SYSTEMATIZING DEFINITIONS IN ONTOLOGIES

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Advantages of Formal Definitions
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BACKGROUND

EXAMPLE

hospital function

A function inhering in a material entity that is realized by the material entity at which inpatient and outpatient healthcare is provided to a patient population.

Source: OMRSE

CANONICAL STRUCTURE

GENUS
categorizes

A function inhering in a material entity that is realized by the material entity at which inpatient and outpatient healthcare is provided to a patient population.

Source: OMRSE

One or more DIFFERENTIAE distinguish

SEMANTIC STRUCTURE

is_a
FUNCTION

inheres_in
MATERIAL ENTITY

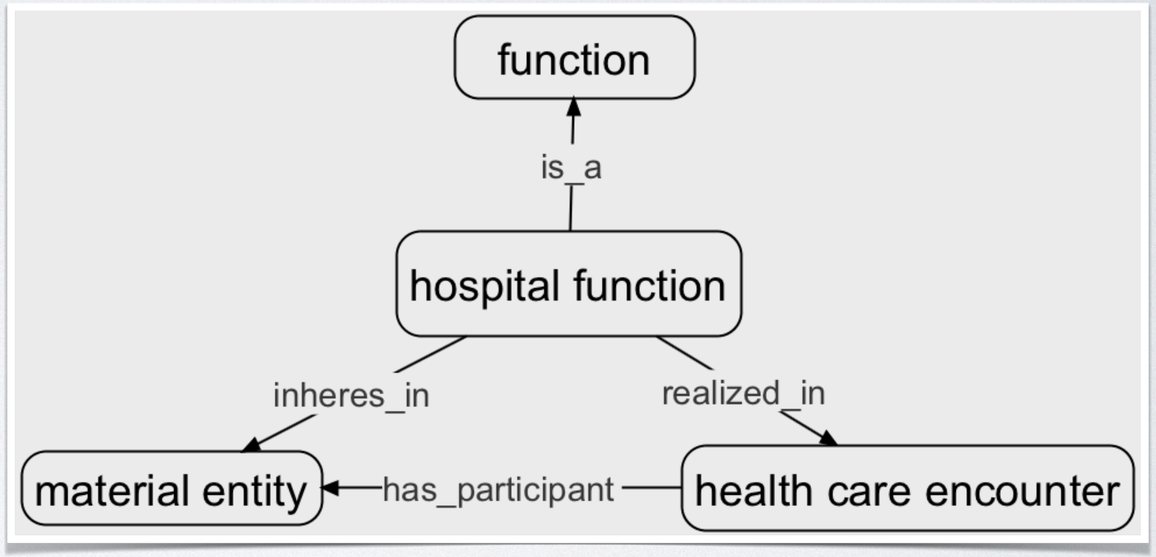
A function inhering in a material entity that is realized by the material entity at which inpatient and outpatient healthcare is provided to a patient population.

Source: OMRSE

realized_in
PROCESS

OTHER OUTPUT FORMS

```
hospital function
subClassOf function
    inheres_in some material entity
    realized_in some health care encounter
        and (has_participant some material entity)
```



