



Brief Introduction to LOINC & CLNtk

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What LOINC is?



- LOINC stands for **Logical Observation Identifiers Names and Codes**: A database & universal standard for identifying medical laboratory observations
- Developed & maintained by the **Regenstrief Institute**, a US non-profit medical research organization.
- **Purpose**: To assist in the electronic exchange and gathering of clinical results (such as laboratory tests, clinical observations, outcomes management and research)
- **Publicly available at no cost**

- Codes are **unique and have no meaning**
- Unique identifier; Not inferable
- Each LOINC record corresponds to a single test or panel
- Includes **long names, short names, and synonyms**
- LOINC codes have a fixed-length field of 3-7 characters
- **Format** – nnnnnnn-n (where the last n is a mod 10 check digit)
- Number after (-) is the check digit, is automatically created by the coding system

Examples: LOINC codes and formal LOINC names



LOINC CODES	LOINC Names
8886-4	Heart rate method
8889-8	Heart rate by Pulse oximetry
2955-3	Sodium [Moles/volume] in Urine
24356-8	Urinalysis complete panel - Urine
58077-9	Urinalysis complete W Reflex Culture panel - Urine
69742-5	CBC W Differential panel, method unspecified - Blood
34565-2	Vital signs, weight and height panel
44249-1	PHQ-9 quick depression assessment panel [Reported.PHQ]



THE LOINC CONCEPT MODEL

Laboratory: focuses on the observations and measurements that can be made on specimen

- Chemistry, Hematology, Serology, Microbiology (including parasitology and virology)
- Toxicology , Allergy testing, Molecular pathology
- Drugs and cell counts for blood smears and cerebrospinal fluids
- Antibiotic susceptibilities

Clinical: focuses on the observations and measurements that can be made on patients.

- Vitals signs, Hemodynamics, Intake/output, ECG, Obstetric ultrasound, Cardio echo
- Urologic imaging, Pulmonary ventilator management, Survey instruments, Phenx and other

LOINC: Axes/Part -The Solution



- A formal, distinct, and unique 6-axes/part name
- The current version 2.73 released on August 08, 2022, contains 99,079 terms
- LOINC's goal is to create different codes for each test, measurement, or observation that has a clinically different meaning.
- To do that LOINC codes distinguish a given observation (test ordered/reported, survey question, clinical document) across 6 dimensions that we call Parts.



Component (Analyte)

- The substance or entity being measured or observed
- For eg: Sodium, Body Weight



Property

- The characteristic or attribute of the analyte
- For eg: Mass Concentration, Catalytic activity



Time

- The interval of time over which an observation was made
- For eg: 24H for a Urine Sodium Concentration



System (Specimen)

- The specimen or thing upon which the observation was made
- For eg: Cerebral Spinal Fluid, Urine, Radial Artery



Scale

- How the observation value is quantified or expressed: quantitative, ordinal, nominal



Method

- [OPTIONAL] A high-level classification of how the observation was made. Only needed when the technique affects the clinical interpretation of the results.

Importance of LOINC Axes - Explained



LOINC	Component	Property	Timing	System	Scale	Units	Long Name
2947-0	Sodium	SCnc	Pt	Bld	Qn	mmol/L	Sodium [Moles/volume] in Blood
2950-4	Sodium	SCnc	Pt	Body fld	Qn	mmol/L	Sodium [Moles/volume] in Body fluid
27419-0	Sodium	SRat	24H	Stool	Qn	meq/24H	Sodium [Moles/time] in 24 hour Stool
14055-8	Sodium	SCnt	Pt	Stool	Qn	meq/kg	Sodium [Moles/mass]in 24 hour Urine
21527-7	Sodium	MRat	24H	Urine	Qn	mg/24H	Sodium [Moles/time]in 24 hour Urine
21526-9	Sodium	MCnc	24H	Urine	Qn	mg/dL	Sodium [Moles/volume] in 24 hour Urine
9485-4	Sodium	MCnc	Pt	Water	Qn	ppm	Sodium [Moles/volume] in Water

Example: LOINC - Axes/Parts



- 18262-6: Cholesterol in LDL [Mass/volume] in Serum or Plasma by Direct assay

Cholesterol. in LDL:MCnc:Pt:Ser/Plas:Qn:Direct assay

CODES	AXES / PART
18262-6	LOINC code
Cholesterol. in LDL	Component
MCnc	Property
Pt	Timing
Ser/ Plas	System
Qn	Scale
Direct assay	Method

