Travel Knowledge Graph

Chaitanya Anumula
Skyler Gentner
Calvin Greenewald
Rakesh Kandula

CS7810 Fall 2023
Advised By Cogan Shimizu

Use Case

- With the rise in social media marketing of travel destinations, the interest in traveling around Europe has gained global attention.
- Limited and not so good means of sources to get adequate information necessary for planning the entire trip.
- A creation of a knowledge graph could help give the tourist all the necessary details for structuring their entire trip.

Goal of Knowledge Graph

- Identify tourist destinations based on personal preferences and recommend possible destinations for users
- Consider budget, length of time, destination interests, destination reviews, transportation options, and activities when recommending travel options

Competency Questions

- How to query the Knowledge Graph (KG) to get the details of the location, tourist is visiting?
- How user can decide the mode of the transport (X), given his/her budget (B)?
- What are the activities(A) can be performed, in the location(Y), for eg: kayaking, rafting, sky-diving, trekking etc.
- List all the locations(Y), if user is interested to participate in specific activity(A), sorted the prices from low to high
- List all the tourist spots (TS), for the given location (Y)

Competency Questions (Cont.)

- What type of accommodations/Housing (H) available in Budget (B) for the location (Y)
- Which location offers multi cuisine restaurants, suitable for food lovers

Descoped

- How user can search nearby places/tourist attractions?
- Querying the KG, based on preferred activities for the current season
- Which are the destinations offer pristine beaches, clear waters or water activities

Modules

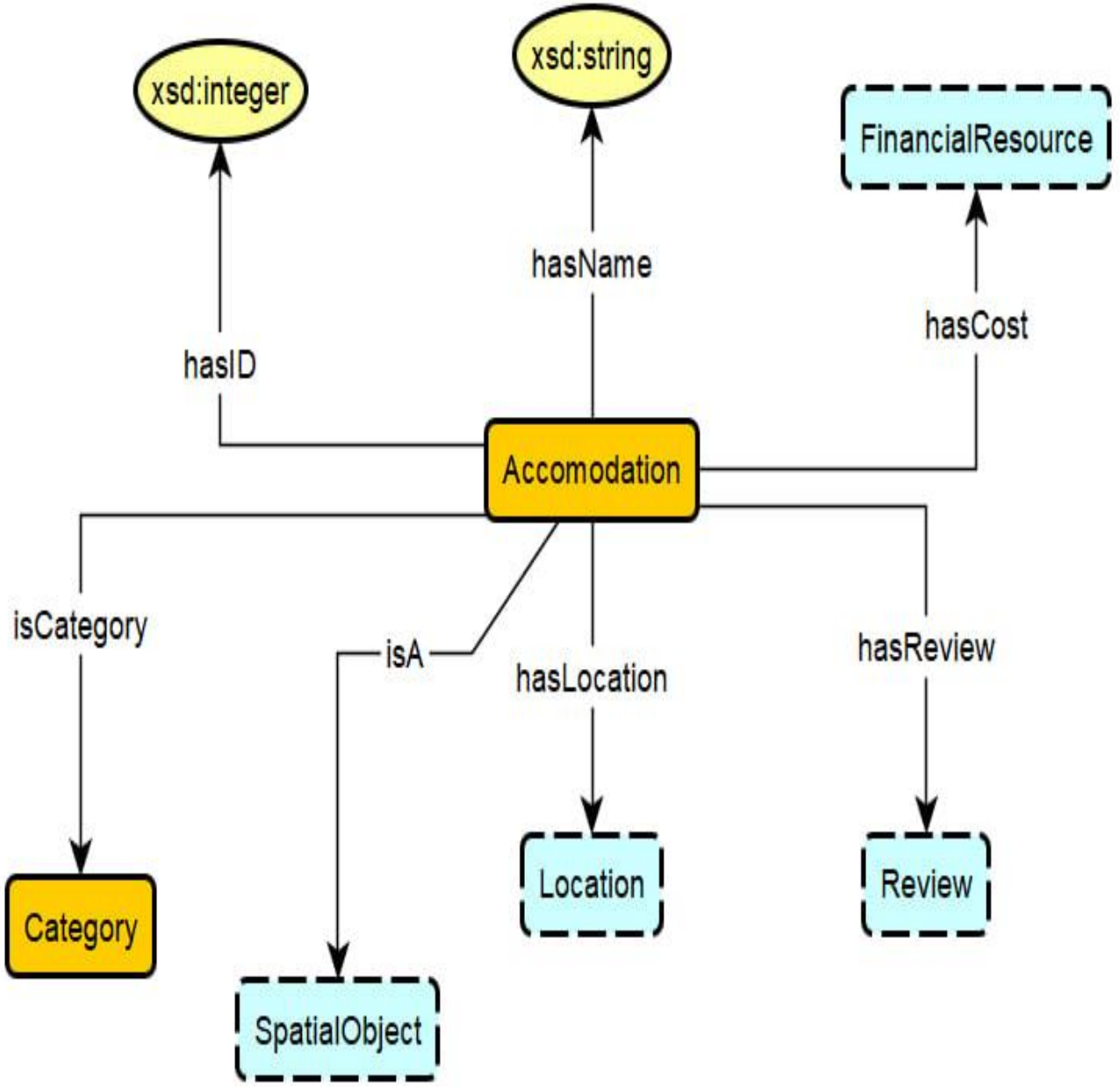
- Transport
- Financial Resource
- Activity
- Location
- Accommodation
- Restaurant