axioms

graph

OUTLINE OF THE METHOD

ANALYZE DEFINITION STRUCTURE

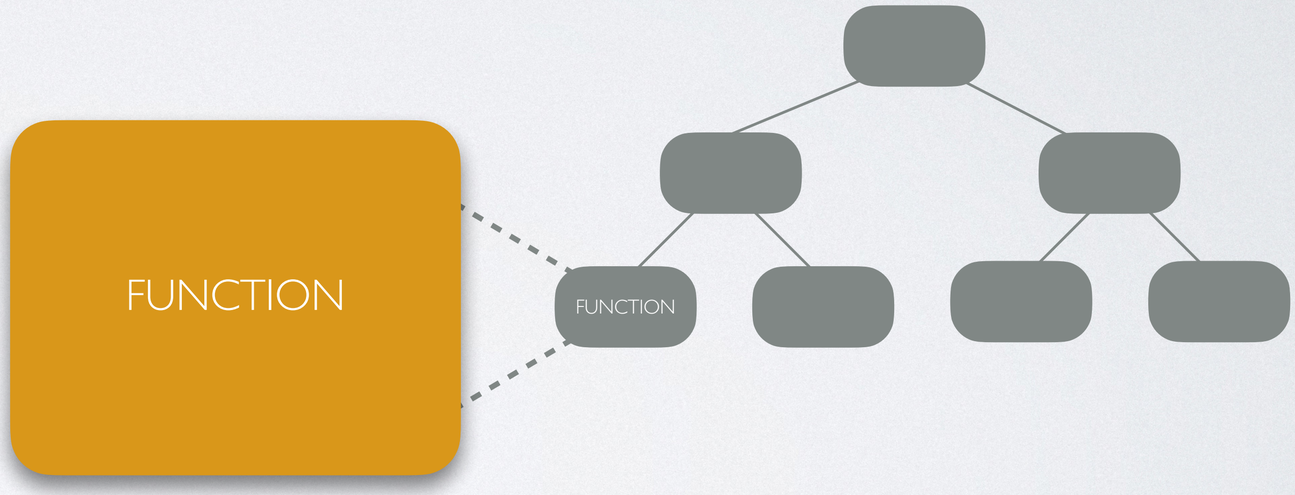
hospital function

A function inhering in a material entity that is realized by the material entity at which inpatient and outpatient healthcare is provided to a patient population.

IDENTIFY ONTOLOGY CLASS

hospital function

is_a FUNCTION inhering in a material entity that is realized by the material entity at which inpatient and outpatient healthcare is provided to a patient population.



CREATE CLASS TEMPLATE

hospital function

is_a FUNCTION inhering in a material entity that is realized by the material entity at which inpatient and outpatient healthcare is provided to a patient population.

FUNCTION

exists_at TEMPORAL REGION

has_material_basis MATERIAL ENTITY

has_specific_dependent PROCESS

inheres_in MATERIAL ENTITY

participates_in PROCESS

realized_in PROCESS

s-depends_on INDEPENDENT CONTINUANT

inheres_in SPATIAL REGION

part_of INDEPENDENT CONTINUANT

…

DESCRIBE SEMANTIC STRUCTURE

hospital function

is_a FUNCTION

inheres_in MATERIAL ENTITY

realized_in PROCESS

FUNCTION

exists_at TEMPORAL REGION

has_material_basis MATERIAL ENTITY

has_specific_dependent PROCESS

inheres_in MATERIAL ENTITY

participates_in PROCESS

realized_in PROCESS

s-depends_on INDEPENDENT CONTINUANT

inheres_in SPATIAL REGION

part_of INDEPENDENT CONTINUANT

…

DESCRIBE SEMANTIC STRUCTURE

hospital function

is_a FUNCTION | inheres_in MATERIAL ENTITY

is_a PROCESS | realized by the material entity at which inpatient and outpatient healthcare is provided to a patient population.

