TNO innovation for life

DIGIPLACE: DISCUSSION ON ASSET LIFECYLE INFORMATION IN THE DIGITAL TWIN
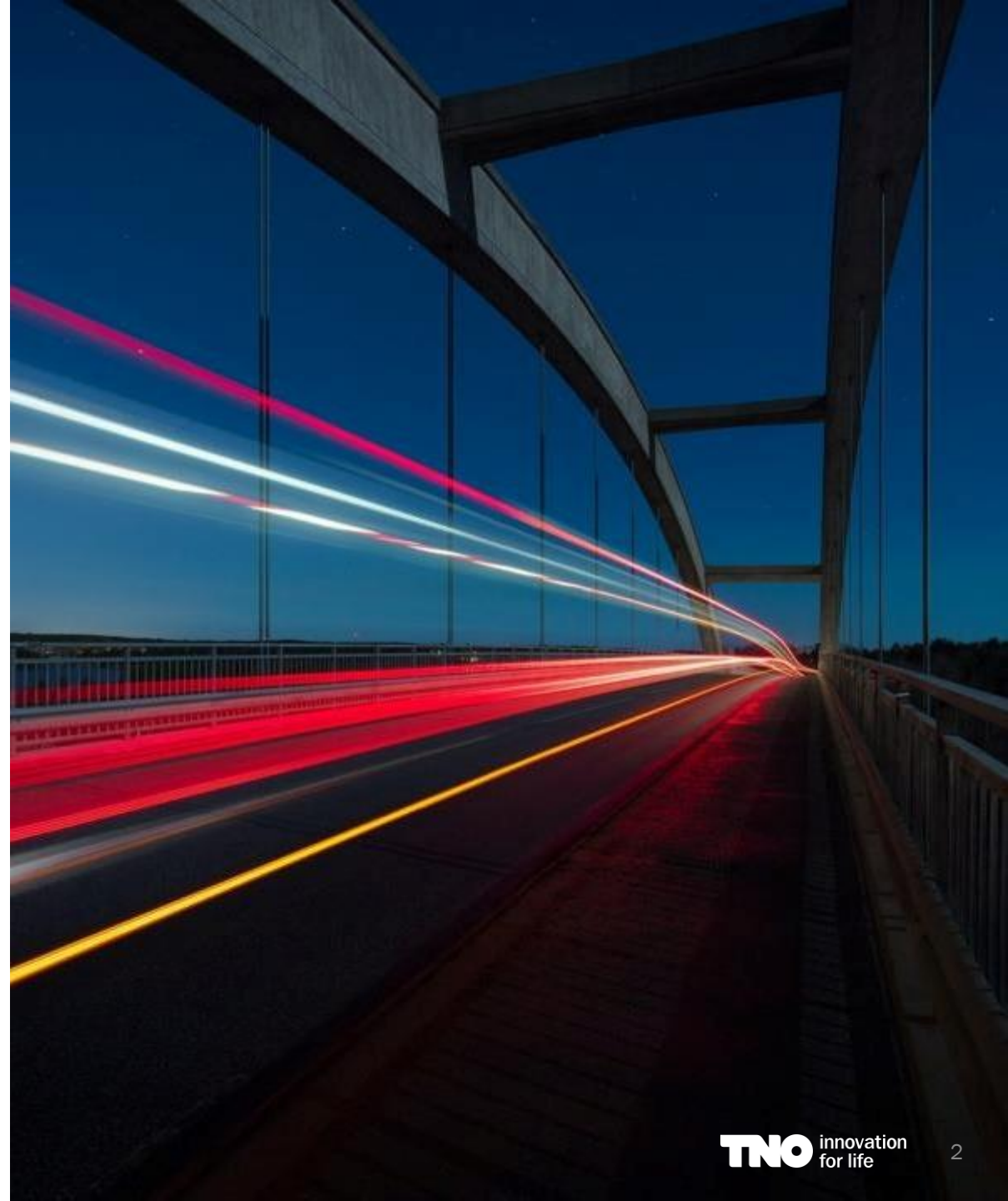BART LUITEN| 26 NOVEMBER 2020

ASSET LIFECYLE INFORMATION IN THE DIGITAL TWIN

WHY THIS APPROACH?