Accommodation

Source Pattern: Part-whole, Quantity, SpatioTemporalExtent
Source Data: Berlin Airbnb Dataset, Tour Dataset

Axioms

- An accommodation has max one ID represented by an integer
- An accommodation has max one name represented by a string
- An accommodation has some review
- An accommodation has exactly one location
- An accommodation has a exactly one category
- An accommodation has exactly one cost of FinancialResource
- An accommodation is of type SpatialObject

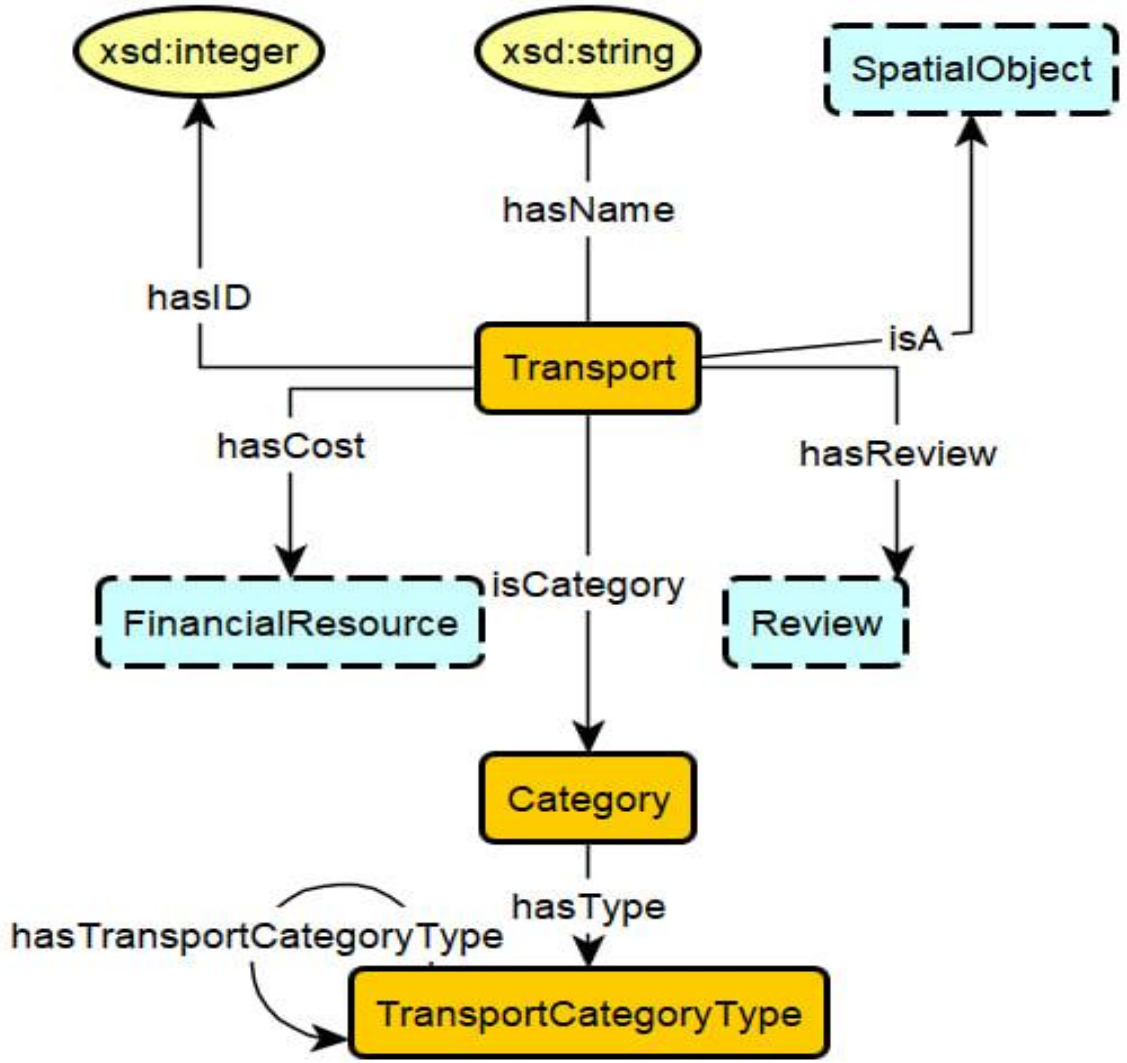


Transport

Source Pattern: Part-whole, Hierarchial-cell-features
Source Data: Tour Dataset

Axioms

