Alignment and Harmonisation: Mapping Ontologies for Narrative and Fiction

GOLEM workshop: Ontologies for Narrative and Fiction
3-4 Jul 2023   Luca Scotti (l.scotti@rug.nl)

Introduction

- **Theoretical framework**
- **Implementation details**
- **Wrapping up**

Formally Defining Ontology Mapping

	definitions (Kalfoglou, 2003)
Ontology	O = (S, A), where S stands for Signature and A for Axioms
Mapping	Ontological Signature Morphism
Total mapping	O1 = (S1 , A1) maps to O2 = (S2 , A2) iff there exists a morphism f : S1 → S2 of ontological signatures, such that, A2 |= f (A1)
Partial mapping	O1 = (S1 , A1) partially maps to O2 = (S2 , A2) iff there exists a sub-ontology O1' = (S1' , A1') (S1' ⊆ S1 and A1' ⊆ A1) such that there is a total mapping from O1' to O2

Mapping Typology

HARMONISATION - Total Mapping

source O1 = (S1 , A1) **harmonises** target O2 = (S2 , A2) iff there is a semantic equivalence of S1 and S2
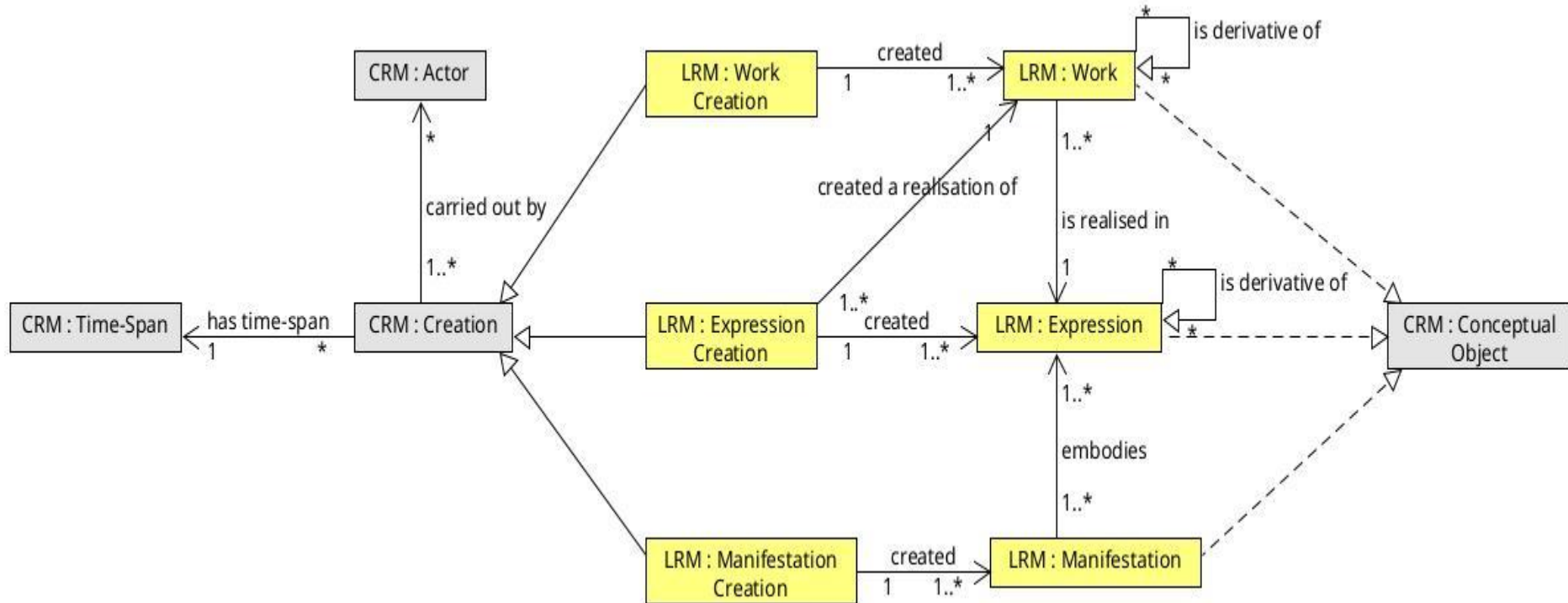
ALIGNMENT and **EXTENSION** - Partial Mapping