WHAT IS THE CONCEPT?

HOW DO WE REALISE THIS?

DIGIPLACE GUIDELINES

WHY THIS ALIM APPROACH?
ENSURE FAIR DATA, WHICH REMAINS AT THE SOURCE WHENEVER POSSIBLE

VISION: DIGITAL TWINS FOR THE BUILT ENVIRONMENT

NETWERK

OBJECT

COMPONENT

VEILIGHEID

KOSTEN

HINDER

DUURZAAM-HEID

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1. DATA / INFORMATION

› Static

› Dynamic

2. MODELS & LEARNING

› Physical models

› Machine learning

# 3. SIMULATE & DECIDE

› Predictions

› Scenarios

WHAT DO WE WANT TO ACHIEVE WITH ASSET LIFECYCLE INFORMATION MODELLING?

› Main objectives ALIM
  › Exchange data, share and link data over the lifecycle, between domains
  › Internally and with partners

› Therefore, ideally:
  › Data remains at the source
  › All data = FAIR
  › Conforming the view of the source owner
  › All data is uniformly accessible
  › All data is linkable

GIS

Monitoring & Inspection

Systems Engineering (SE)

BIM

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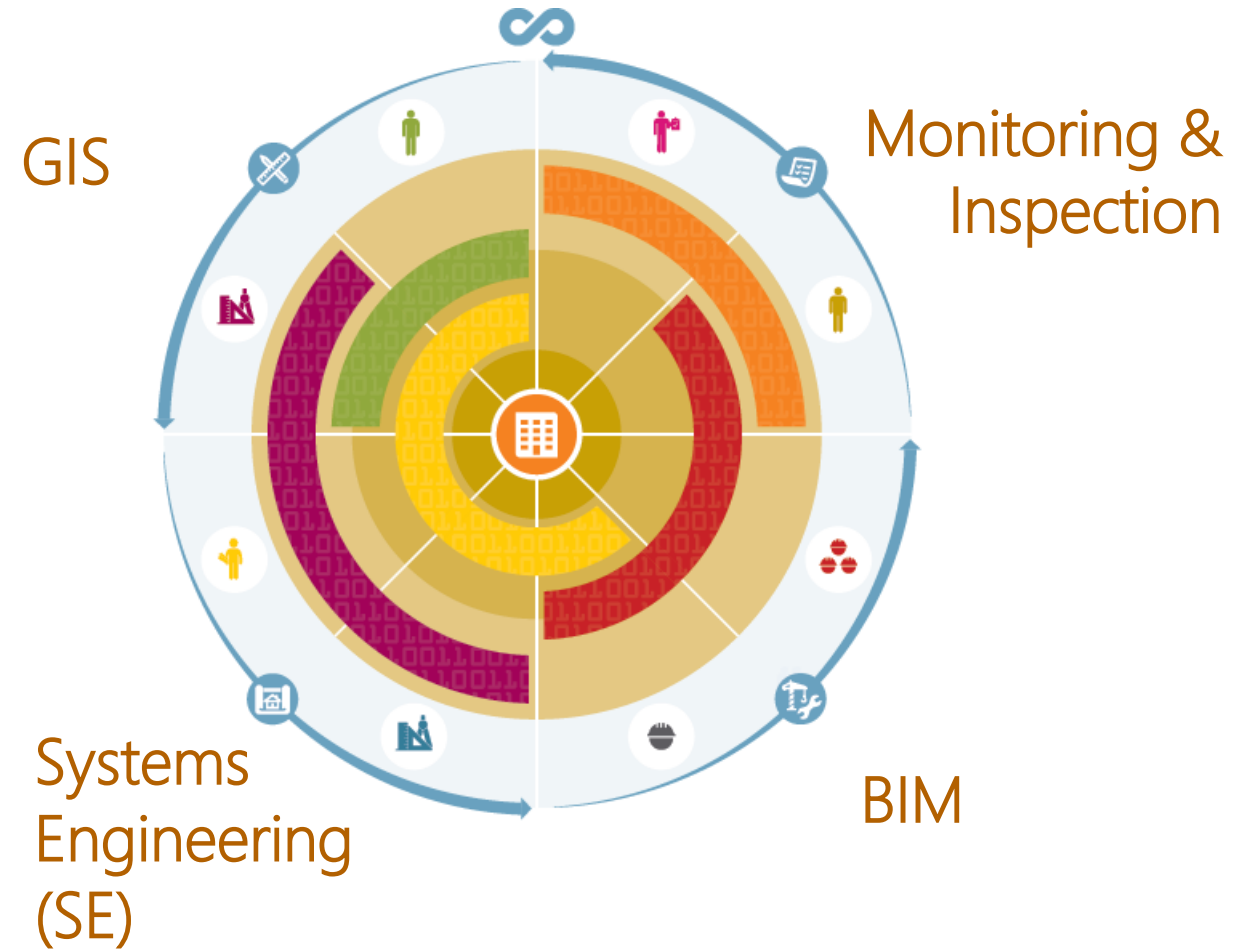
UNIFORMITY BY MODELLING & LINKING STANDARD
CEN SLM: SEMANTIC MODELLING AND LINKING (SML) STANDARD FOR DATA MODELLING IN THE BUILT ENVIRONMENT