- A Transport has an ID represented by an integer value
- A Transport has a name represented by a string value
- A Transport has some review
- A Transport has a exactly one category
- A Transport has exactly one cost of FinancialResource



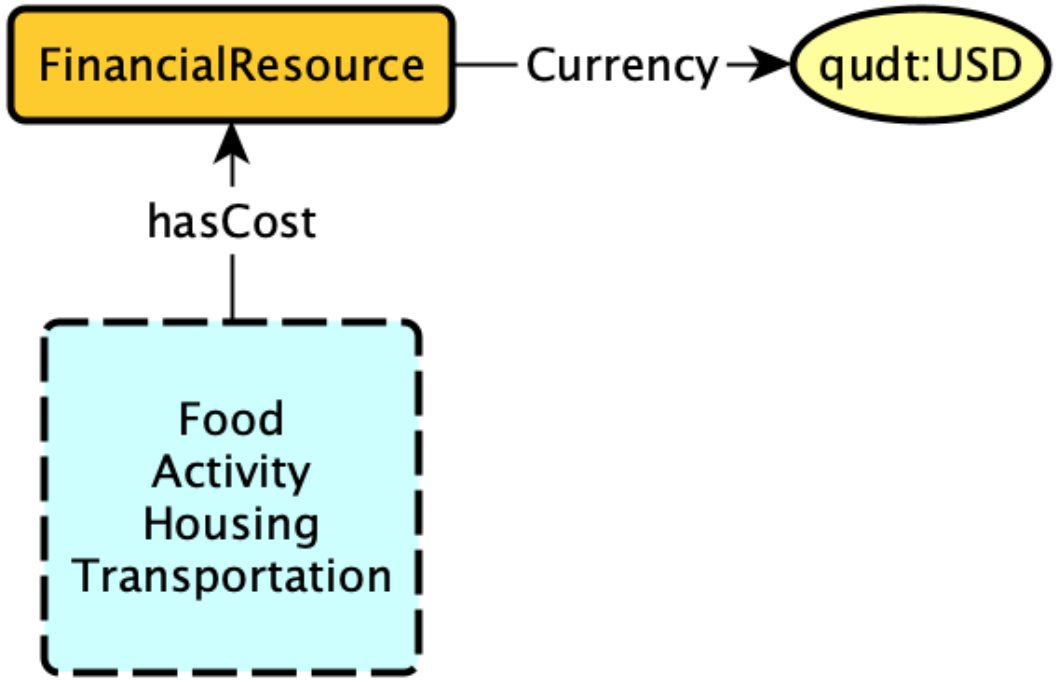
Financial Resource

Source Pattern: QuantityPattern

Source Data: Tour Dataset

Axioms

- FinancialResurce has a currency represented by USD
- Food has a cost represented by FinancialResource
- Activity has a cost represented by FinancialResource
- Housing has a cost represented by FinancialResource
- Transportation has a cost represented by FinancialResource.