Fully-Specified Name (FSN)

- **The six-part formal Name**
 - *<component/analyte>:<kind of property of observation or measurement>:<time aspect>:<system type>:<scale>:<method>*
 - *For eg- Leukocytes: NCnc: Pt: CSF: Qn: Manual count*

Long Common Name (LCN)

- **Clinician-friendly display**
 - *For eg- Leukocytes [# /volume] in Cerebral spinal fluid by Manual count*

Short Name

- **Need a column header in a report**
 - *For eg- WBC # CSF Manual*

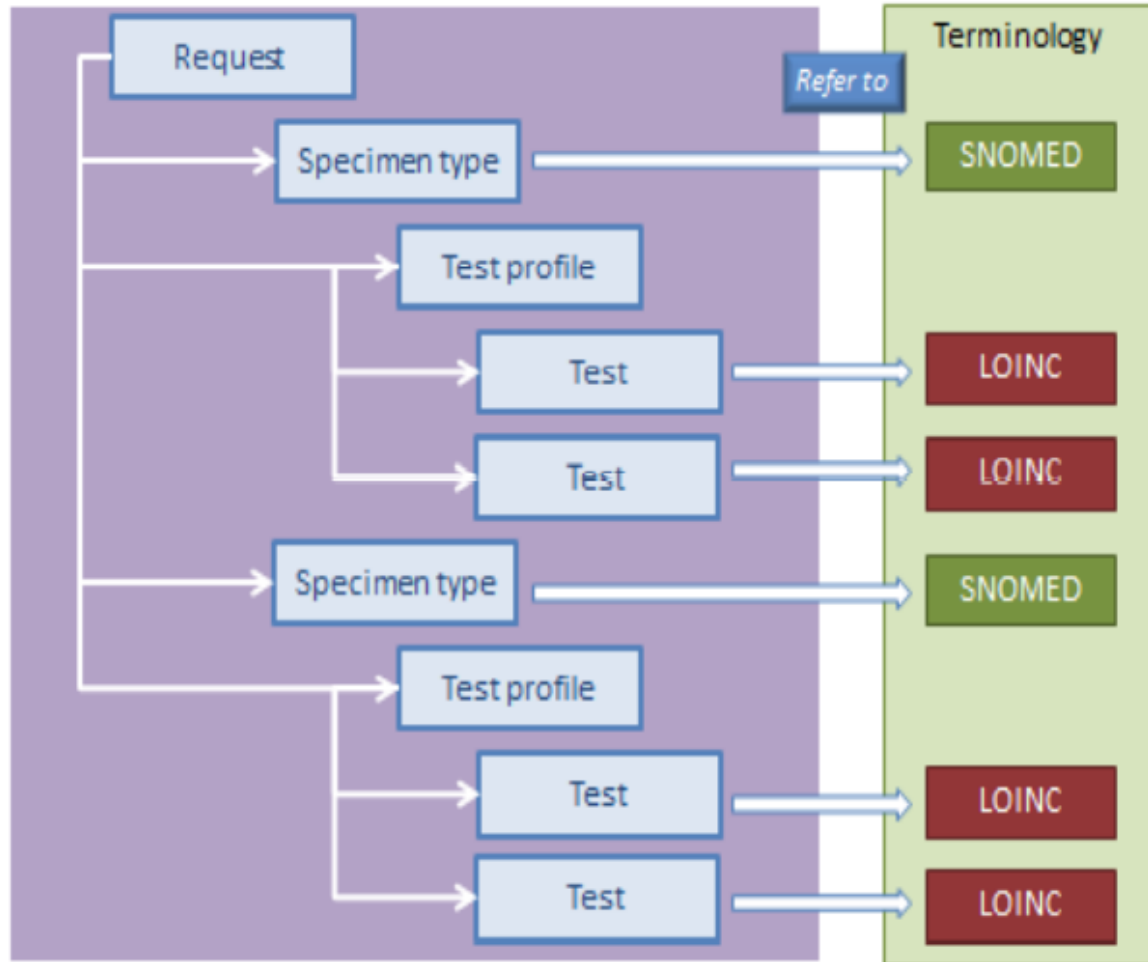
NOT A Part of LOINC Name



- Reason for the test
- Test instrument
- Specific details about the specimen
- Priority
- Where testing was done
- Who did the test
- Test interpretation
- Pricing
- Anything not part of the naming the test
- Things from other fields in an HL7 artifact