› CEN SLM defines an integrated and unified approach for data aspects, specifically for assets in the built environment

› Why would we do that?

Today, data often is
- Unfindable
- Unaccessible
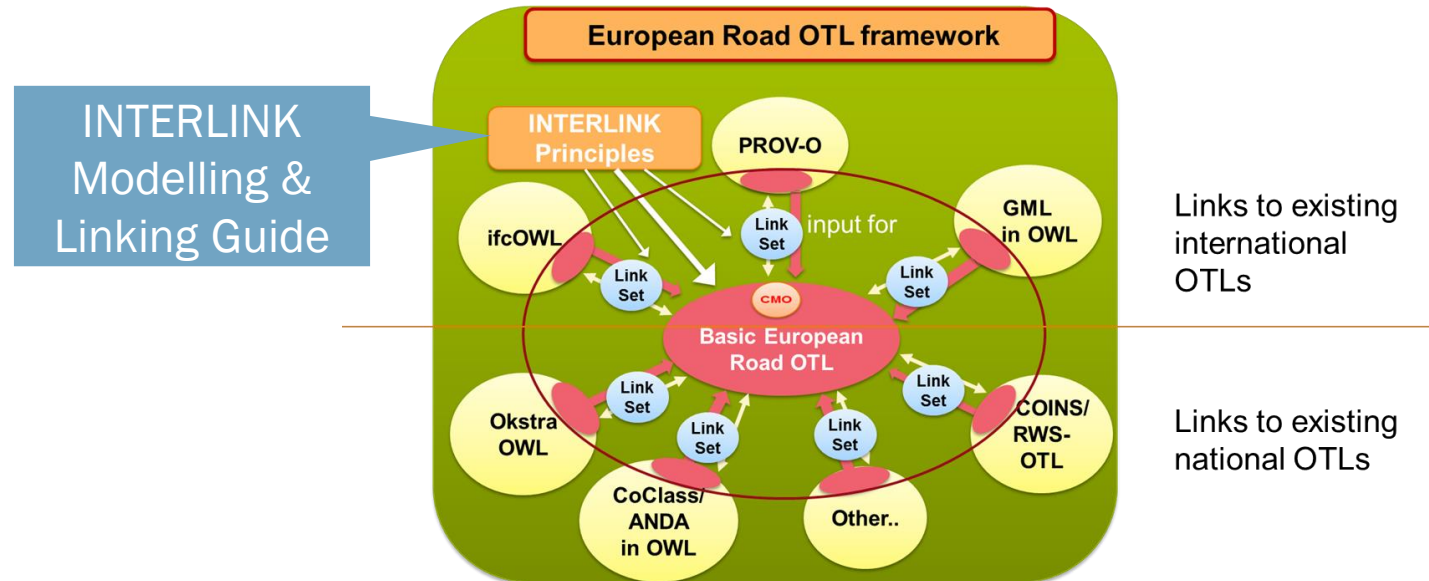- Not interoperable
- Not reusable

