

# UBIQUITOUS LANGUAGE

## FROM BEGINNER TO EXPERT IN 30 MINUTES

BJÖRN GENFORS & BJÖRN BESKOW

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# AGENDA

- Introduction
  - Ubiquitous language - what and why?
- Part 1: Theory
  - Today's terminology
  - The terminology of terminology
  - Ontologies: what, why & how
- Part 2: Ubiquitous language in Domain Driven Design (DDD)
  - Establishing a common language
  - Refining the language into a Domain Model
  - Bounded Contexts and Context Maps



# UBIQUITOUS LANGUAGE



# UBIQUITOUS LANGUAGE - WHAT AND WHY

- What is it?
  - Part of Domain Driven Design (DDD)
  - Pervasive language
- Why?
  - Language is the basics for common understanding
  - Nothing lost in translation



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# TODAY'S TERMINOLOGY



## | TODAY'S TERMINOLOGY

- The content
- The container
- The art of putting content in the container

Taxonomy  
Lexicon

Terminology

Code system

Controlled vocabulary

Dictionary  
Classification

Thesaurus  
Enumerated type  
Nomenclature

Glossary

Ontology

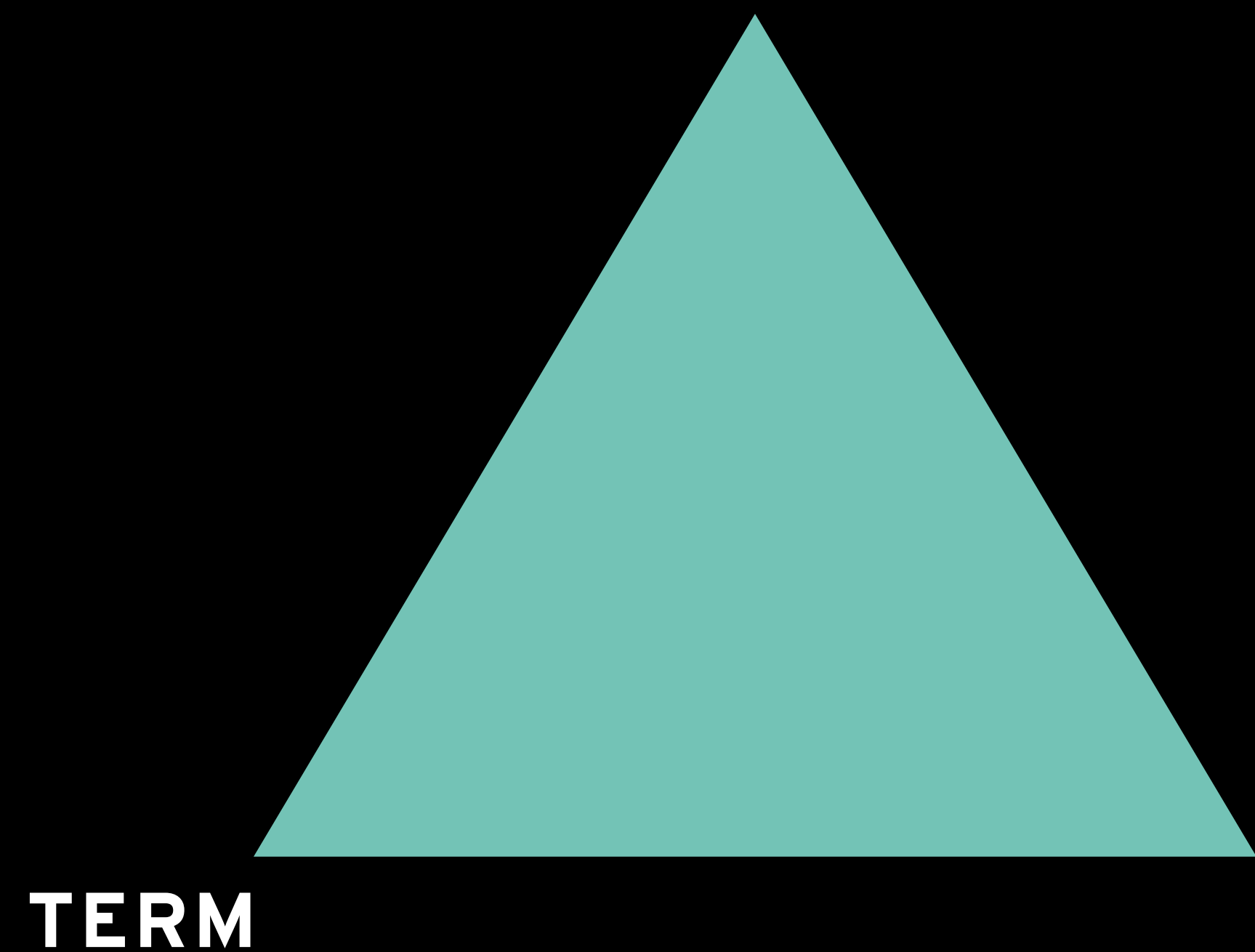
## | TODAY'S TERMINOLOGY

- The content: controlled vocabulary
- The container (+ content): ontology
- The art of putting content in the container: terminology