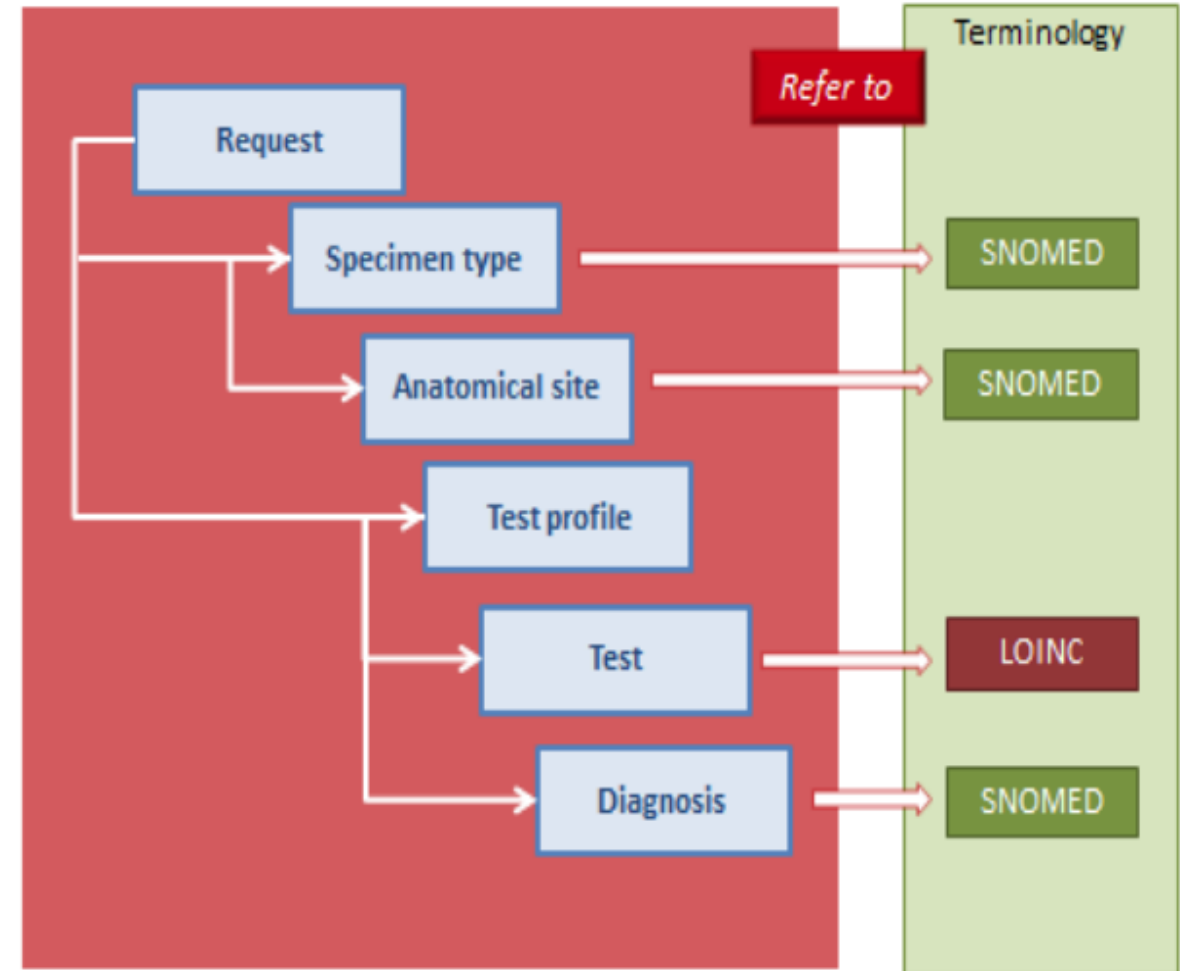
Implementation of LOINC and SNOMED CT

Structured report model – Clinical Pathology



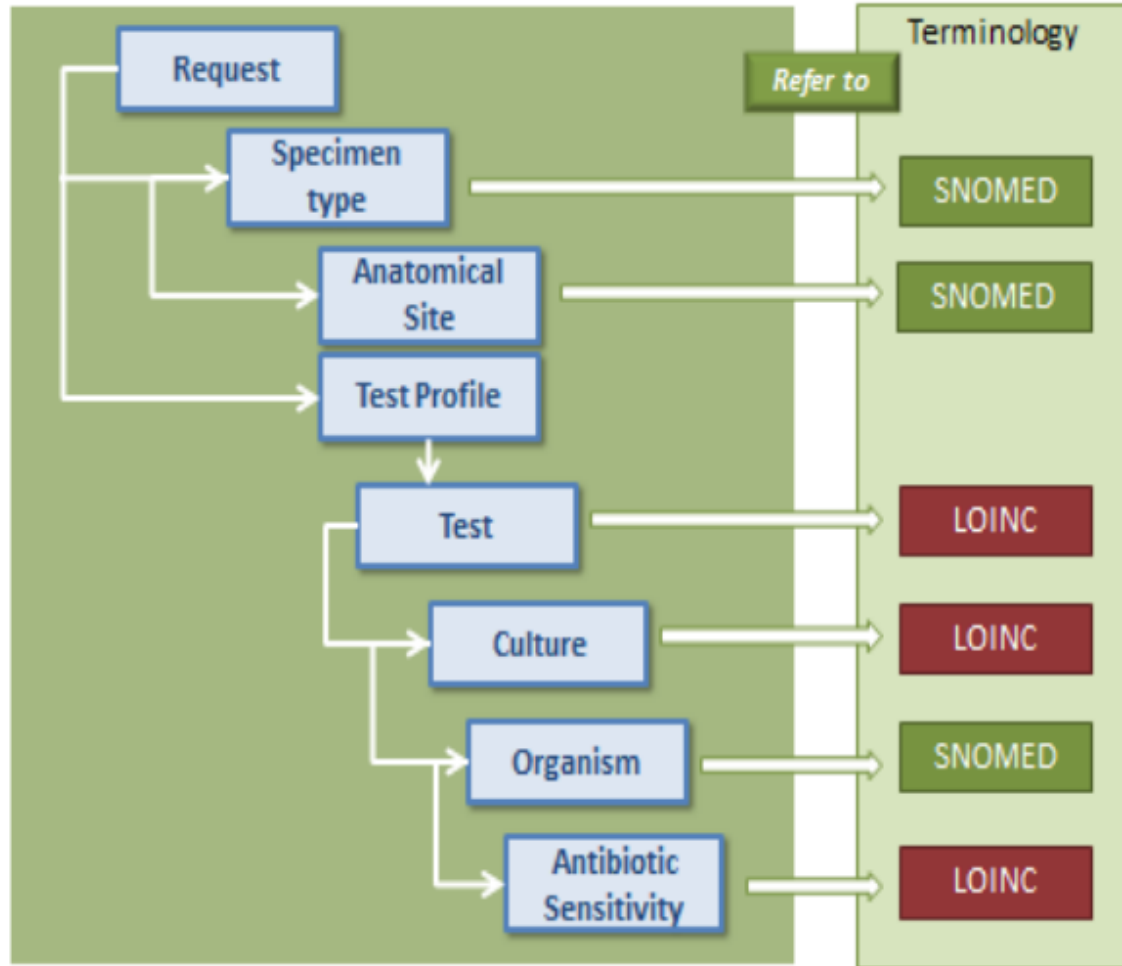
A general case of a laboratory test on two specimens (coded with SNOMED CT) and test profiles containing four tests (coded using LOINC)

