PADERBORN UNIVERSITY

LauNuts: A Knowledge Graph to identify and compare geographic regions in the European Union

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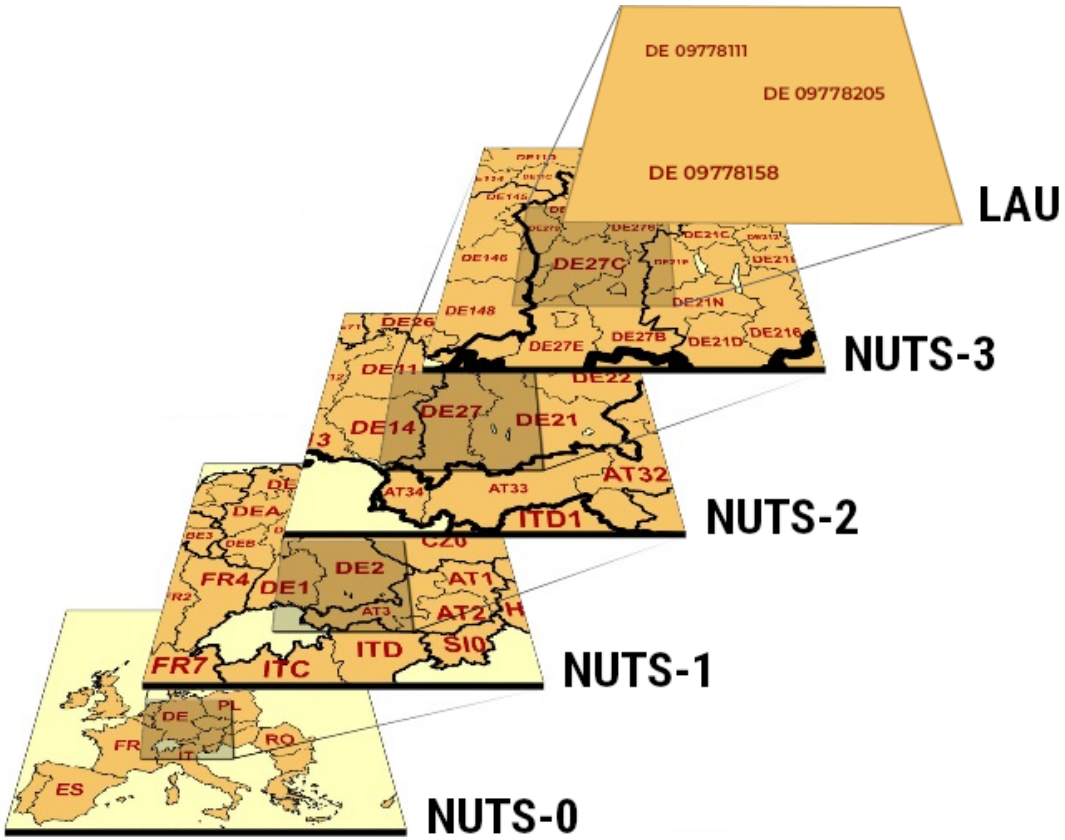
Introduction



Eurostat data:

- **LAU**: Local Administrative Units
- **NUTS**: Nomenclature of Territorial Units for Statistics[1]