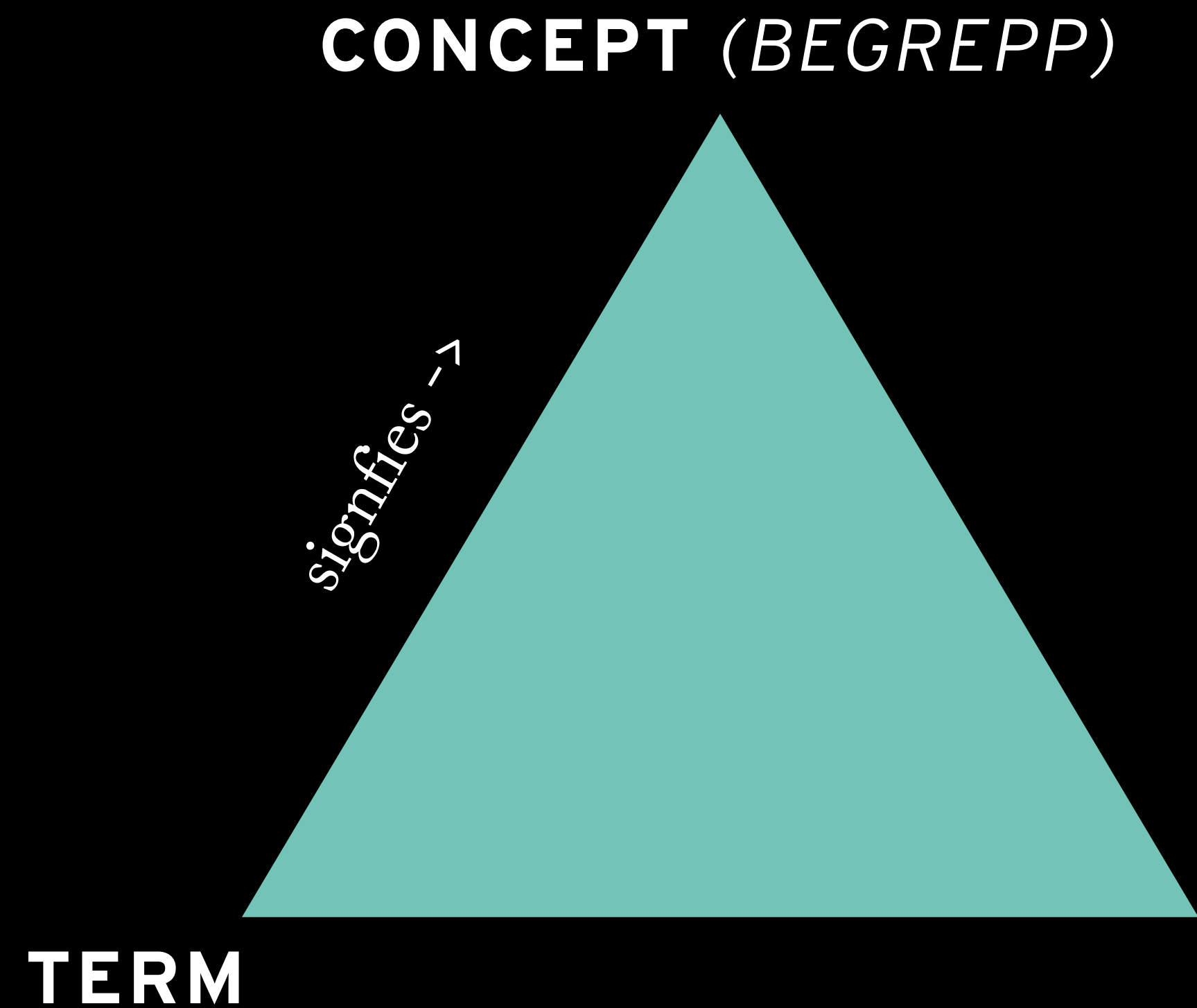


# THE TERMINOLOGY OF TERMINOLOGY

# THE TERMINOLOGY OF TERMINOLOGY - THE SEMANTIC TRIANGLE

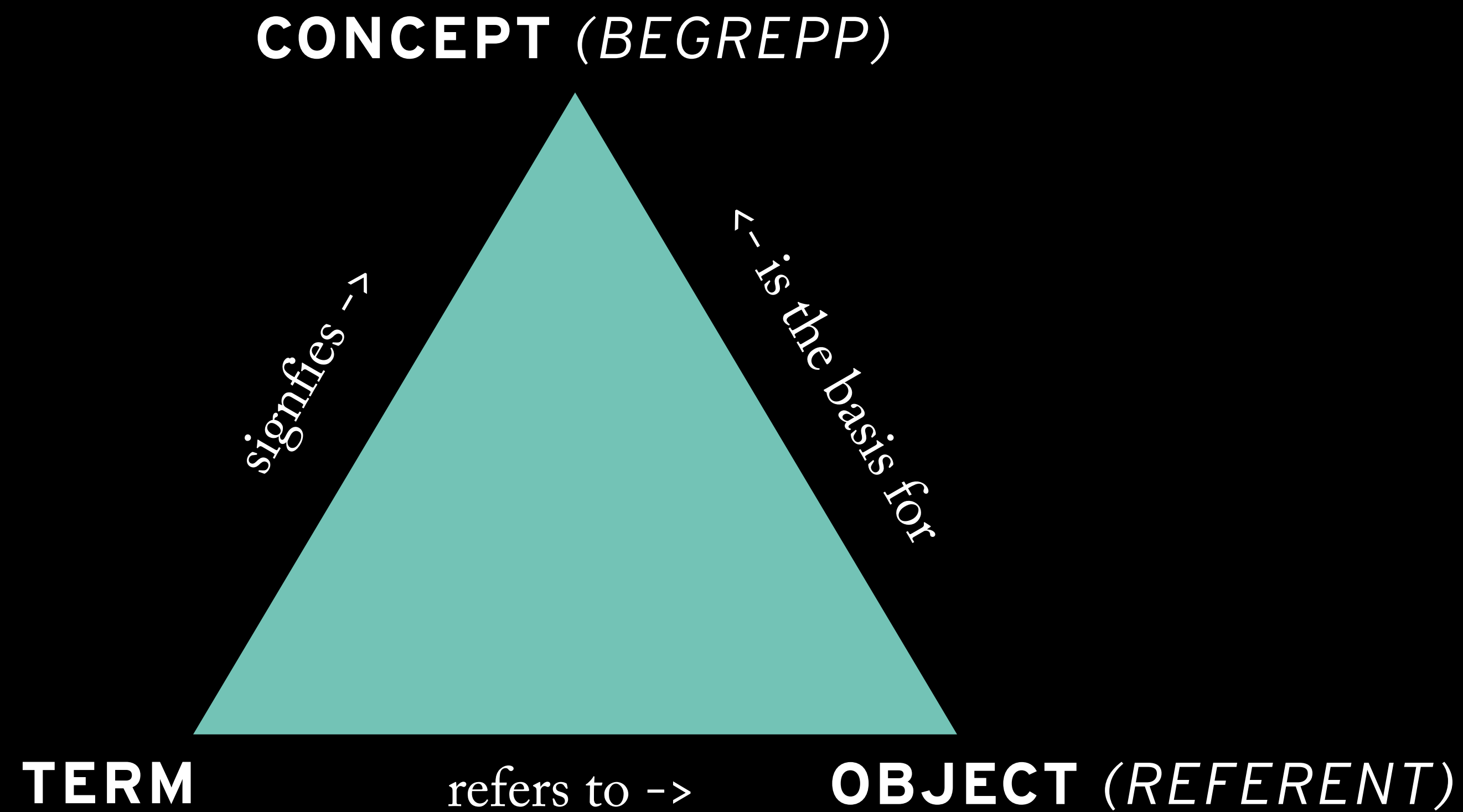


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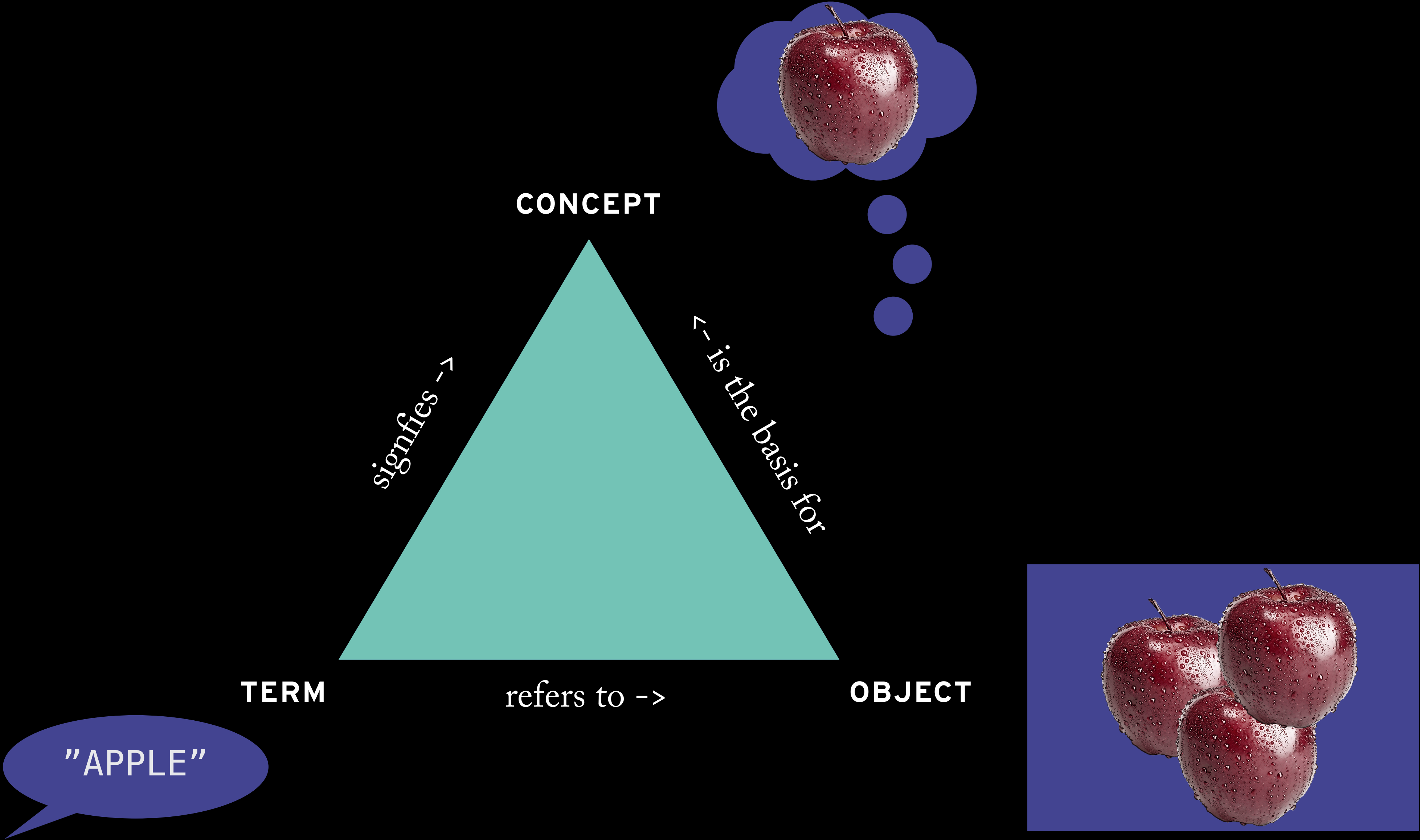




# THE TERMINOLOGY OF TERMINOLOGY - THE SEMANTIC TRIANGLE



# THE SEMANTIC TRIANGLE - AN EXAMPLE



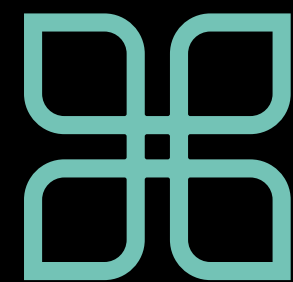
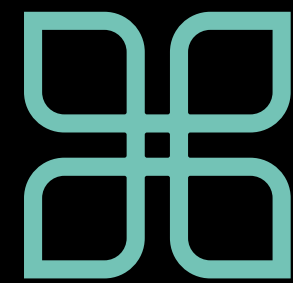
## THE ART OF TERMINOLOGY - HOW

1. Focus on the concept. "What is this thing we're talking about"
2. Figure out a good term. "What do we call this thing we're talking about"



*What's in a name? That which we call a rose  
would by any other name smell as sweet.*

- Juliet / William Shakespeare



## THE ART OF TERMINOLOGY - WHY

- Resolves language issues with
  - Synonymy
    - » intelligent/smart
  - Homonymy
    - » Bar
    - » Ring
  - Polysemy (non-accidental homonymy)
    - » Stomach
- (The opposite of NLP)