We would like data to be
- Findable
- Accessible
- Interoperable
- Reusable

› From UNFAIR   to   FAIR

› As a result, we are able to link FAIR data of multiple sources, using the power of Linked Data

FAIR (www.go-fair.org/fair-principles/)

A SHORT HISTORY

› This hybrid linked data approach was first developed in the EU FP7 project V-Con

  › RWS, Trafikverket, TNO, CSTB

› In the CEDR INTERLINK project this approach was further elaborated

INTERLINK Modelling & Linking Guide

European Road OTL framework

INTERLINK Principles

Links to existing international OTLs

Links to existing national OTLs

› In NL, the Interlink Modelling & Linking Guide evolved into the pre-standard NTA 8035

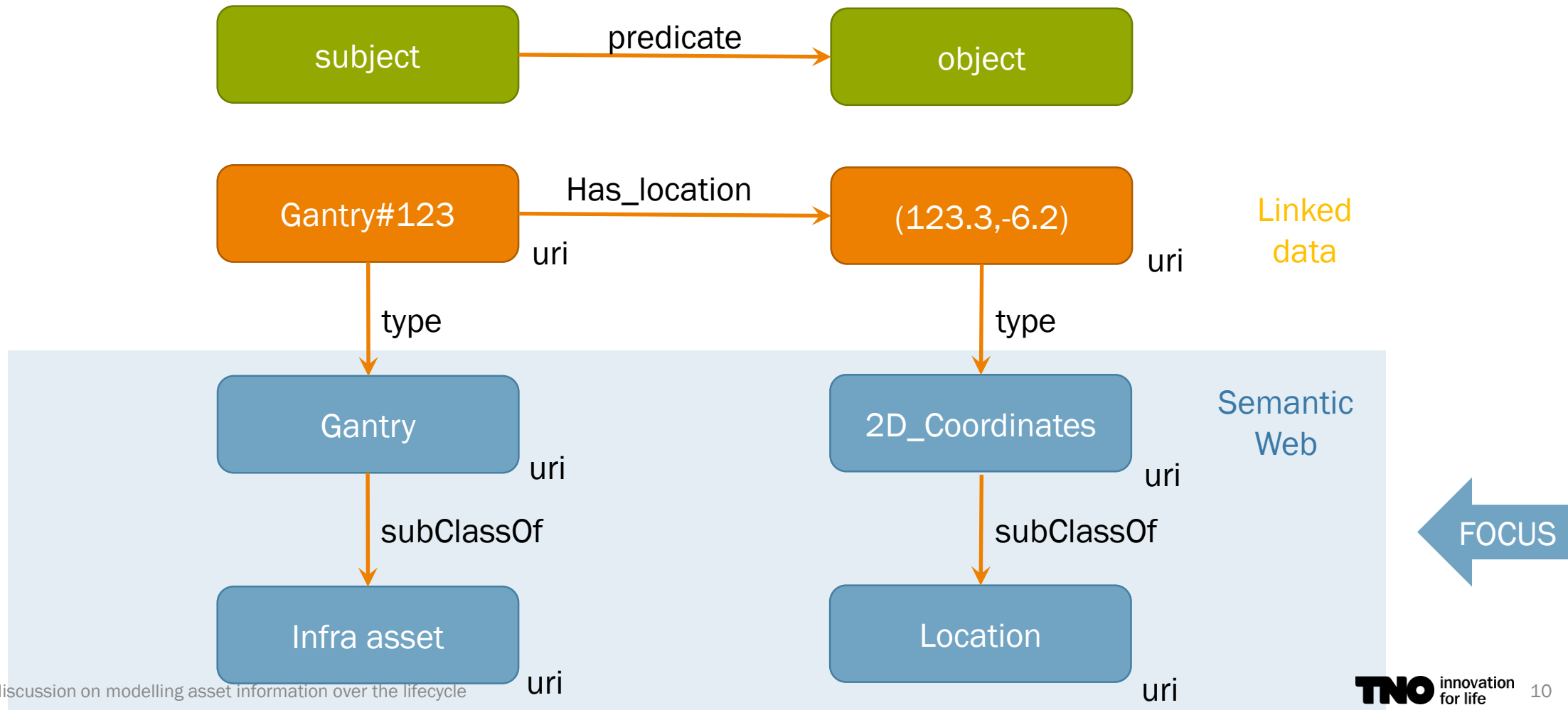› This year, the NTA8035 evolved in the CEN SLM, and is currently under review