FUNCTION

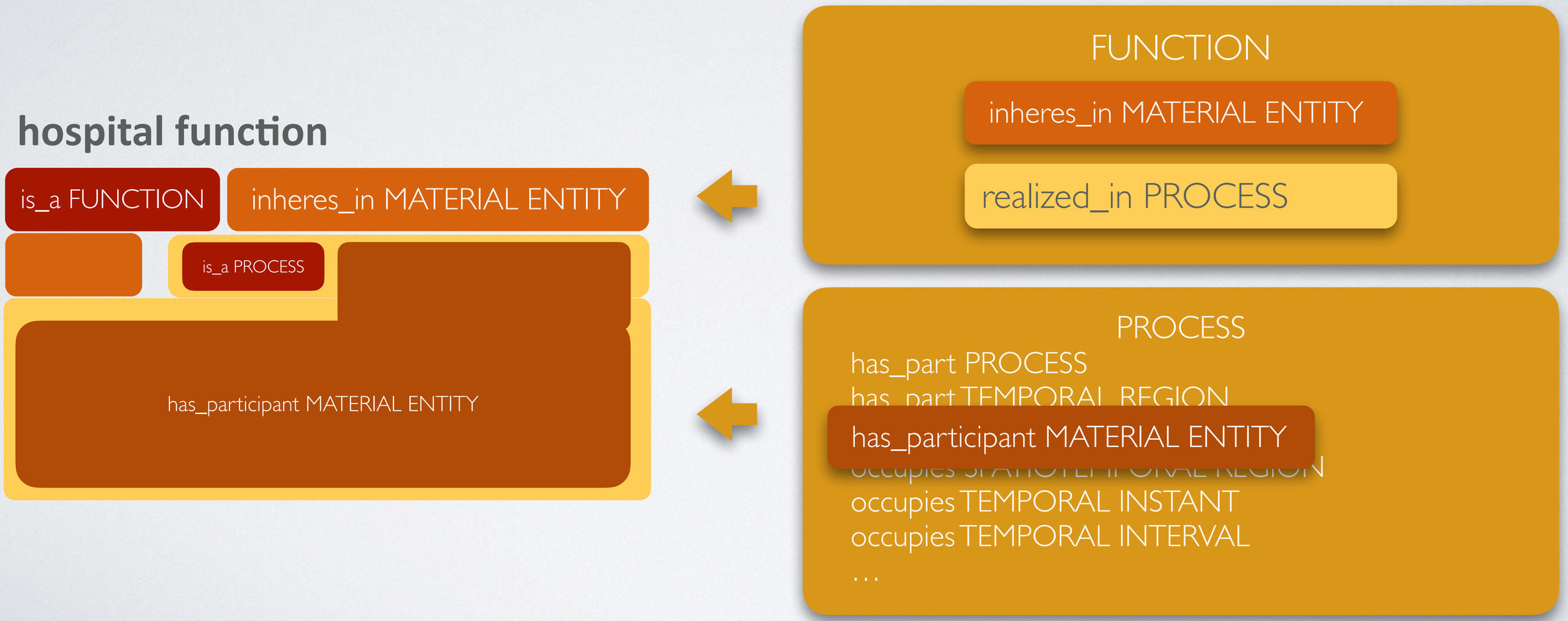
inheres_in MATERIAL ENTITY

realized_in PROCESS

PROCESS

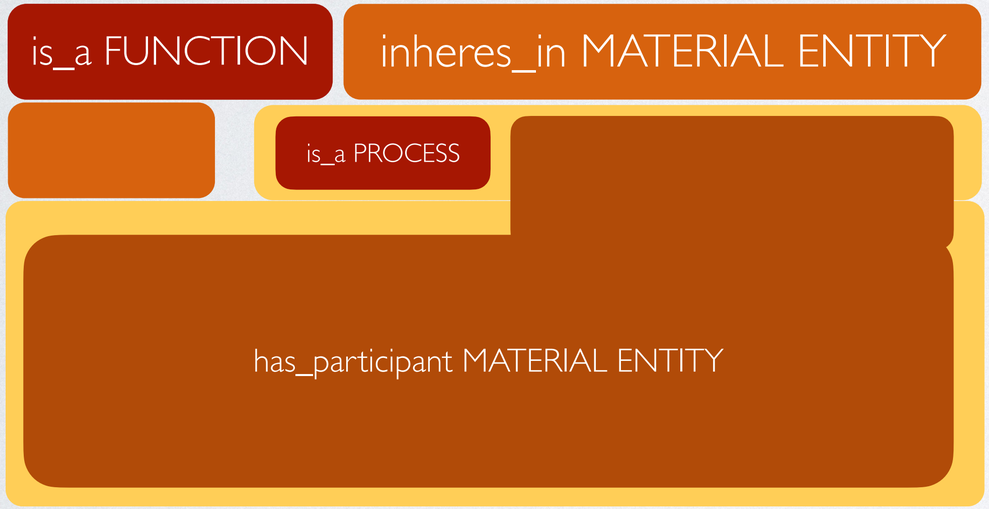
has_part PROCESS
has_part TEMPORAL REGION
has_participant MATERIAL ENTITY
occupies SPATIOTEMPORAL REGION
occupies TEMPORAL INSTANT
occupies TEMPORAL INTERVAL
…