# DESIRED PROPERTIES OF ONTOLOGIES

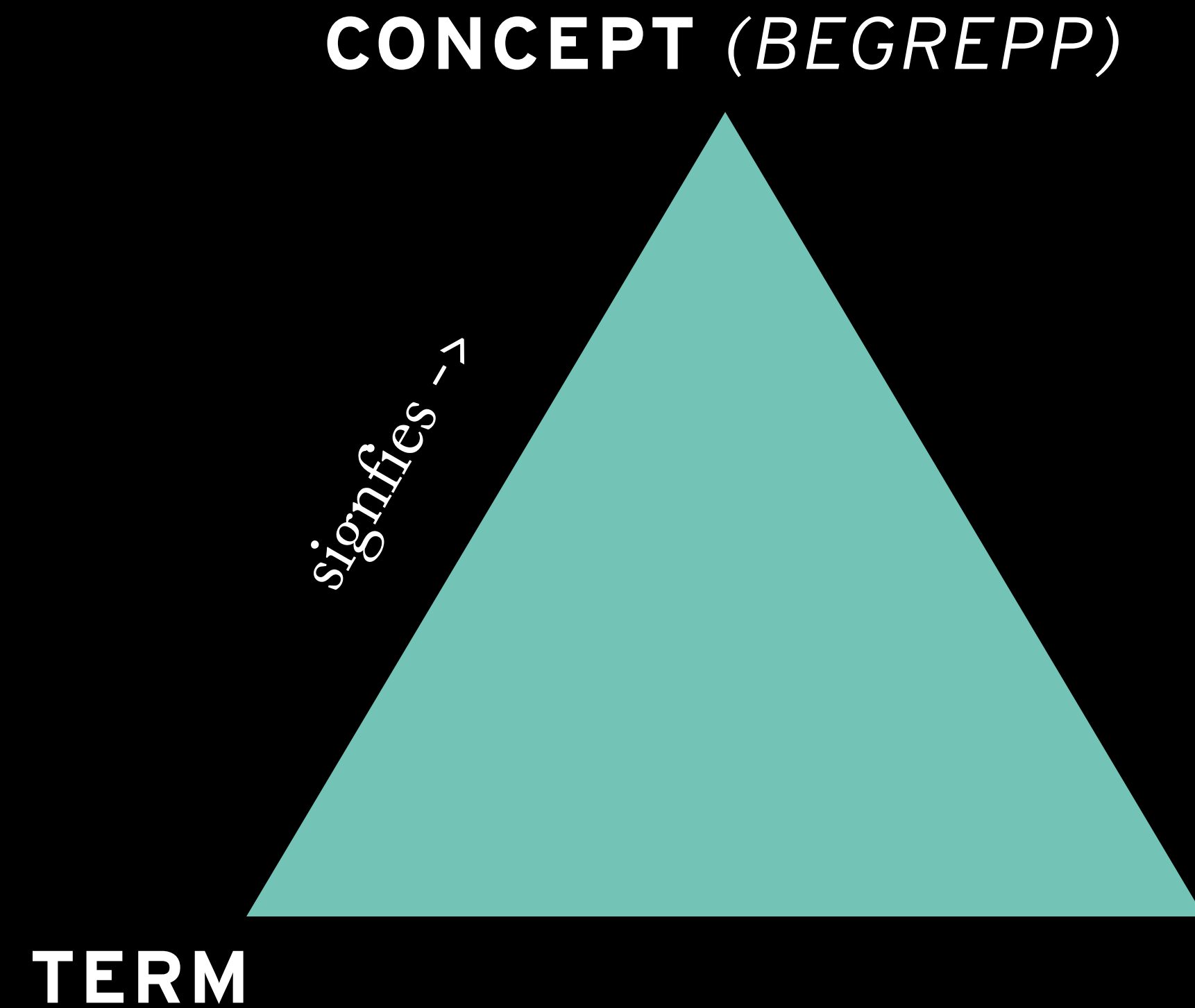


# ONTOLOGIES, WHAT AND WHY?

- In philosophy of science: a representation of reality
- Formalism describing knowledge
  - Enables machine processable semantics
- Examples:
  - SNOMED CT
  - The semantic web

# CONCEPT ORIENTATION

- What is concept orientation?
  - Separate concepts from terms
  - Focus on the concept, not the term



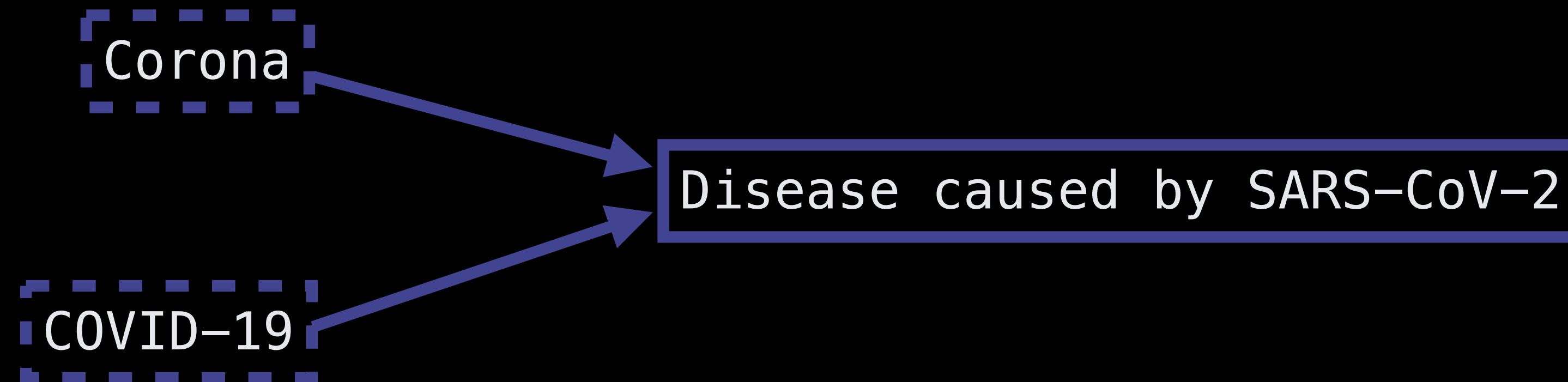
## CONCEPT ORIENTATION, CONTINUED

- Why should you do it?
  - Goes back to the basics of terminology
    - » Synonymy
    - » Homonymy
    - » Polysemy