CEDR-INTERLINK video on the European Road OTL

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WHAT IS THE CONCEPT BEHIND ALIM?
ALIM CONCEPT APPLIED TO INFORMATION MANAGEMENT OF ASSETS

INTERMEZZO: WHAT IS LINKED DATA?

CEN SLM DESCRIBES A UNIFORM APPROACH

› To make of each domain FAIR

› To describe data structures uniformly in ontologies (or object type libraries - OTLs)

› Using semantic linked data

› Enabling exchange and sharing of data from multiple and diverse sources

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USE A NETWORK OF ONTOLOGIES ...
DON'T TRY TO SOLVE EVERYTHING AT ONCE

> Big mama, mother-of-all-models doesn't exist
>> It will never be finished
>> Not extendable
>> Not maintainable
>> Hinders re-use of parts
>> Hinders adaptation to individual needs

> Instead, use a network of ontologies
>> Split up in manageable chunks
>> Preferably conforming to accepted standards
>> Keep it simple
>> Split into generic and specific parts
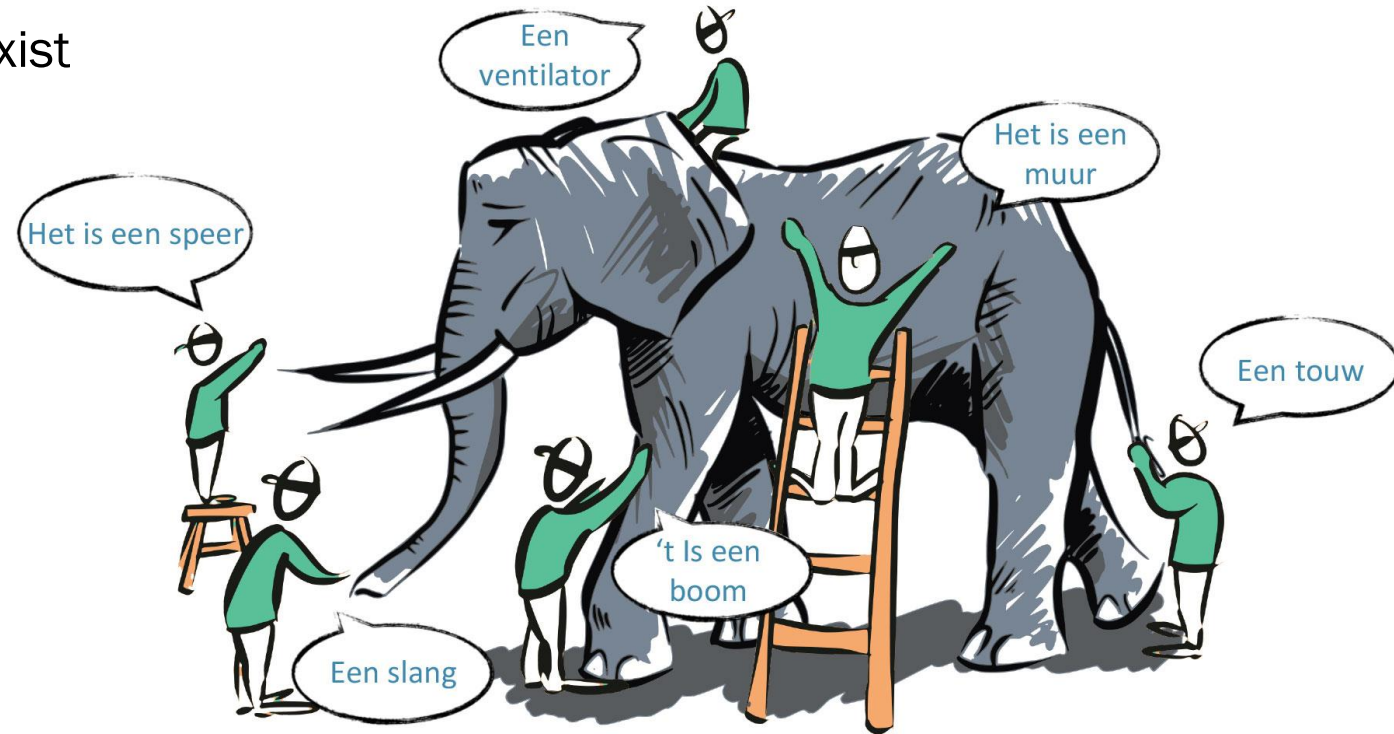
"eat an elephant one bite at a time"