[1] Image source: https://ec.europa.eu/eurostat/web/nuts/background

Introduction

NUTS classification criteria

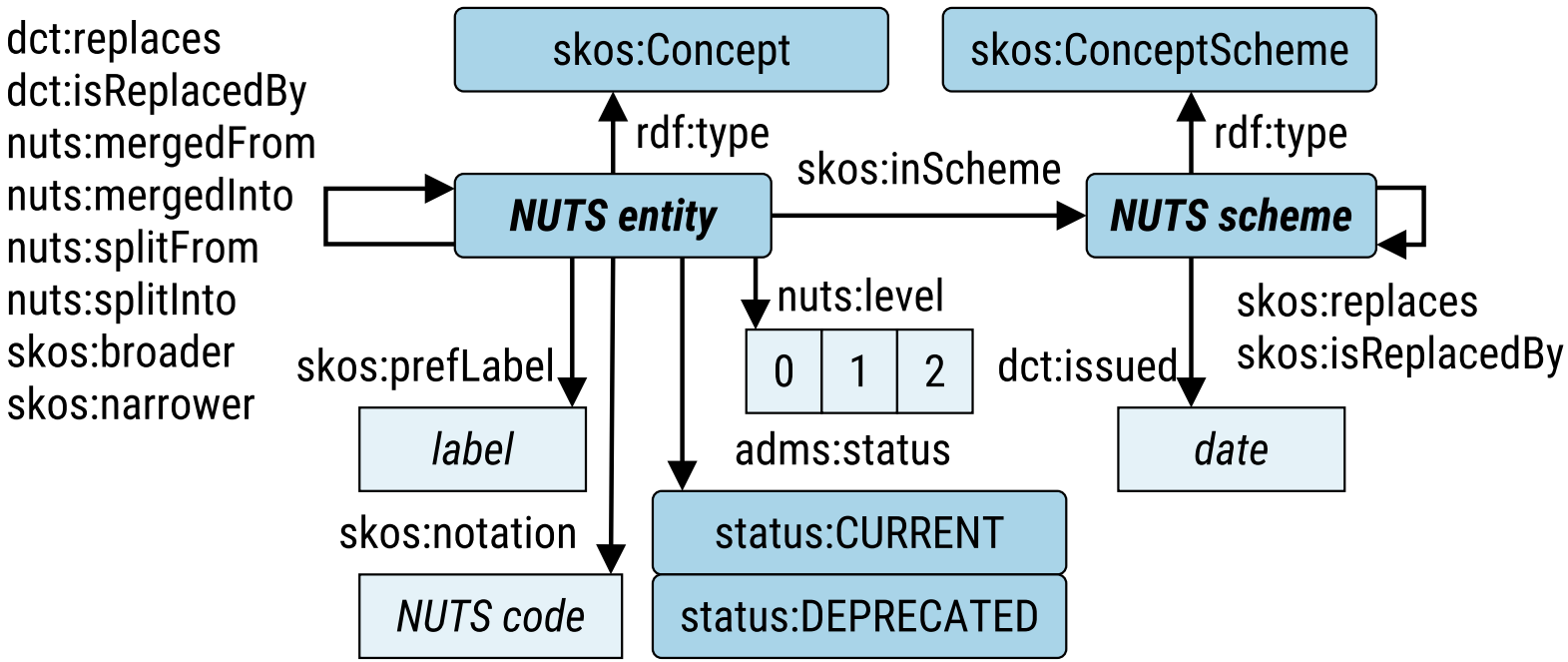
- NUTS classification criteria based on population thresholds
- Example: Strasbourg

Level	Minimum	Maximum	Example	Code 2021	Population
NUTS 0	Country level		France	FR	67.9 M
NUTS 1	3,000,000	7,000,000	Grand Est	FRF	5.5 M
NUTS 2	800,000	3,000,000	Alsace	FRF1	1.9 M
NUTS 3	150,000	800,000	Bas-Rhin	FRF11	1.1 M
LAU	-		Strasbourg	67482	0.3 M