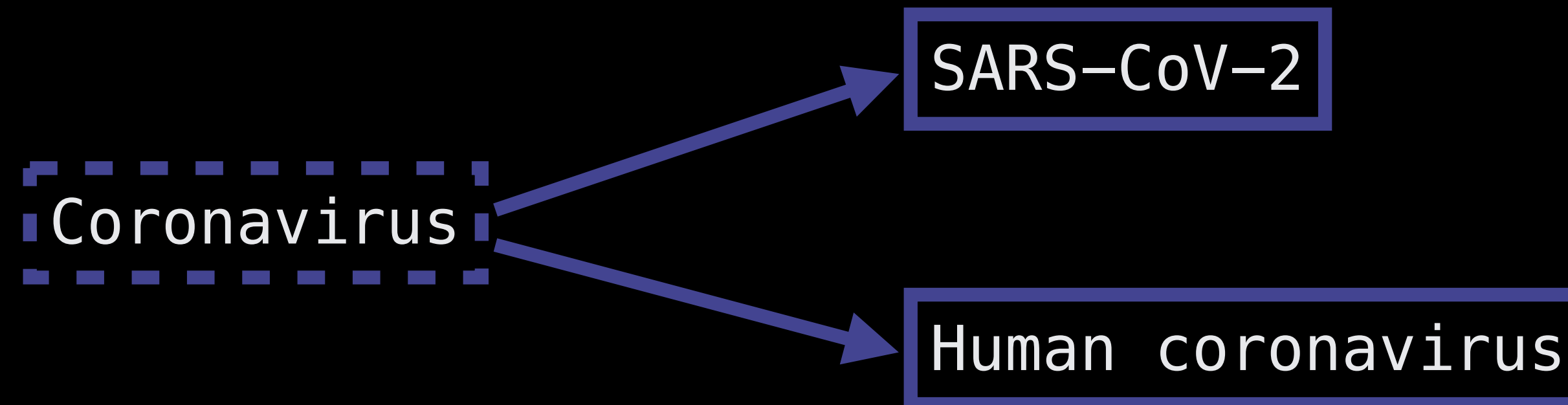
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## CONCEPT ORIENTATION, CONTINUED

- Why should you do it?
  - Goes back to the basics of terminology
    - » Synonymy
    - » Homonymy
    - » Polysemy



# NON-SEMANTIC IDS

- Examples of semantics in id:s
  - Birthdates
  - Gender identity
  - Serial number
  - Hierarchical position
  - Organizational ownership



Source: transportstyrelsen.se

- Avoidable problems are obvious at second thought



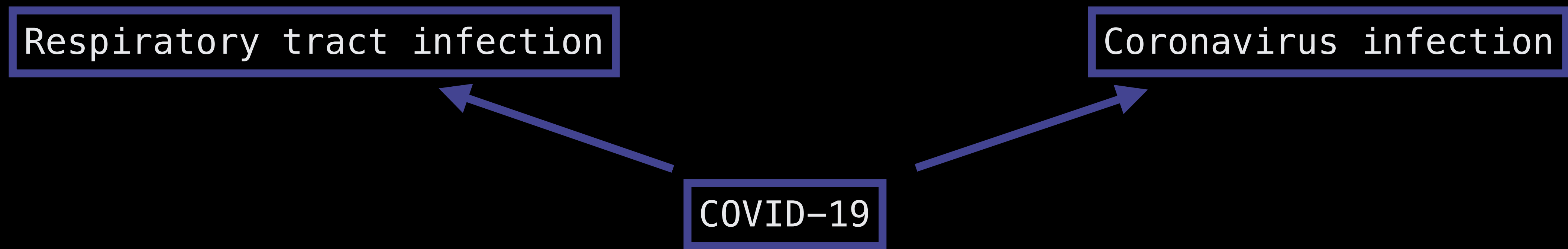
## CONCEPT PERMANENCE

- Semantic stability
  - You may **never**:
    - » change the meaning of a concept
  - You may:
    - » Change preferred term
    - » Make concepts redundant
- Avoids semantic drift
  - Ensures historic accuracy/comparability

## ■ POLYHIERARCHY

- Every concept may inherit from *one or more* other concepts
  - i.e. can have several *is a*-relationships
- Necessary if concepts are categorized in more than one dimension

# POLYHIERARCHY

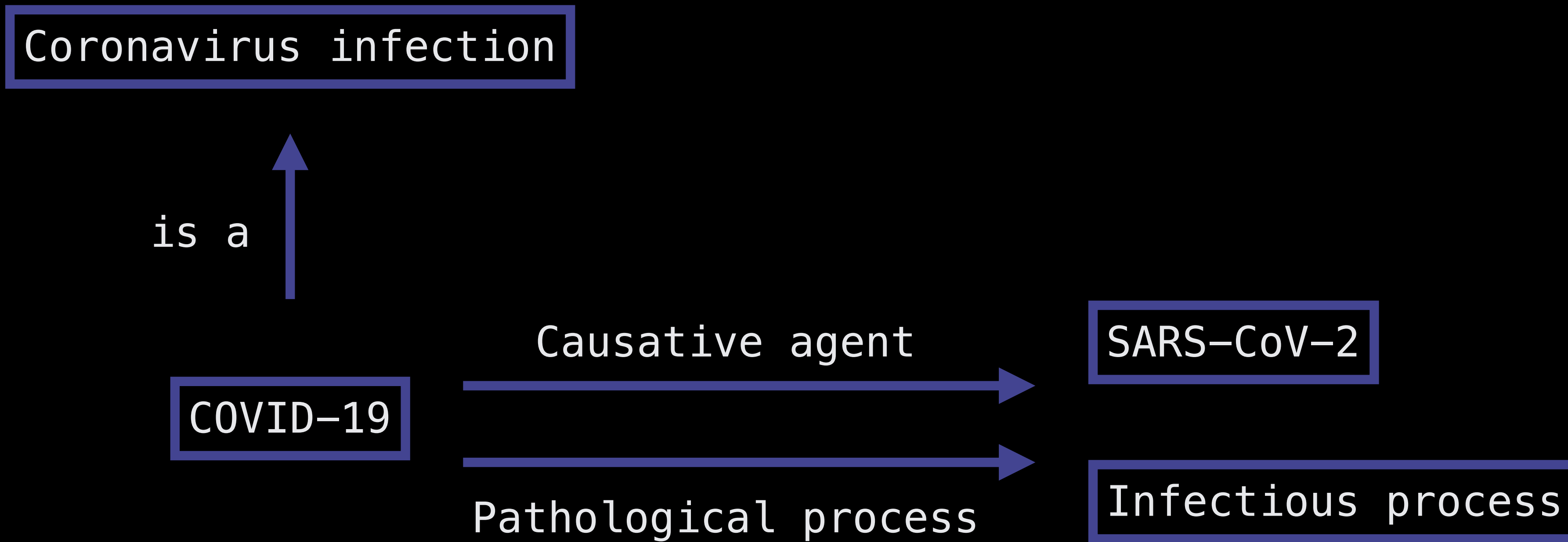


## FORMAL DEFINITIONS

- Define concepts by their relations to other concepts
- Enables machine processable semantics



# FORMAL DEFINITIONS, CONTINUED



## THE UBIQUITOUS LANGUAGE ...

- Domain == *problem space*
- Model == *solution space*
- Domain Model == *Distilled knowledge about the problem and solution space*



## | MULTIPLE LANGUAGES?

What if multiple human languages are spoken within the organization/team?

