code to translate <input type="text" value="L21"/>
<b>system</b> * required string (query)	The system of the code to translate Examples: <input type="text" value="[Modified value]"/> <input type="text" value="http://node-x.org/terminology/diagnostics"/>
<b>targetsystem</b> * required string (query)	The target system for the translation Examples: <input type="text" value="ICD-10 CodeSystem"/> <input type="text" value="http://hl7.org/fhir/sid/icd-10"/>

[http://localhost/fhir/ConceptMap/\\$translate?code=L21&system=http%3A%2F%2Fnode-x.org%2Fterminology%2Fdiagnostics&targetsystem=http%3A%2F%2Fhl7.org%2Ffhir%2Fsid%2Ficd-10](http://localhost/fhir/ConceptMap/$translate?code=L21&system=http%3A%2F%2Fnode-x.org%2Fterminology%2Fdiagnostics&targetsystem=http%3A%2F%2Fhl7.org%2Ffhir%2Fsid%2Ficd-10)

# Mapping between Code Systems

- Find the local code for the ICD-11 Vaccine code "Y5" (\* not real codes)

GET /ConceptMap/\$translate Translate a concept using a ConceptMap

Parameters


Cancel

Name	Description
<b>code</b> * required string (query)	The code to translate <input type="text" value="Y5"/>
<b>system</b> * required string (query)	The system of the code to translate Examples: <input type="text" value="ICD-11 CodeSystem"/> <input type="text" value="http://id.who.int/icd/release/11/mms"/>
<b>targetsystem</b> * required string (query)	The target system for the translation Examples: <input type="text" value="[Modified value]"/> <input type="text" value="http://node-x.org/terminology/vacunas"/>

[http://localhost/fhir/ConceptMap/\\$translate?code=Y5&system=http%3A%2F%2Fid.who.int%2Ficd%2Frelease%2F11%2Fmms&targetsystem=http%3A%2F%2Fnode-x.org%2Fterminology%2Fvacunas](http://localhost/fhir/ConceptMap/$translate?code=Y5&system=http%3A%2F%2Fid.who.int%2Ficd%2Frelease%2F11%2Fmms&targetsystem=http%3A%2F%2Fnode-x.org%2Fterminology%2Fvacunas)



# Swagger playground

 **Swagger**  
Supported by SMARTBEAR

/api-docs

Explore

## FHIR Resources API

1.0.0 OAS3

/api-docs

API for FHIR CodeSystem, ValueSet, and ConceptMap

Servers

http://localhost:8080/fhir

default

GET /CodeSystem Get a list of CodeSystems

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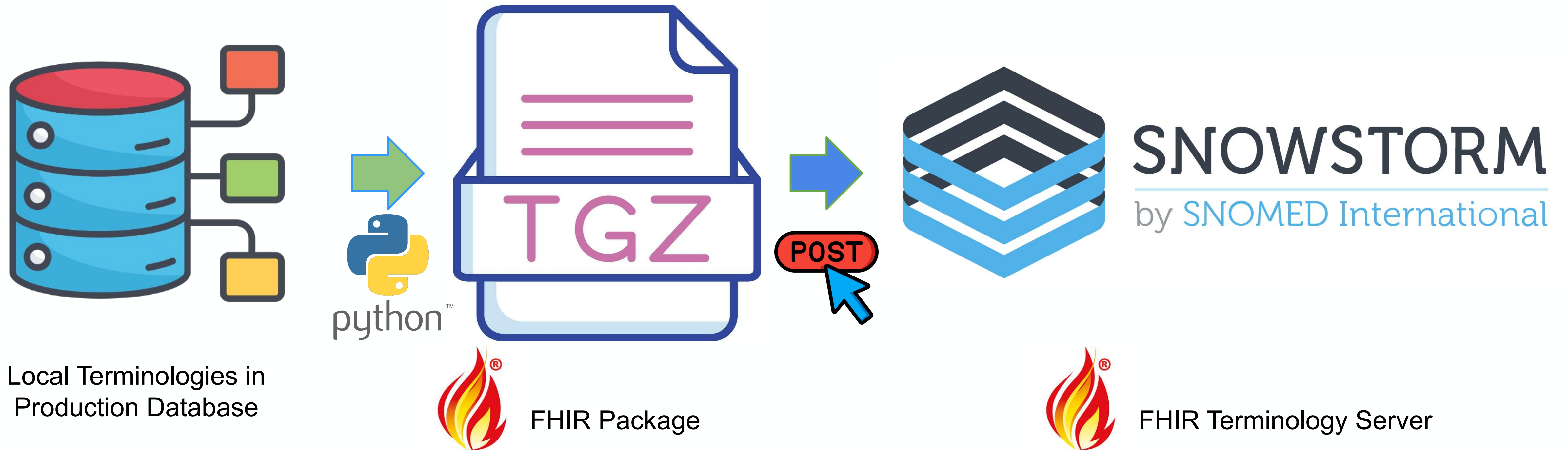
GET /ConceptMap/\$translate Translate a concept using a ConceptMap

GET /CodeSystem/\$lookup Lookup a code in a CodeSystem

GET /ValueSet/\$validate-code Validate a code against a ValueSet



# Using this experience in production





# Next steps

- Good luck in the connectathon!
- Please reach out in Slack!





snomed.org



x.com/SnomedCT



linkedin.com/company/ihtsdo



youtube.com/@snomedct

**SNOMED**  
International

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# Thank You

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implementation@snomed.org