Introduction

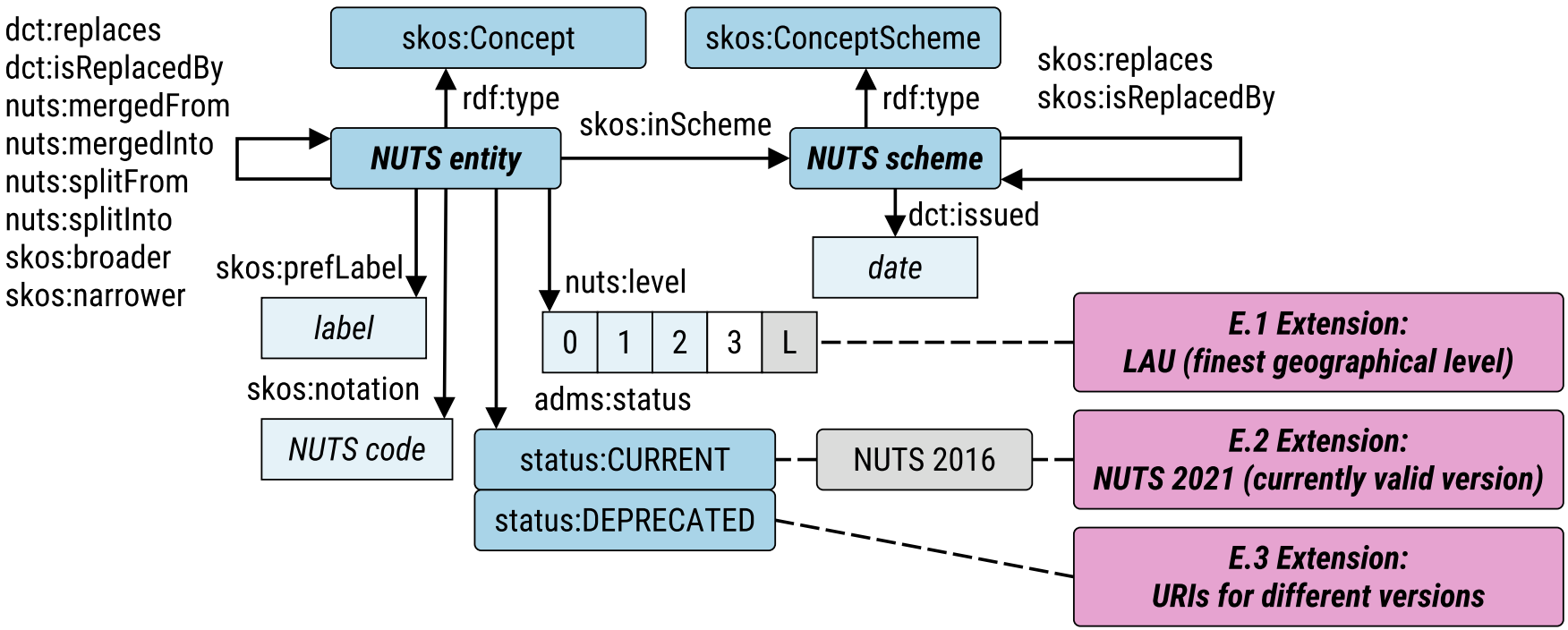
Eurostat: NUTS - Linked Open Data

- NUTS entity: e.g. Strasbourg or France
- NUTS scheme: e.g. NUTS 2016 classification