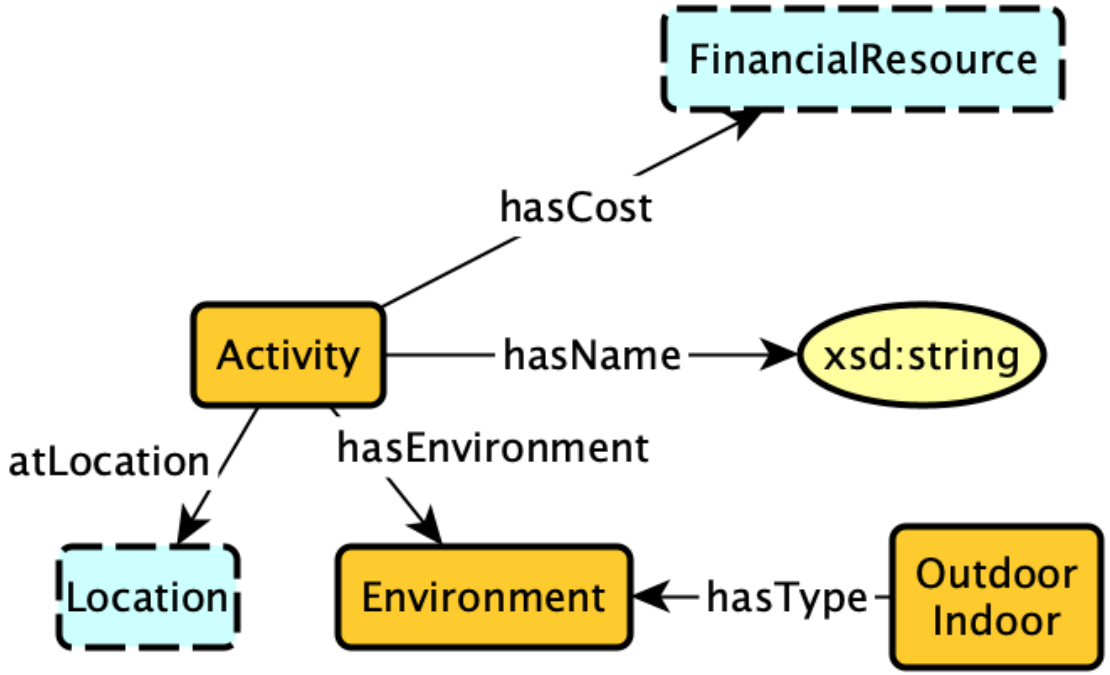


Activity

Source Pattern: SpatioTemporalExtent, Temporal extent
Source Data: Tour Dataset

Axioms

- Activity have a cost of exactly one FinancialResource
- Activity have a name that is represented by some string
- Activity have exactly one location
- Activity have a type that is either Indoor or Outdoor
- If type is Outdoor then the type is represented by Outdoor
- If type is Indoor then the type is represented by Indoor