... WITH A SHARED KERNEL ONTOLOGY
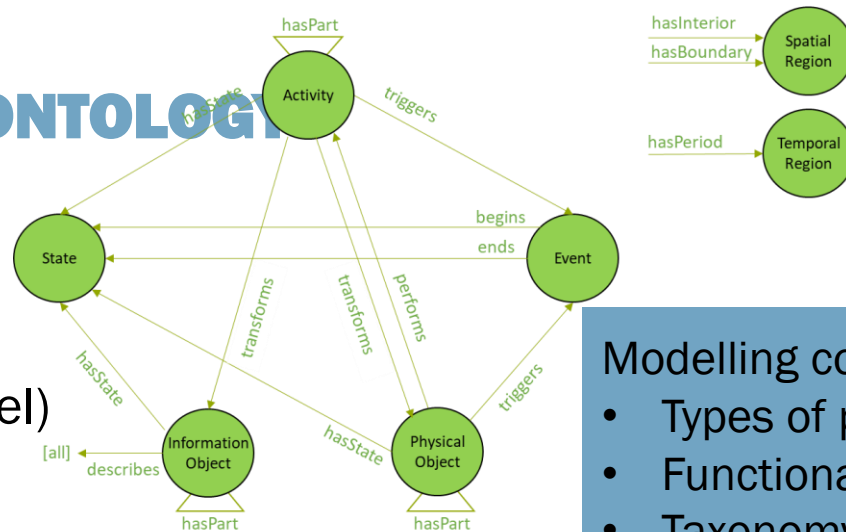
› Choose for a widely accepted lean&mean kernel ontology (or model)

  › Top level model of CEN SLM

  › Unified modelling constructs (to be harmonised, standardised)

  › Choose the most appropriate kernel ontology per asset type

Modelling constructs (u.d. in NL)
- Types of physical objects
- Functional vs. Technical
- Taxonomy and meronomy
- Implicit grouping without individuals
- Location, orientation, geometry, topology