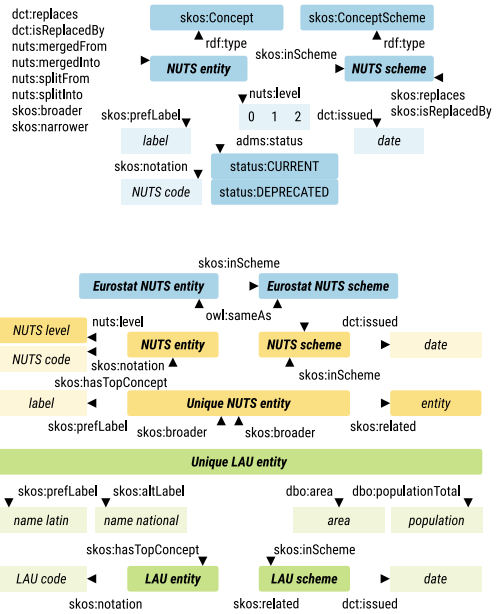
Motivation

Possibilities for extension

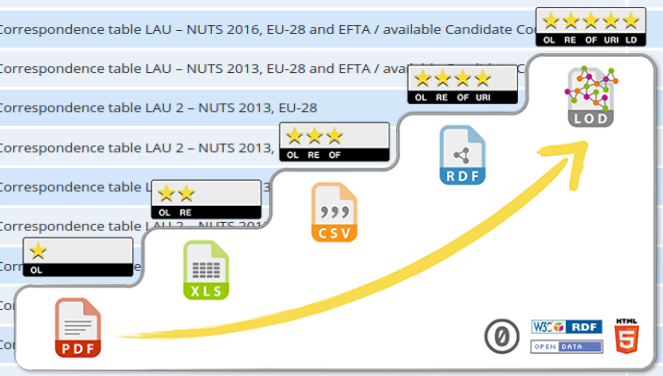


Contributions

C.1 Contribution: Extention of Linked Data scheme



C.2 Contribution: Knowledge Graph generator



C.3 Contribution: Knowledge Graph

Tables	Provisional/ Validated	Year	Links
Correspondence table LAU – NUTS 2021, EU-27 and EFTA / available Candidate Countries	Partially validated	2022	
Correspondence table LAU – NUTS 2021, EU-27 and EFTA / available Candidate Countries	Partially validated	2021	
Correspondence table LAU – NUTS 2016/2021, EU-27, UK and EFTA / available Candidate Countries	Provisional	2020	
Correspondence table LAU – NUTS 2016, EU-28 and EFTA / available Candidate Countries	Validated	2019	
Correspondence table LAU – NUTS 2016, EU-28 and EFTA / available Candidate Countries	Validated	2018	
Correspondence table LAU – NUTS 2016, EU-28 and EFTA / available Candidate Co	Validated	2017	
Correspondence table LAU – NUTS 2013, EU-28 and EFTA / ava	Validated	2017	
Correspondence table LAU 2 – NUTS 2013, EU-28	Validated	2016	
Correspondence table LAU 2 – NUTS 2013,	Validated	2015	
Correspondence table L	Validated	2014	
Correspondence table	Validated	2013	
Cor	Validated	2012	
Co	Validated	2011	
Co	Validated	2011	
Correspondence table LAU 2 – NUTS 2010, EU-27	Validated	2010	

NUTS versions
NUTS 2021 (incl. changes to NUTS 2016)
NUTS 2013 - NUTS 2016
NUTS 2010 - NUTS 2013
NUTS 2006 - NUTS 2010
NUTS 2003 - NUTS 2006
NUTS 1999 - NUTS 2003
NUTS 1995 - NUTS 1999
NUTS 1981 - NUTS 1999