- Decide on one of the human languages as an *Interlingua*, with a formal dictionary to other languages if necessary



## | A FICTIVE EXAMPLE

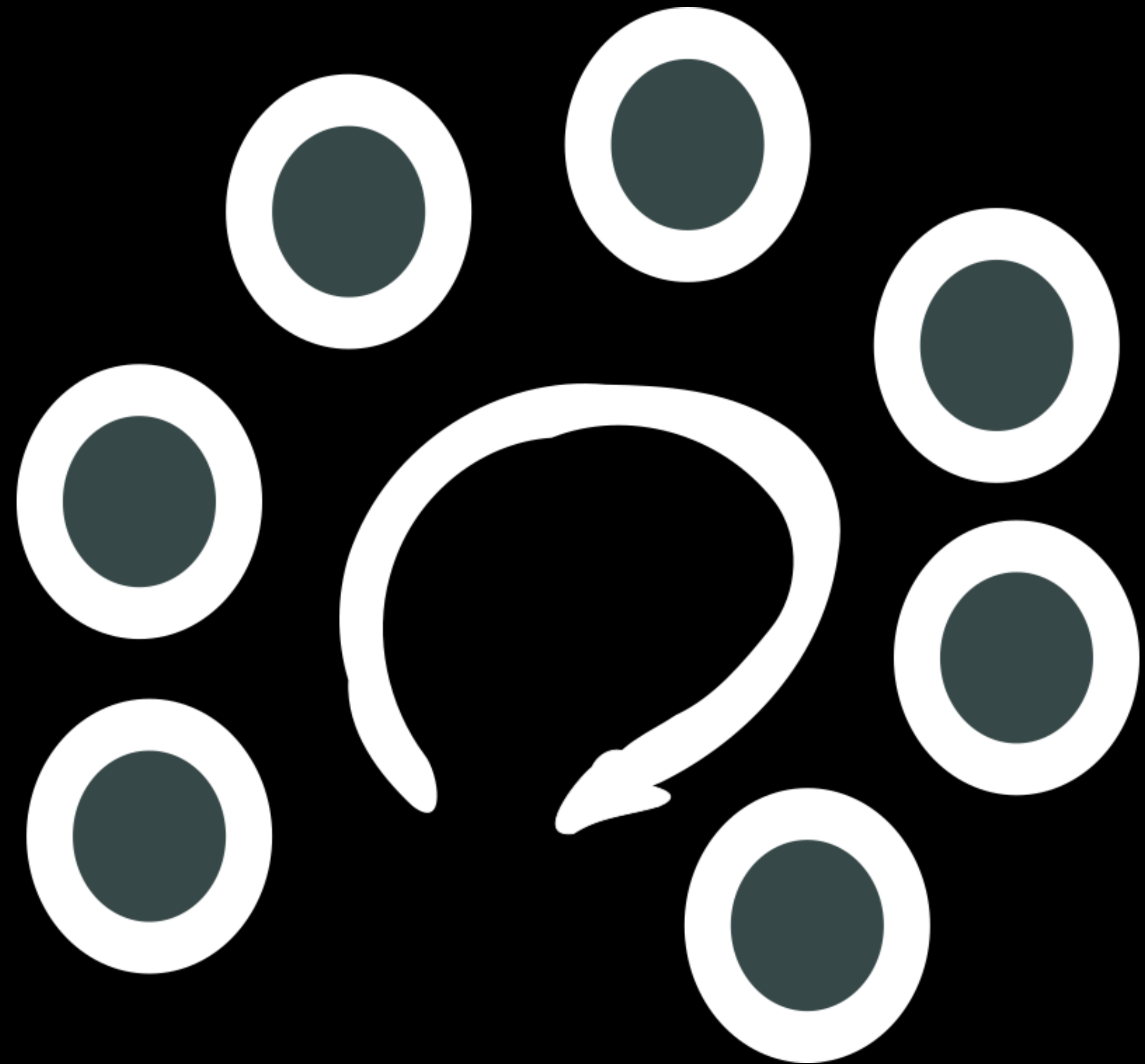
Ett vårdtillfälle på slutenvårdsavdelning startar när en patient efter initial bedömning skrivs in på avdelningen med en primär diagnos. Vårdtillfället avslutas när patienten skrivs ut, t.ex för fortsatt vård inom öppenvården eller i kommunal regi.





## REFINING THE LANGUAGE - DISTILLING THE DOMAIN MODEL

- Identify, analyse and define core concepts
  - List their defining characteristics
  - Relate them to other concepts
  - Agree on suitable names
- Organise the concepts into a coherent model
  - Refine the concepts towards a software solution