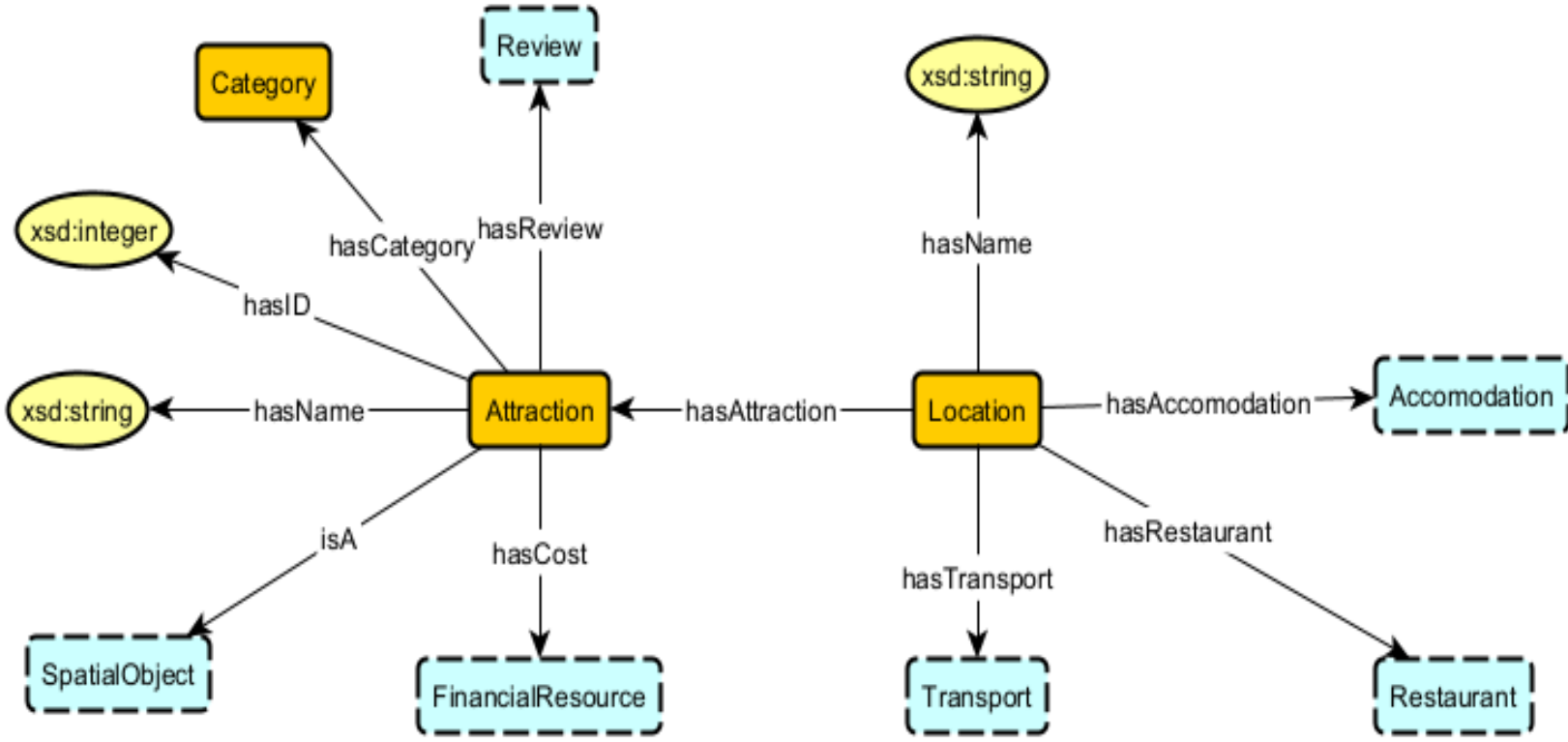


Location

Source Pattern: SpatialObject or SpatialExtent
Source Data: Tour Dataset

Axioms

- An attraction has max one ID represented by an integer value
- An attraction has max one name represented by a string value
- An attraction has some review
- An attraction has exactly one location
- An attraction has a exactly one category
- An attraction has exactly one cost of FinancialResource
- An attraction has some activity
- An Attraction is of type SpatialObject