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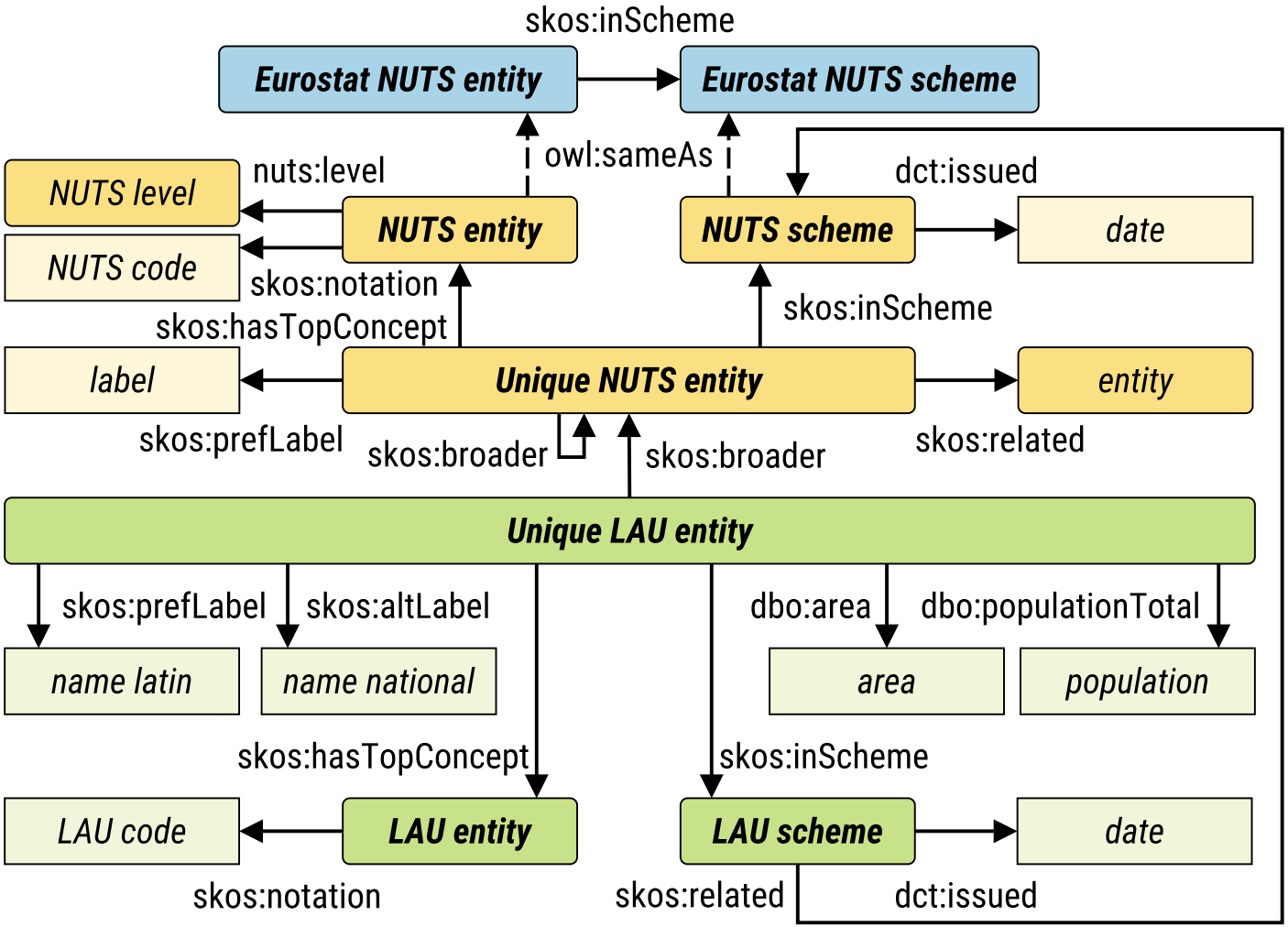
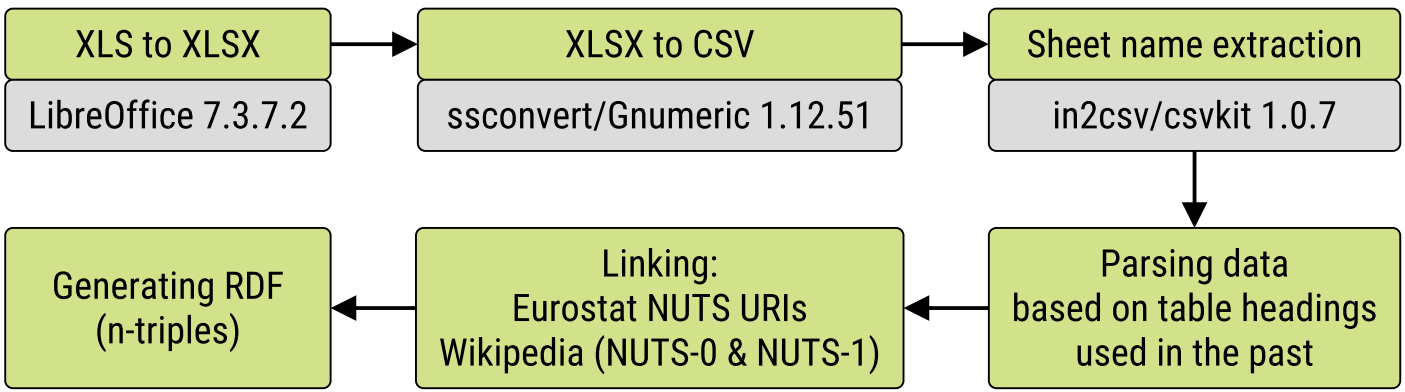
C.1 Extension of the Eurostat scheme