Structured report model – Anatomical Pathology



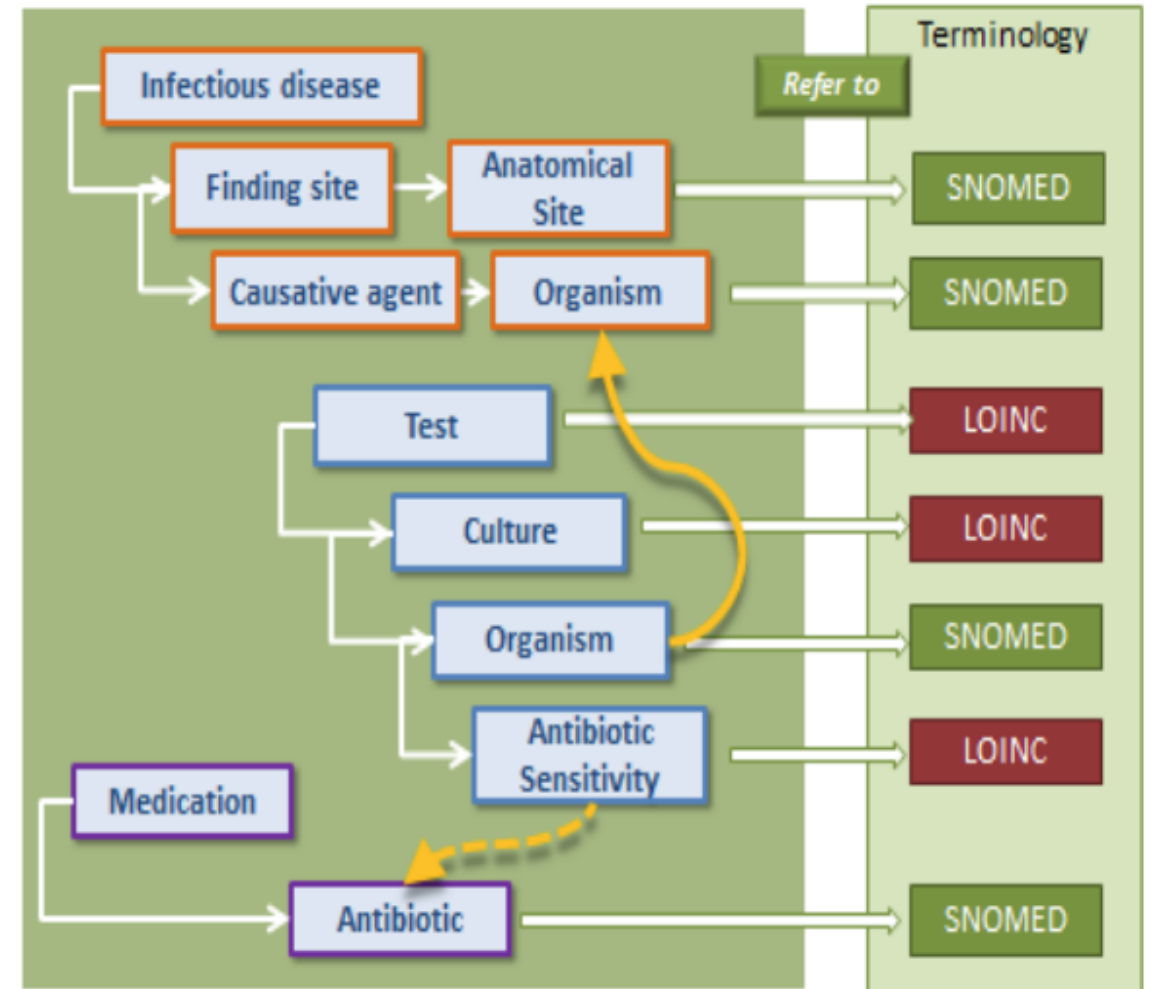
An anatomical pathology test for a specimen (e.g. a biopsy) taken from a particular site

Structured report model – Microbiology



A structured microbiology report using SNOMED CT and LOINC for different elements.

Microbiology report related to EHR data



Relationships between EHR entries coded using SNOMED CT and a microbiology report coded using the mixture of LOINC and SNOMED

Summary of use of SNOMED CT and LOINC - Recommendations



DATA ELEMENTS	SCENARIO	
	Bio-surveillance(human/animal)	Lab reporting (micro, infect diseases)
Vital signs Name (Observation name)	LOINC	---
Vital signs Result (Observation value)	SNOMED CT	---
Laboratory Orders	LOINC	LOINC
Laboratory Test Results Name (Identifier)	LOINC	LOINC
Laboratory Test Results no Quantitative (Value)	SNOMED CT	SNOMED CT
Specimens (Specimen Types, Specimen Source Types, ...)	SNOMED CT	SNOMED CT
Animal Species/Breeds	SNOMED CT	SNOMED CT
Procedures (Laboratory Methods)	SNOMED CT	SNOMED CT



C-DAC'S TOOLKIT FOR LOINC (CLNTK)

C-DAC's Toolkit for LOINC (CLNtk)