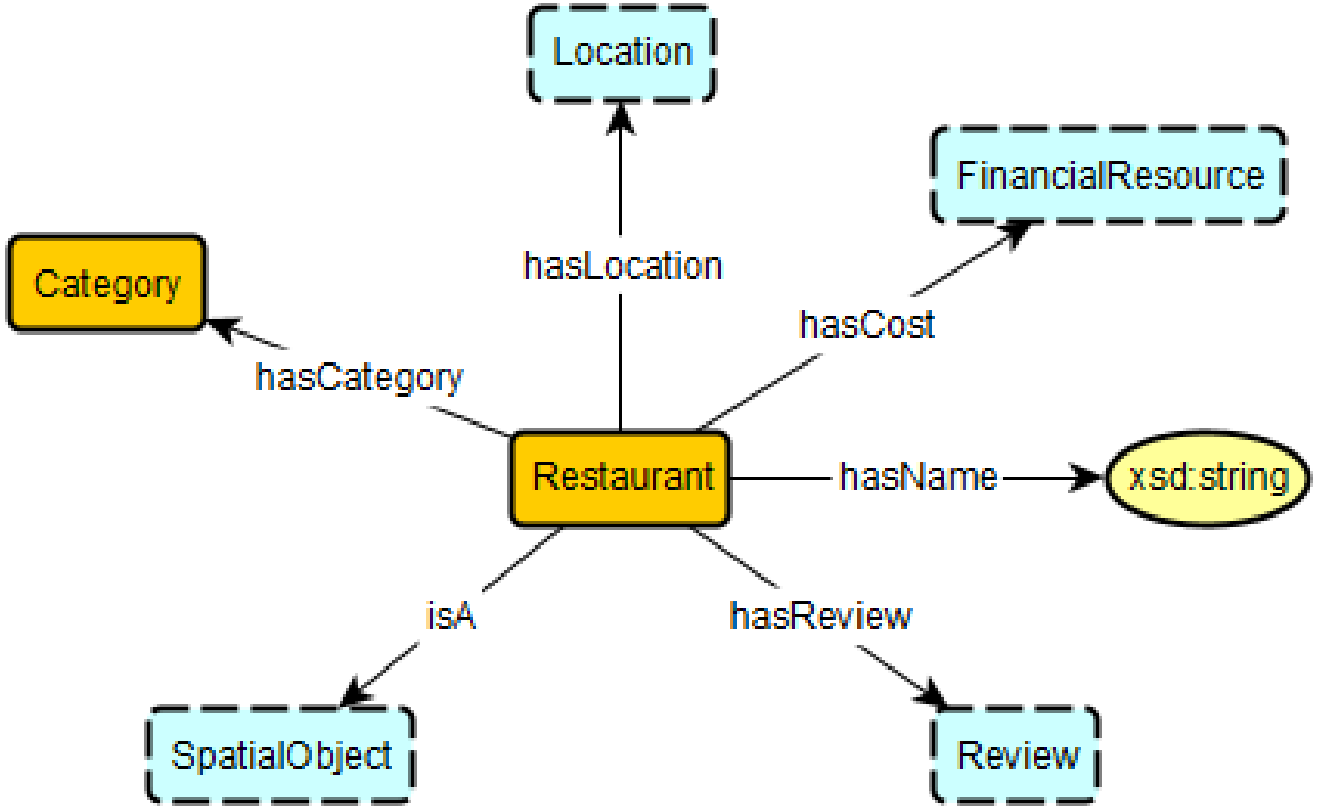


Restaurant

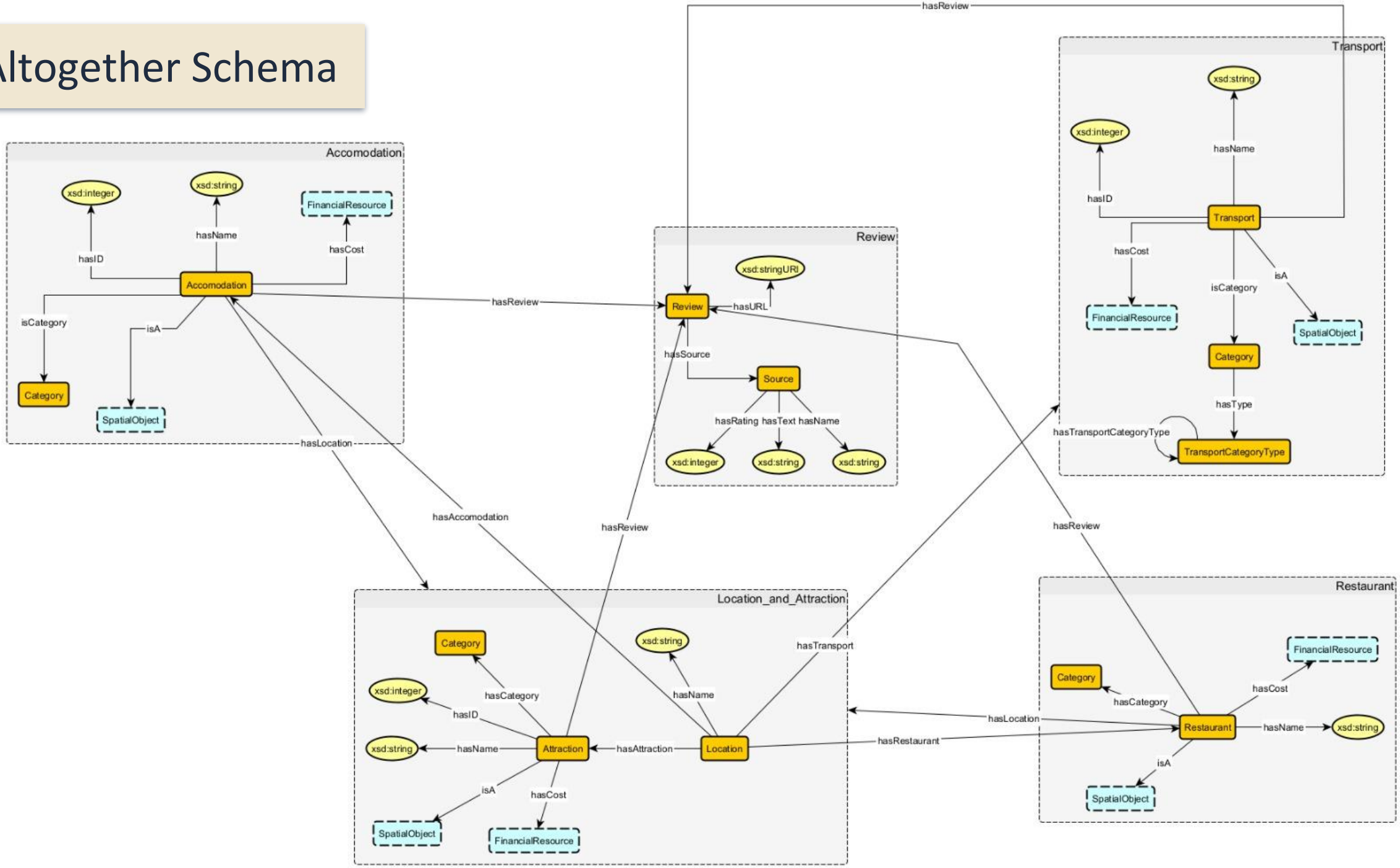
Source Pattern: Provenance, Temporal extent
Source Data: Restaurant info, Tour Dataset

Axioms

- A Restaurant has a name represented by a string
- A Restaurant has some review
- A Restaurant may or may not have a Category represented by a string value
- A Restaurant has exactly one location
- A Restaurant has exactly one cost of FinancialResource
- A Restaurant is of type SpatialObject



Altogether Schema



CQ 2 – Budget based Transport

```
8  SELECT ?transport ?category  ?cost
9  WHERE {
10   ?transport a kl-ont:Transport ;
11               kl-ont:hasName ?name;
12               kl-ont:hasLocation ?location;
13               kl-ont:hasCategory ?category;
14               kl-ont:hasCost ?cost .
15   FILTER(?cost < 30)
16 } LIMIT 10
```

Table | Response | 10 results in 0.027 seconds | Simple view ☐ | Ellipse ☑ | Filter query results | Pa

	transport	category	cost