C.2 Knowledge Graph generator

- Java software: github.com/dice-group/launuts
- Open license (GNU AGPLv3)
- Handle future data releases



C.3 Knowledge Graph

- LauNuts2021b: NUTS schemes 2021 & 2016, LAU 2021 & 2020
- Knowledge Graph generator examples:

	0	NUTS-1	NUTS-2	NUTS-3	LAU	Area	Population	Linked	Triples
2016	28	132	309	1,376	89,284	54,313	45,570	0	568,396
2021	37	162	371	1,551	98,891	98,825	90,074	151	707,816
2021b	65	294	680	2,927	188,175	153,138	135,644	151	1,181,549
All	177	829	1,992	9,122	1,591,703	1,151,106	1,266,290	151	8,039,437

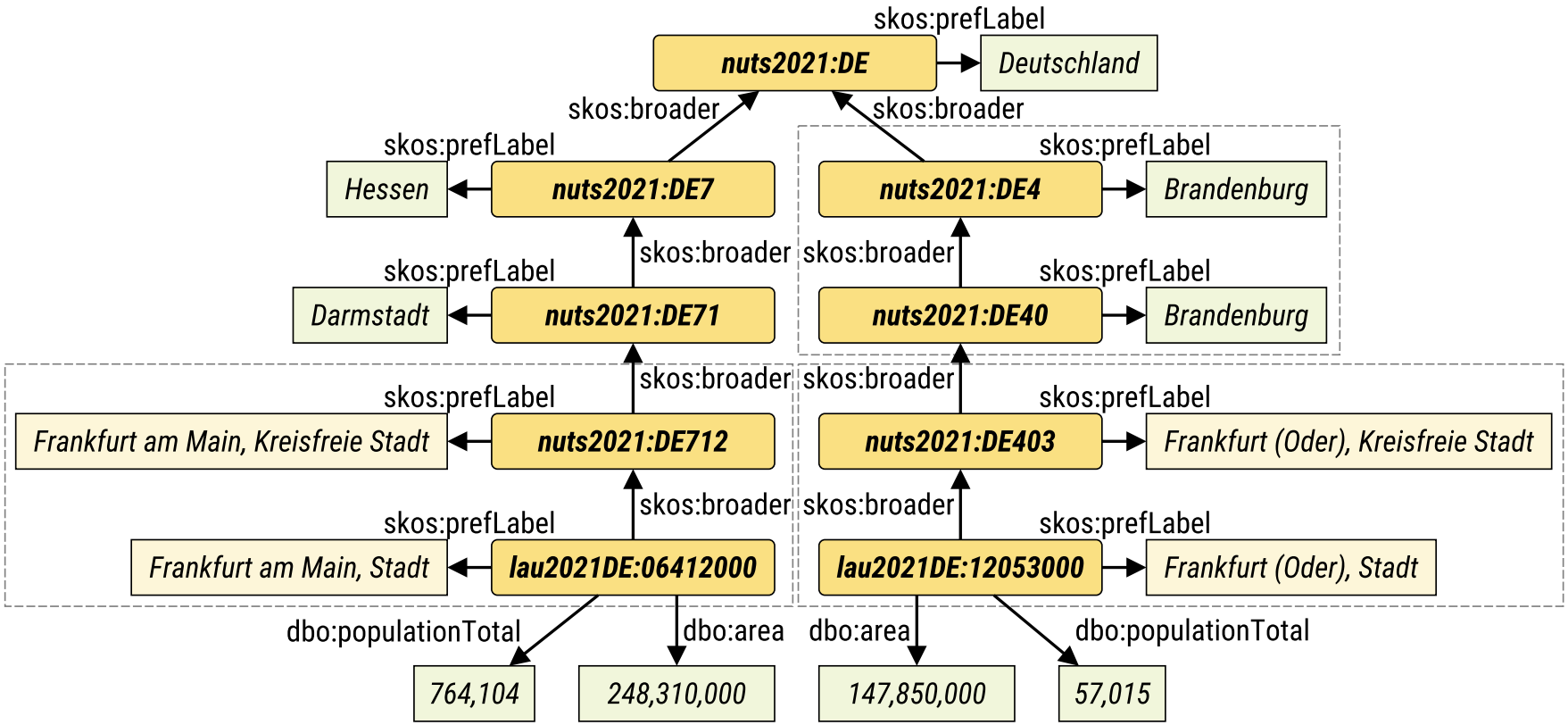
- 37 NUTS 2021 countries:
  AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, EL, ES, FI, FR, HR, HU, IE, IS, IT, LI, LT, LU, LV, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, TR, UK
- Download, SPARQL endpoint & queries: w3id.org/launuts