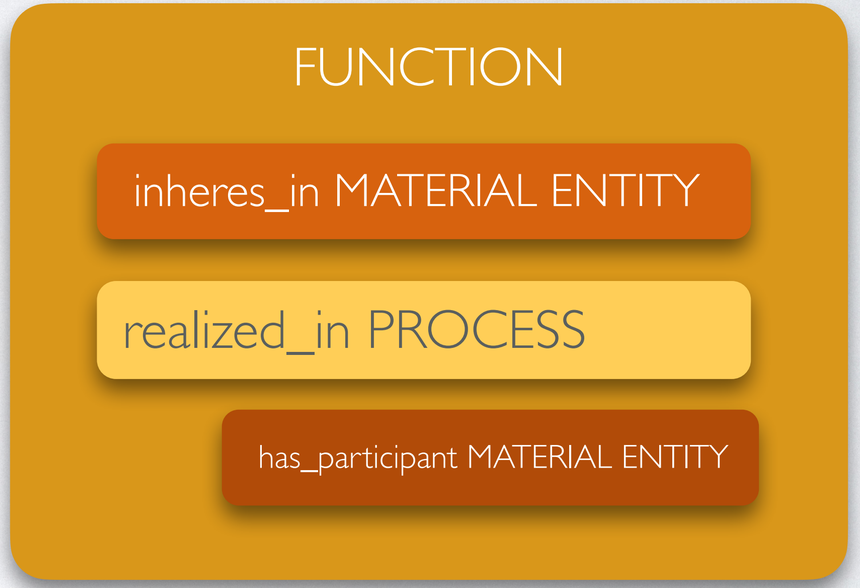
DESCRIBE SEMANTIC STRUCTURE



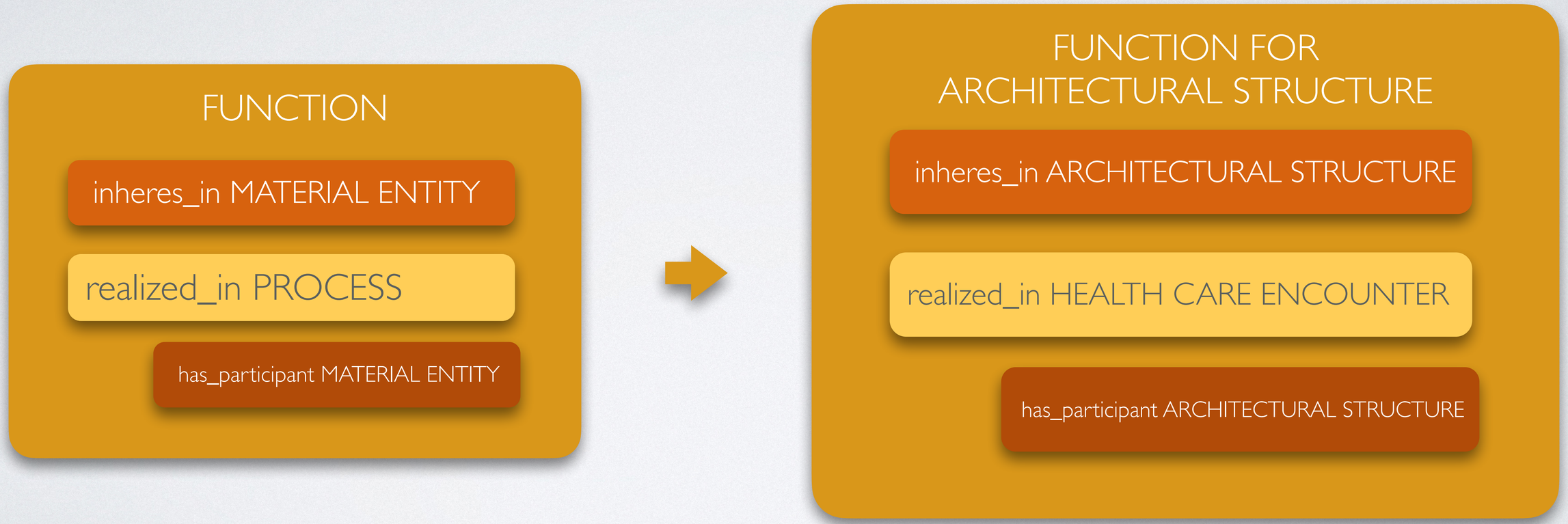
REFINE CLASS TEMPLATE

hospital function

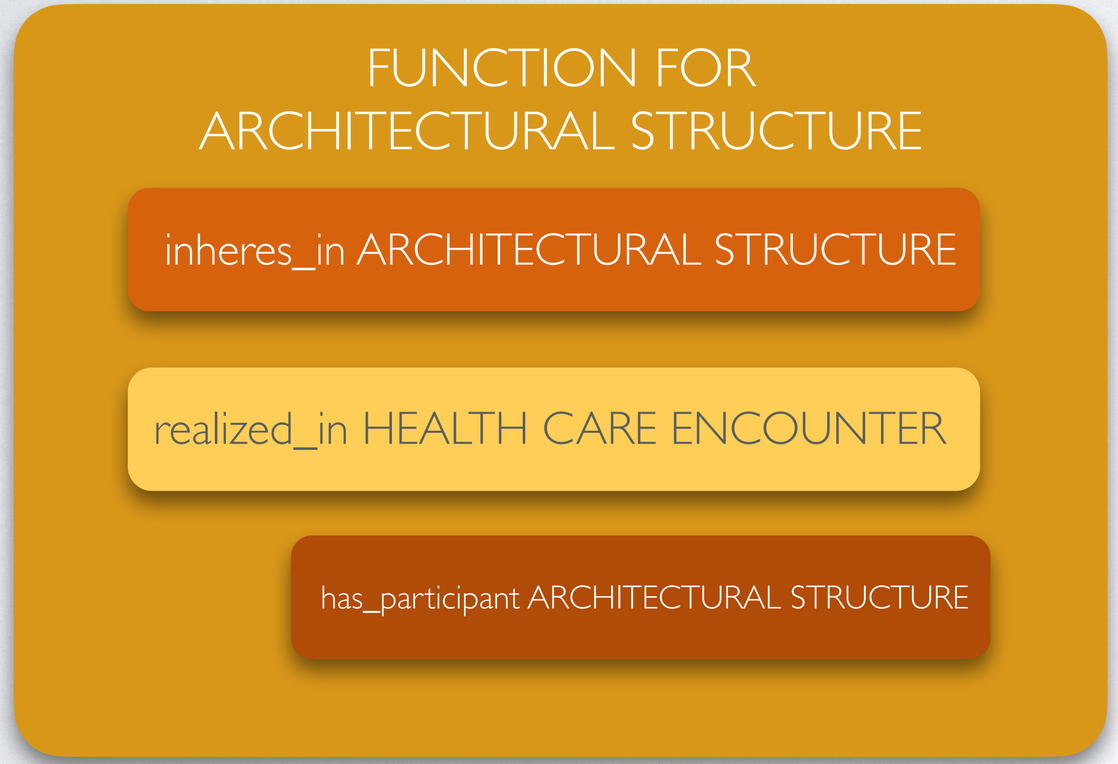




REFINE CLASS TEMPLATE



CREATE DEFINITION TEMPLATES



<architectural structure> function

A function inhering in a <architectural structure> that is realized by the <architectural structure> at which <health care encounter>.

```
<architectural structure> function
   subClassOf function
     inheres_in some <architectural structure>
     realized_in some <health care encounter>
       and (has_participant
       some <architectural structure>)
```

OUTPUT LOWER-LEVEL DEFINITION TEMPLATES

<architectural structure> function

A function inhering in a <architectural structure> that is realized by the <architectural structure> at which <health care encounter>.

```
<architectural structure> function
   subClassOf function
     inheres_in some <architectural structure>
     realized_in some <health care encounter>
        and (has_participant
        some <architectural structure>)
```



<hospital> function

A function inhering in a <health care facility> that is realized by the <health care facility> at which <inpatient and outpatient healthcare is provided to a patient population>.

```
hospital function
   subClassOf function
     inheres_in some <health care facility>
     realized_in some <health care encounter>
        and (has_participant
        some <health care facility>)
```

OUTPUT LOWER-LEVEL DEFINITION TEMPLATES

<architectural structure> function