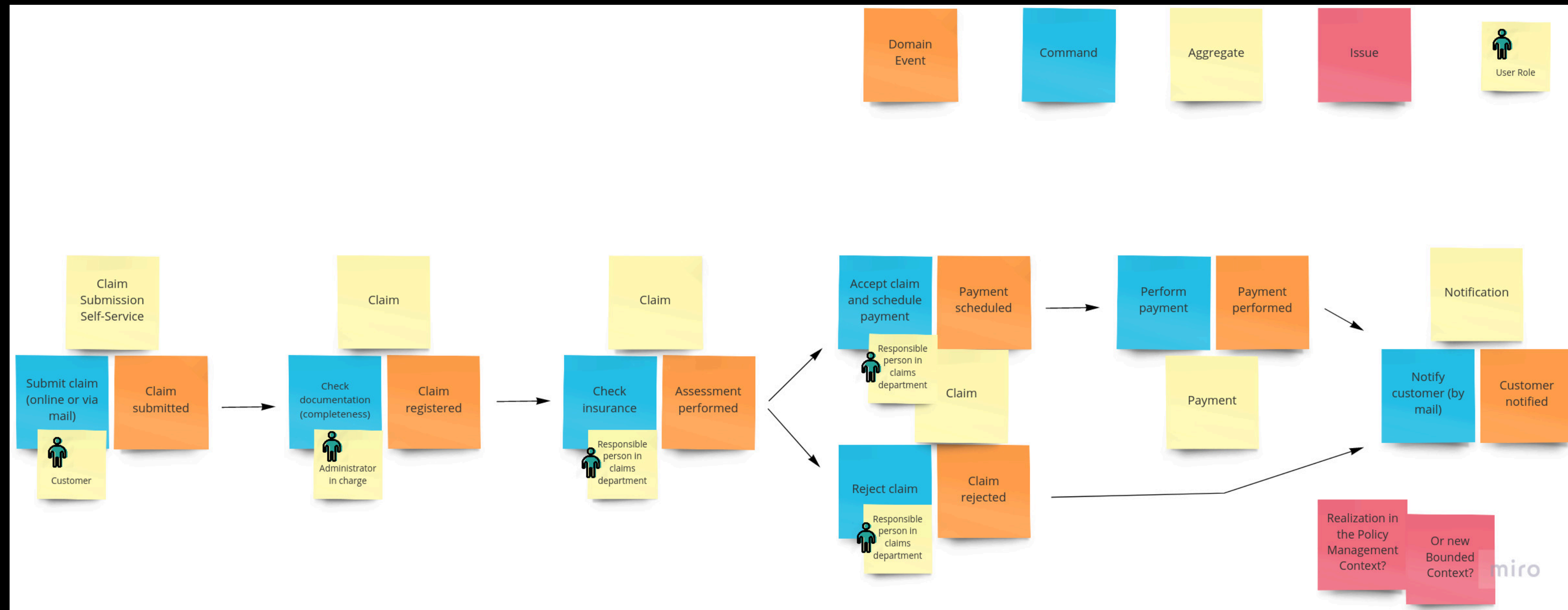


## CLASS, RESPONSIBILITY AND COLLABORATORS CARDS (CRC)

<i>Vårdtillfälle</i>	
<i>Responsibilities:</i>	<i>Collaborators:</i>
<i>- inskrivningsdatum</i>	<i>- patient</i>
<i>- utskrivningsdatum</i>	<i>- diagnos</i>
<i>- ...</i>	

<https://www.agilealliance.org/glossary/crc-cards/>

# EVENT STORMING

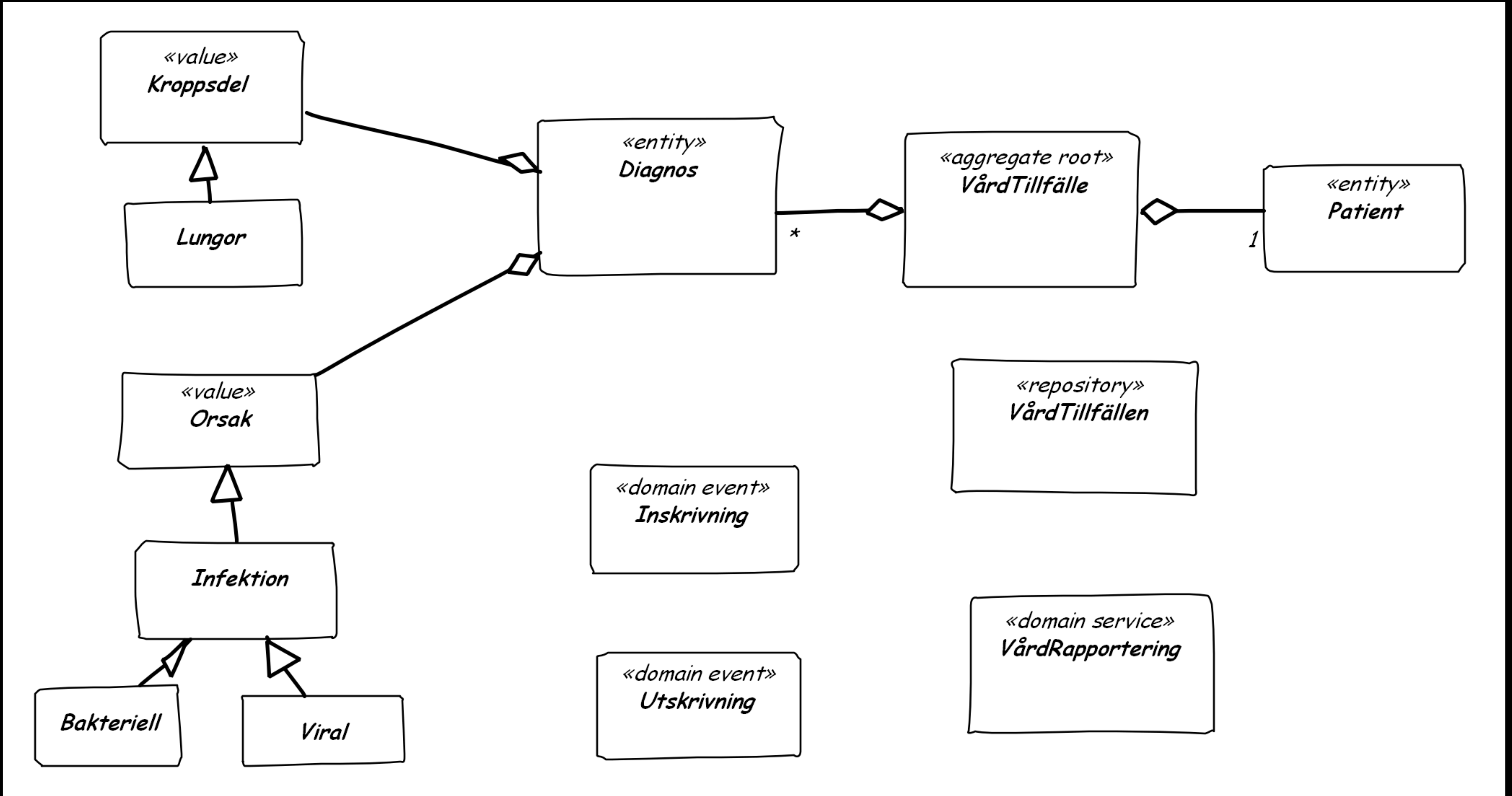


[https://leanpub.com/introducing\\_eventstorming](https://leanpub.com/introducing_eventstorming)

# PROJECT/SYSTEM GLOSSARY

Concept	Definition	Synonyms
Vårdtillfälle	Tidsperiod under vilken en patient ges vård på en sluten avdelning för en primär diagnos och eventuellt ytterligare sekundära diagnoser.	Vårdperiod, Sjukfall
Diagnos	Beskrivning av ett visst sjukdomstillstånd i termer av orsak och fysisk placering	
Patient	...	
Inskrivning	...	