C.3 Knowledge Graph: SPARQL example

```
PREFIX skos: <http://www.w3.org/2004/02/skos/core#>
PREFIX dbo: <http://dbpedia.org/ontology/>
SELECT (?uniqueLau as ?lau) ?code ?name ?national ?area ?population WHERE {
  ?uniqueLau skos:inScheme <https://w3id.org/launuts/lau/2021> .
  ?uniqueLau skos:broader <https://w3id.org/launuts/nuts/2021#EL431> .
  ?uniqueLau skos:hasTopConcept ?lauBroader .
  ?lauBroader skos:notation ?code .
  OPTIONAL { ?uniqueLau skos:prefLabel ?name } .
  OPTIONAL { ?uniqueLau skos:altLabel ?national } .
  OPTIONAL { ?uniqueLau dbo:area ?area } .
  OPTIONAL { ?uniqueLau dbo:populationTotal ?population } .
}
ORDER BY DESC(?code)
```

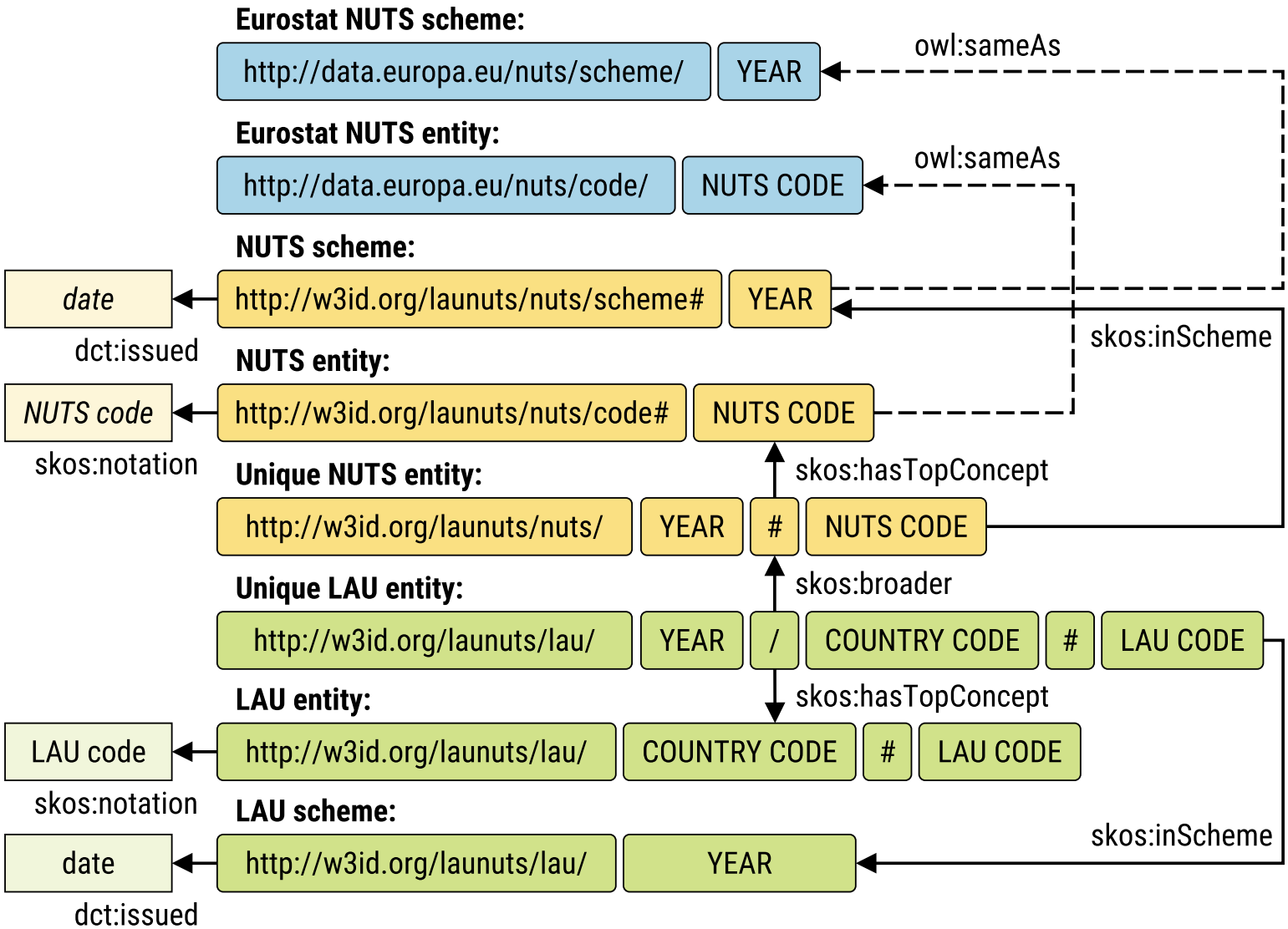
lau	code	name	national	area	population
https://w3id.org/launuts/lau/2021/EL#71080406	71080406	Commune of Chersonissos	Κοινότητα Χερσονήσου	19446663	3165
https://w3id.org/launuts/lau/2021/EL#71080405	71080405	Commune of Potamies	Κοινότητα Ποταμιών	15991254	414