A function inhering in a <architectural structure> that is realized by the <architectural structure> at which <health care encounter>.

```
<architectural structure> function
   subClassOf function
     inheres_in some <architectural structure>
     realized_in some <health care encounter>
       and (has_participant
       some <architectural structure>)
```



<emergency department> function

A function inhering in a <emergency department facility> that is realized by the <emergency department facility> at which <urgent healthcare is provided to a patient population>.

```
emergency department function
   subClassOf function
     inheres_in some <emergency department
   facility>
     realized_in some <health care encounter>
       and (has_participant
       some <emergency department facility>)
```

CONCLUSION

SUMMARY

Analyze	Identify	Create	Describe	Refine	Output
Analyze definition structure of existing definitions (genus & differentiae)	Identify relevant ontology class	Create corresponding class template using class specifications (features)	Describe semantic structure using class template	Refine class template with observed features	Create output templates for textual and logical definitions & specialize

USES

- Ontology template & ODP development (e.g., ENVO templates)
- Semi-automatic generation of (partial) definitions & axioms
- Definition checking (textual & logical)
- Quality control of ontologies

ADVANTAGES

- Works for textual and logical definitions
- Creates recursively specifiable templates
- Systematizes & accelerates definition creation
- Increases consistency of definitions & ontologies

THANK YOU!

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