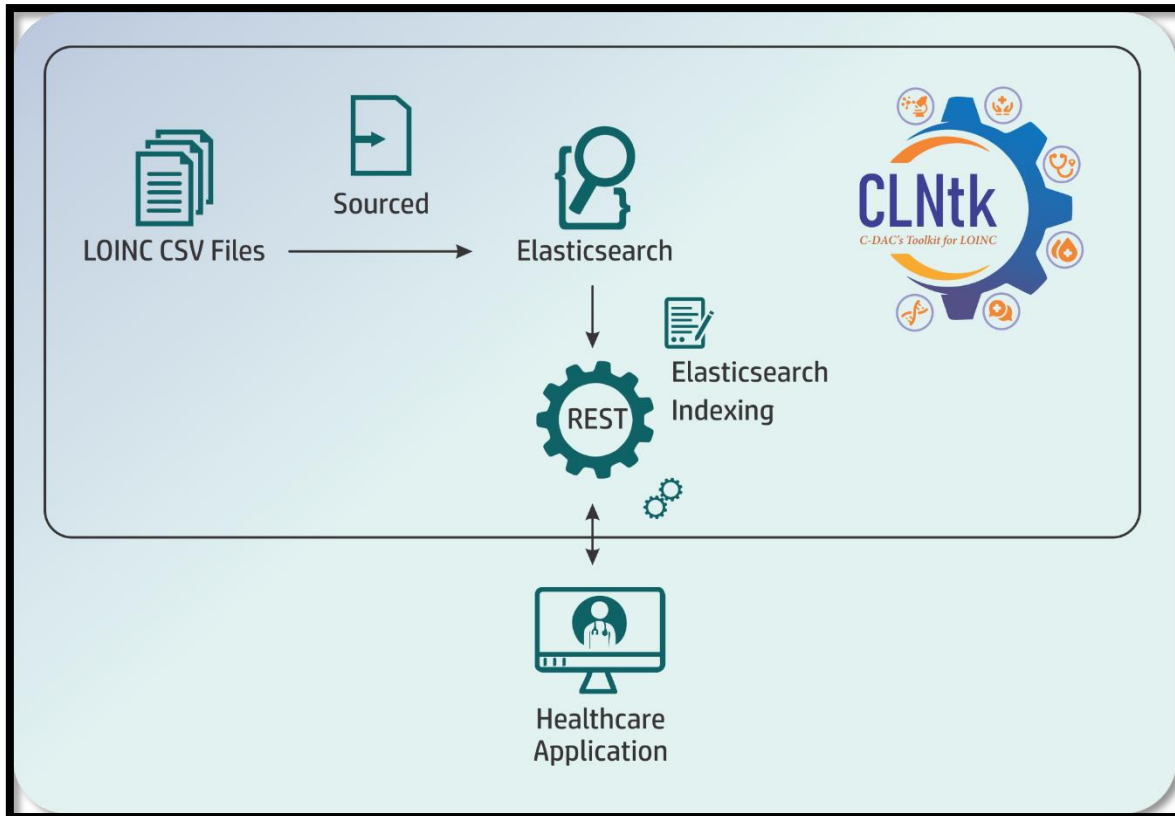


- Specially designed FOSS application for easy access and integration of LOINC standard in health care applications
- Provides simple to use REST APIs for LOINC integration
- Enables clinical informatician and researchers to find out relevant LOINC codes from its components including, long common name, short name, display name, and other related information
- More details & download available at:

https://www.cdac.in/index.aspx?id=hi_hs_medinfo_loinc_home



CLNtk Architecture



- Allows Elasticsearch index creation from the LOINC standard CSV files like LOINC CSV, LOINC Panel & Forms CSV and LOINC Part CSV
- Provides a layer of REST APIs categorized as LOINC APIs and Supporting APIs
- Support Advanced search for LOINC APIs
- Demo Application

LOINC APIs Loinc API Controller

GET **/v1/expand/panel** Provides facility to retrieve information of particular panel by specifying class parameter.

GET **/v1/lookup** Provides facility to find information about specified Loinc Number.

GET **/v1/search** Provides facility to search through LOINC short name/long common name/display name/component/system/property based on different filter parameters provided.

Supporting APIs Supporting API Controller

GET **/v1/classes** Gives list of all classes available in Loinc.

GET **/v1/components** Gives list of all components available in Loinc.

GET **/v1/methods** Gives list of all methods available in Loinc.

GET **/v1/properties** Gives list of all properties available in Loinc.

GET **/v1/scales** Gives list of all scales available in Loinc.

GET **/v1/systems** Gives list of all systems available in Loinc.

GET **/v1/timings** Gives list of all timings available in Loinc.



Thank You!

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