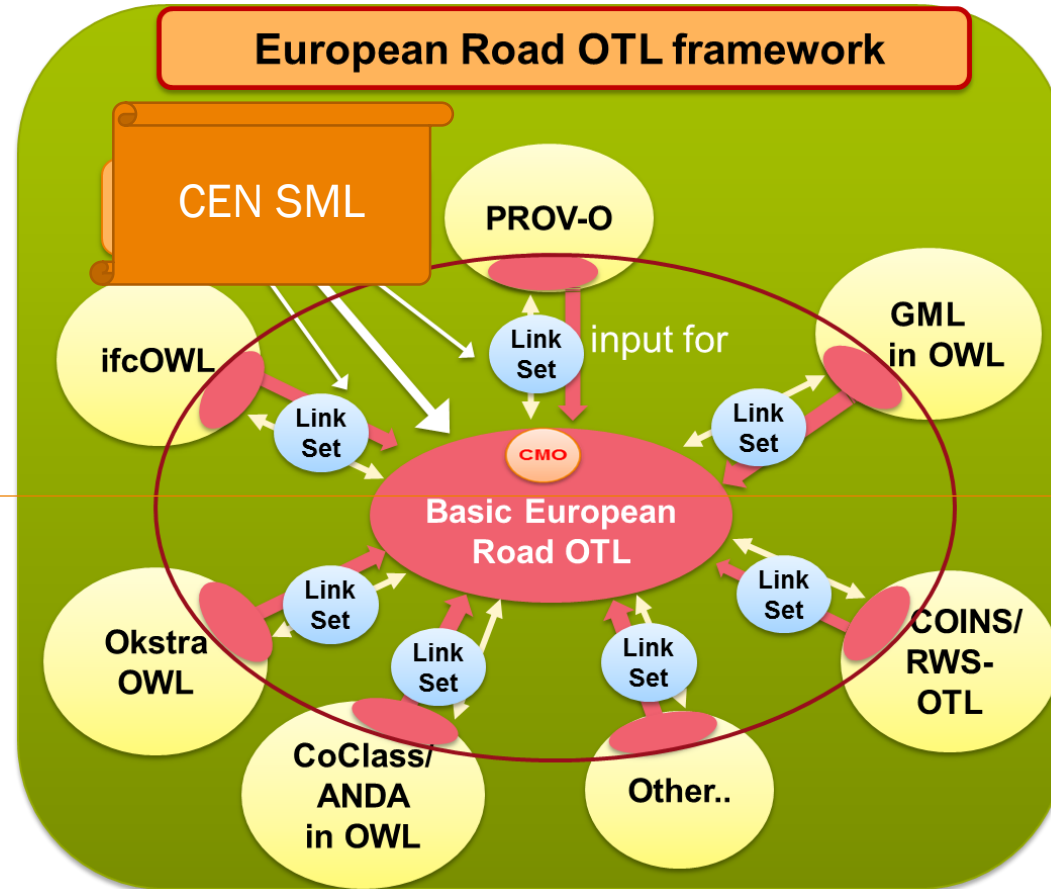Systems Engineering modelling patterns
- Lifecycle and states
- Planned vs. realised
- Interactions on interfaces

A kernel ontology should:
- Define terms in a Dictionary
- Define object types in a specialisation hierarchy in a Taxonomy
- Define typical decomposition in a Meronomy

USING A NETWORK OF ONTOLOGIES (OR OTLS)

European Road OTL framework

CEN SML

PROV-O

ifcOWL

Link Set input for

GML in OWL

Link Set

CMO

Basic European Road OTL

Okstra OWL

Link Set

Link Set

Link Set

Link Set

COINS/ RWS-OTL

CoClass/ ANDA in OWL

Other..