1	<https://kastle-lab.org/lod/resource/1850>	<https://kastle-lab.org/lod/resource/Boat_or_Ferry>	"25"^^<http://www.w3.org/2001/XMLSchema#integer>
2	<https://kastle-lab.org/lod/resource/31654>	<https://kastle-lab.org/lod/resource/Road>	"18"^^<http://www.w3.org/2001/XMLSchema#integer>
3	<https://kastle-lab.org/lod/resource/38045>	<https://kastle-lab.org/lod/resource/Travel_Lounge>	"20"^^<http://www.w3.org/2001/XMLSchema#integer>
4	<https://kastle-lab.org/lod/resource/8584>	<https://kastle-lab.org/lod/resource/Bus_Line>	"28"^^<http://www.w3.org/2001/XMLSchema#integer>
5	<https://kastle-lab.org/lod/resource/11744>	<https://kastle-lab.org/lod/resource/Bus_Line>	"29"^^<http://www.w3.org/2001/XMLSchema#integer>
6	<https://kastle-lab.org/lod/resource/43496>	<https://kastle-lab.org/lod/resource/Taxi>	"24"^^<http://www.w3.org/2001/XMLSchema#integer>
7	<https://kastle-lab.org/lod/resource/37315>	<https://kastle-lab.org/lod/resource/Train_Station>	"21"^^<http://www.w3.org/2001/XMLSchema#integer>