https://w3id.org/launuts/lau/2021/EL#71080404	71080404	Commune of Kera	Κοινότητα Κεράς	3856511	110
https://w3id.org/launuts/lau/2021/EL#71080403	71080403	Commune of Gonies Pediados	Κοινότητα Γωνιών Πεδιάδος	8521447	401
https://w3id.org/launuts/lau/2021/EL#71080402	71080402	Commune of Avdou	Κοινότητα Αβδού	11748622	357
https://w3id.org/launuts/lau/2021/EL#71080401	71080401	Commune of Limenas Chersonissou	Κοινότητα Λιμένος Χερσονήσου	11339668	3815
https://w3id.org/launuts/lau/2021/EL#71080303	71080303	Commune of Mochos	Κοινότητα Μοχού	25641449	2062
https://w3id.org/launuts/lau/2021/EL#71080302	71080302	Commune of Krassio	Κοινότητα Κρασίου	12683178	147
https://w3id.org/launuts/lau/2021/EL#71080301	71080301	Commune of Malia	Κοινότητα Μαλίων	21814584	3224
https://w3id.org/launuts/lau/2021/EL#71080205	71080205	Commune of Sgourokefalio	Κοινότητα Σγουροκεφαλίου	4248190	474

Use case: Named Entity Disambiguation



Thank you for your attention!

dice-research.org/LauNuts

Appendix

Extension: URI schemes