Links to existing international OTLs

Links to existing national OTLs
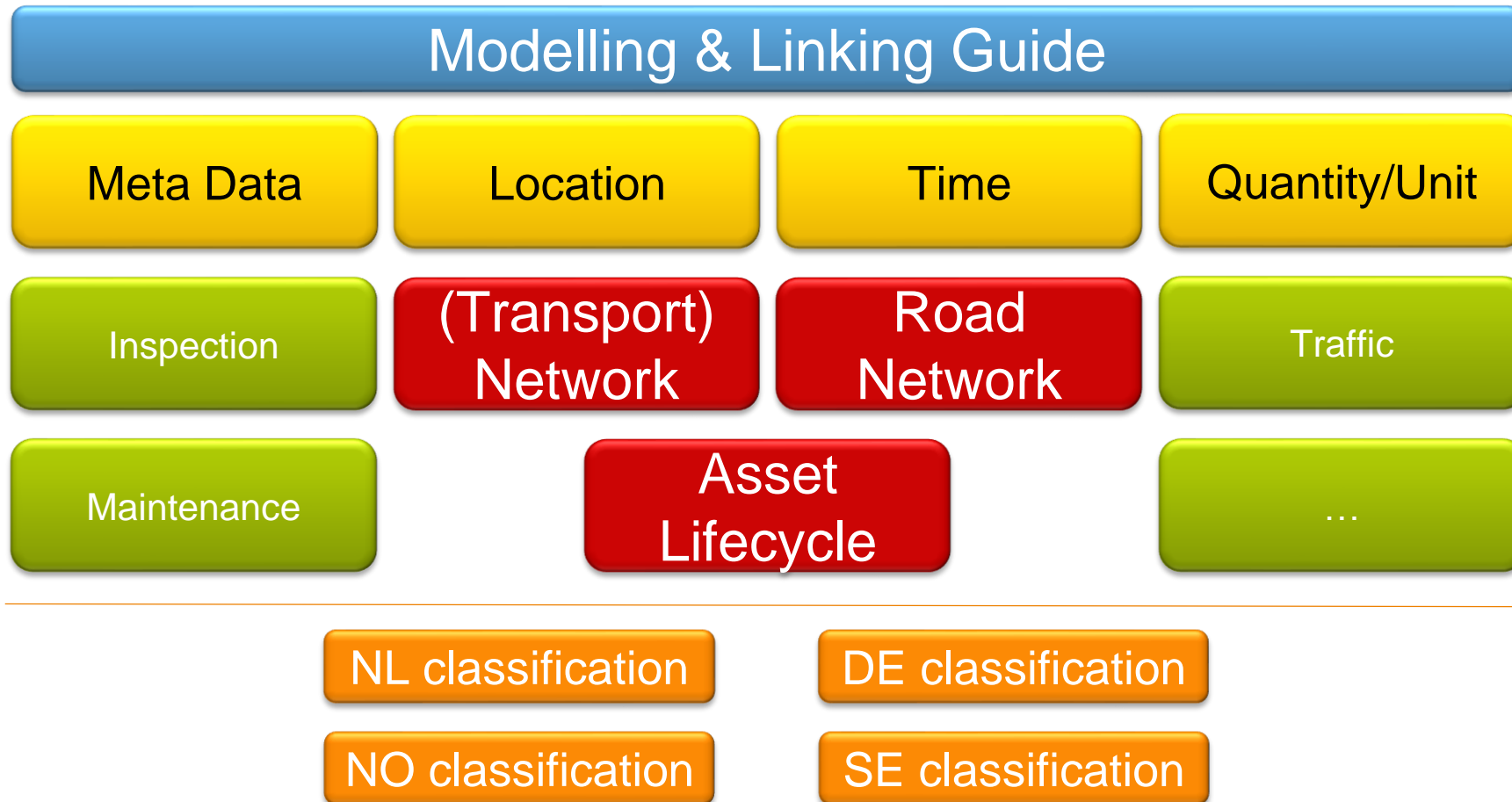
USE OF THE EUROTL

1. USE M&LG TO (RE)MODEL INTERNAL OTLS

2. RE-USE OTL(S) THAT ARE PART OF EUROTL

National

3. SHARE NATIONAL OTLS FOR REUSE BY OTHERS

European

4. DEFINE BEST PRACTICE

5. HARMONISE

6. STANDARDISE: PRESCRIBE THE USE OF A PART OF THE EUROTL

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GUIDELINES FOR THE DIGIPLACE ARCHITECTURE

GUIDELINES FOR ASSET LIFECYCLE INFORMATION MODELLING

› Data should be liberated and shared per domain
  › Make data FAIR
  › Use the open standard accepted, or even obliged, in the domain
  › Use W3C - linked data / semantic web to represent the ontologies and the specific asset data
  › Preferably following the CEN Semantic Modelling and Linking (SML) Standard
› The actual ICT landscape is hybrid and will be so for a long time
  › Documents tagged with meta data
  › Structured data
  › Structured semantic data, using the CEN SML; this is the linking pin
› Big-mama model, Mother-of-all-Models doesn't exist
  › Combine existing (open) standards in a network of ontologies, with a common taxonomy and/or meronomy as a core

SUGGESTIONS FOR STEPS IN THE ROADMAP

› Please, try this at home: get familiar with SW/LD and see the value of the CEN SLM standards

› Give feedback to the CEN SLM standardisation process this winter

› When agreed upon, use CEN SLM whenever possible (and add it to the DigiPLACE Guidelines)

› Urge standardisation bodies you are involved in to move to LD/SW, preferably conforming the CEN SLM

› Develop, validate, share, harmonise, standardise ontologies

› Agree upon the core ontologies for your domain

› Develop, validate, share tools & interfaces to existing software for working with LD/SW data

Bart Luiten, +31 6 5136 9616, bart.luiten@tno.nl