CQ 3 – Activities based on Location

```
8  SELECT ?location ?attraction  ?category
9  WHERE {
10   ?location a kl-ont:Location;
11   kl-ont:hasAttraction ?attraction .
12   ?attraction kl-ont:hasCategory ?category
13
14   FILTER (?location = kl-res:Amsterdam)
15
16 } LIMIT 10
```

Table | Response | 10 results in 0.046 seconds | Simple view ☐ Ellipse ☑ | Filter query results

	location	attraction	category
1	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29216>	<https://kastle-lab.org/lod/resource/Skydiving>
2	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29252>	<https://kastle-lab.org/lod/resource/Harbor__Marina>
3	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29089>	<https://kastle-lab.org/lod/resource/Nightclub>
4	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/28933>	<https://kastle-lab.org/lod/resource/Hotel_Bar>
5	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29295>	<https://kastle-lab.org/lod/resource/Hookah_Bar>
6	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29200>	<https://kastle-lab.org/lod/resource/Cocktail_Bar>
7	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29449>	<https://kastle-lab.org/lod/resource/Gym__Fitness_Center>

CQ 4 – Locations based on Activities

```
7
8  SELECT ?location ?attraction  ?category
9  WHERE {
10   ?location a kl-ont:Location;
11   kl-ont:hasAttraction ?attraction .
12   ?attraction kl-ont:hasCategory ?category
13
14   FILTER (?category = kl-res:Skydiving)
15
16 } LIMIT 10
```

Table | Response | 10 results in 0.026 seconds | Simple view ☐ Ellipse ☑ Filter query results | Pa

	location	attraction	category
1	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29216>	<https://kastle-lab.org/lod/resource/Skydiving>
2	<https://kastle-lab.org/lod/resource/Berlin>	<https://kastle-lab.org/lod/resource/95369>	<https://kastle-lab.org/lod/resource/Skydiving>
3	<https://kastle-lab.org/lod/resource/Tuscany>	<https://kastle-lab.org/lod/resource/187294>	<https://kastle-lab.org/lod/resource/Skydiving>
4	<https://kastle-lab.org/lod/resource/Tuscany>	<https://kastle-lab.org/lod/resource/187453>	<https://kastle-lab.org/lod/resource/Skydiving>
5	<https://kastle-lab.org/lod/resource/Tuscany>	<https://kastle-lab.org/lod/resource/187441>	<https://kastle-lab.org/lod/resource/Skydiving>
6	<https://kastle-lab.org/lod/resource/Berlin>	<https://kastle-lab.org/lod/resource/95992>	<https://kastle-lab.org/lod/resource/Skydiving>
7	<https://kastle-lab.org/lod/resource/Amsterdam>	<https://kastle-lab.org/lod/resource/29502>	<https://kastle-lab.org/lod/resource/Skydiving>

CQ 6 – Accomodation for budget (x-y) & location (z)

```
8  SELECT ?locName ?accomodationName  ?cost
9  WHERE {
10   ?location a kl-ont:Location;
11   kl-ont:hasName ?locName;
12   kl-ont:hasAccomodation ?accomodation .
13   ?accomodation kl-ont:hasName ?accomodationName;
14   kl-ont:hasCost ?cost .
15
16   FILTER (?location = kl-res:London && ?cost > 110 && ?cost < 150)
17
```

Table | Response | 10 results in 0.033 seconds | Simple view

	locName	accomodationName	cost
1	London	The Florida Room	"140"^^<http://www.w3.org/2001/XMLSchema#integer>
2	London	Lidl	"124"^^<http://www.w3.org/2001/XMLSchema#integer>
3	London	Sleeping Beauty Motel	"138"^^<http://www.w3.org/2001/XMLSchema#integer>
4	London	Premier Inn	"129"^^<http://www.w3.org/2001/XMLSchema#integer>
5	London	Church Cottage	"112"^^<http://www.w3.org/2001/XMLSchema#integer>
6	London	Chumleigh Lodge	"149"^^<http://www.w3.org/2001/XMLSchema#integer>
7	London	AirBNB 37 Commercial Road	"142"^^<http://www.w3.org/2001/XMLSchema#integer>

Retrospective