# TOWARDS A DOMAIN MODEL





# SOFTWARE ARTEFACTS

```
databaseChangeLog:
- logicalFilePath: db.changelog-1.yml
- changeSet:
  id: vårdtillfälle
  author: bjobes
  changes:
    - createTable:
      tableName: vård_tillfälle
      columns:
        - column:
          name: id
          type: BIGINT
          constraints:
            nullable: false
            primaryKey: true
            primaryKeyName: vård_tillfälle_pkey
...

```

## SOFTWARE ARTEFACTS

```
@Entity
public class VårdTillfälle {

    @Id
    @GeneratedValue(strategy = GenerationType.IDENTITY)
    private Long vårdTillfälleId;

    @NotNull
    private LocalDate inskrivningsDatum;

    private LocalDate utskrivningDatum;

    ...

}
```

## SOFTWARE ARTEFACTS

```
@Service
public class VårdRapporteringImpl implements VårdRapportering {

    @Inject
    private VårdTillfälleRepository vårdTillfällen;

    @Override
    @Transactional
    public Inskrivning inskrivning(
        Patient patient,
        Diagnos diagnos,
        Avdelning avdelning) {
        ...
    }
    ...
}
```

## SOFTWARE ARTEFACTS

```
public class InskrivningEventConsumer {
```

```
    @KafkaListener(topics = "${kafka.topic.event.inskrivning}",  
        containerFactory = "listenerContainerFactory")
```

```
    public void receive(Inskrivning inskrivning) {  
        log.info("Received event {}", inskrivning);
```

```
        ...
```

```
    }
```

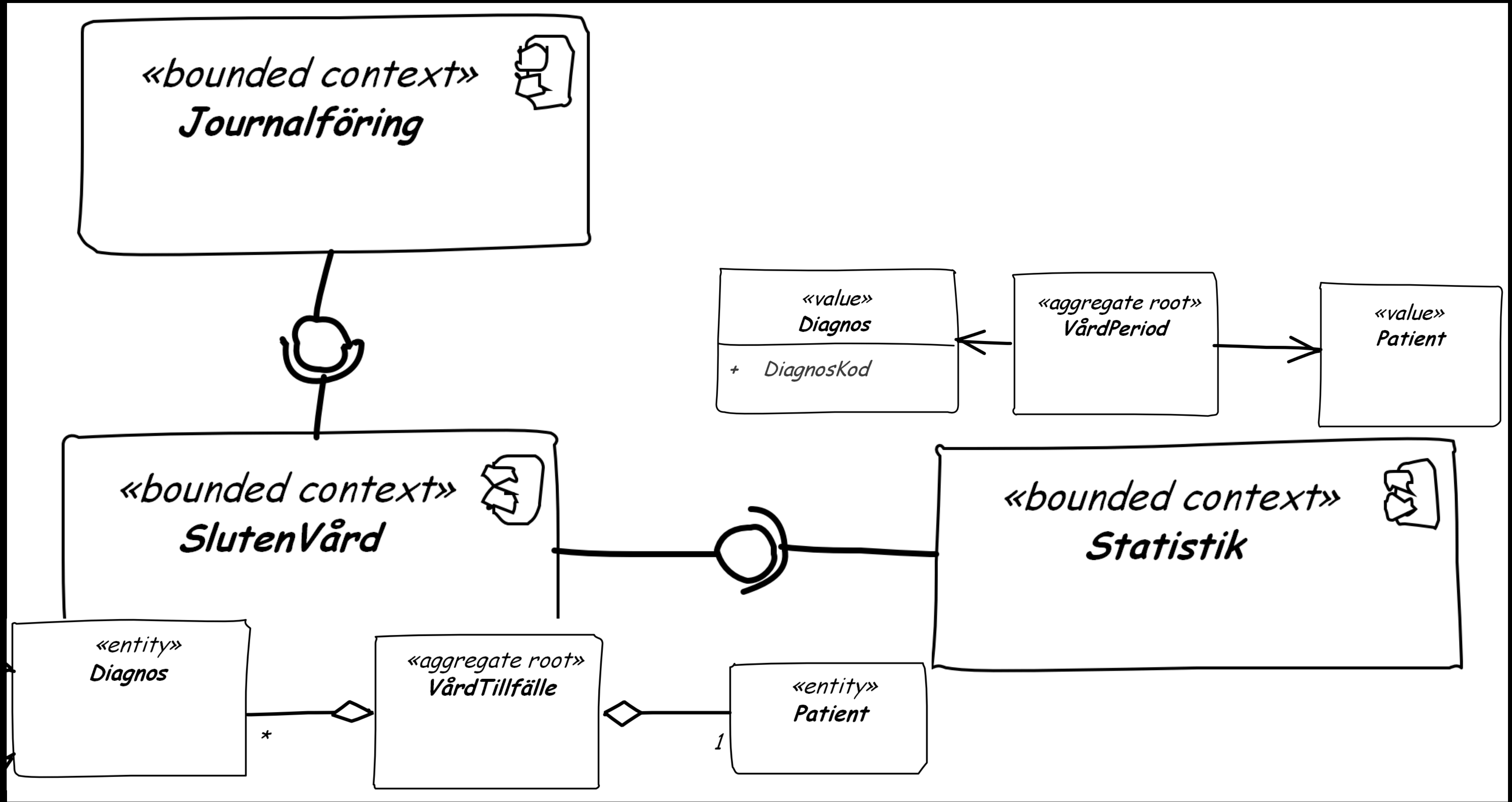
```
}
```

# SOFTWARE ARTEFACTS

```
{  
  "event": "inskrivning",  
  "patient": { ... },  
  "diagnos": {  
    "orsak": { ... },  
  },  
  ...  
}
```



# DEALING WITH CONFLICTS: BOUNDED CONTEXTS, CONTEXT MAPS AND APIS



## CONCLUSIONS

- Establishing and refining a Ubiquitous Language is a powerful way to deal with highly complex domains and systems
- The Ubiquitous Language is present in all aspects of and all manifestations of the system
- Efficient reasoning about the domain model is a critical success factor



# Time for questions!



**BJORN.GENFORS@CALLISTAENTERPRISE.SE**  
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