source O1 = (S1 , A1) **is aligned to** target O2 = (S2 , A2) iff there is a generalisation relation r : S1 $\subseteq$ S2

source O1 = (S1 , A1) **is extended by** target O2 = (S2 , A2) iff there is a specialisation relation r : S1 $\supseteq$ S2
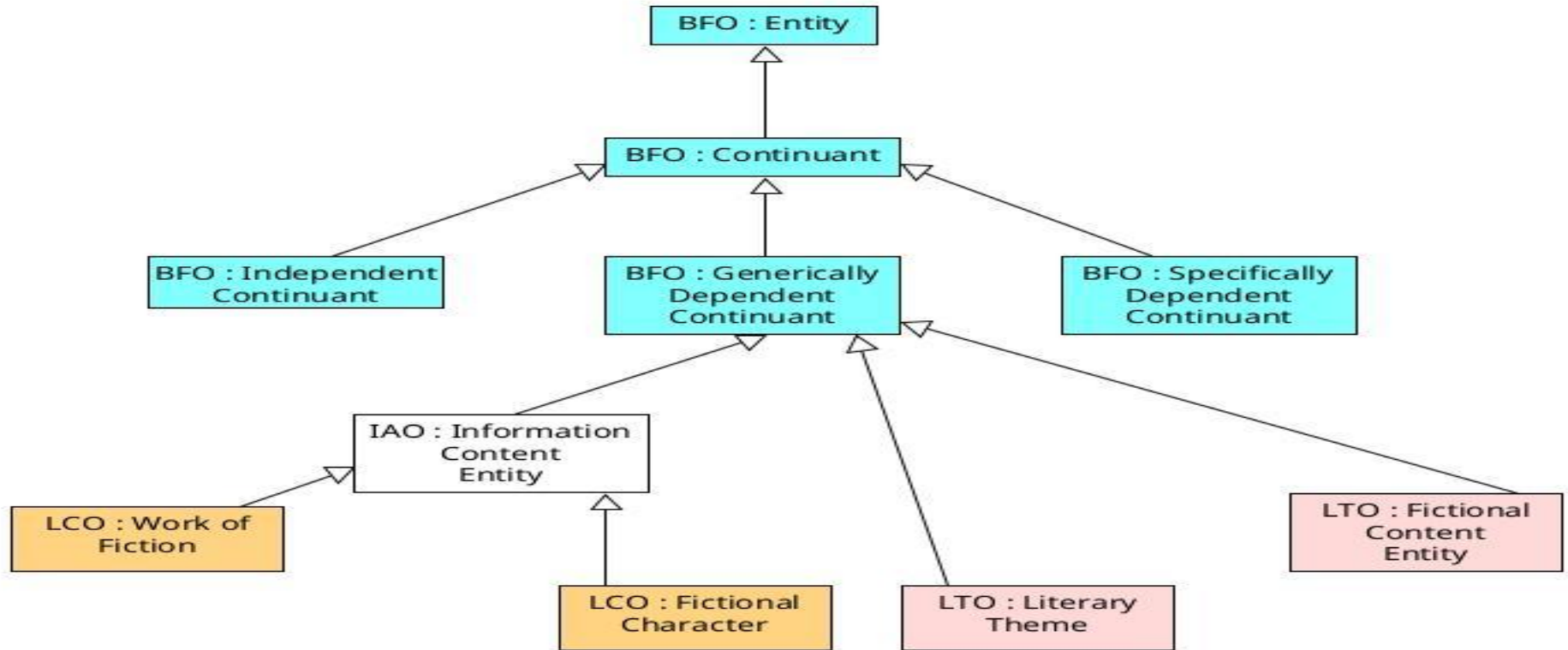
Starting point

Ontology set one including, as CIDOC-CRM extension, the LRMoo module: (WEMI) Work-Expression-Manifestation-Item

Ontology set two including, as extensions of BFO:
(LTO) LITERARY THEME ONTOLOGY
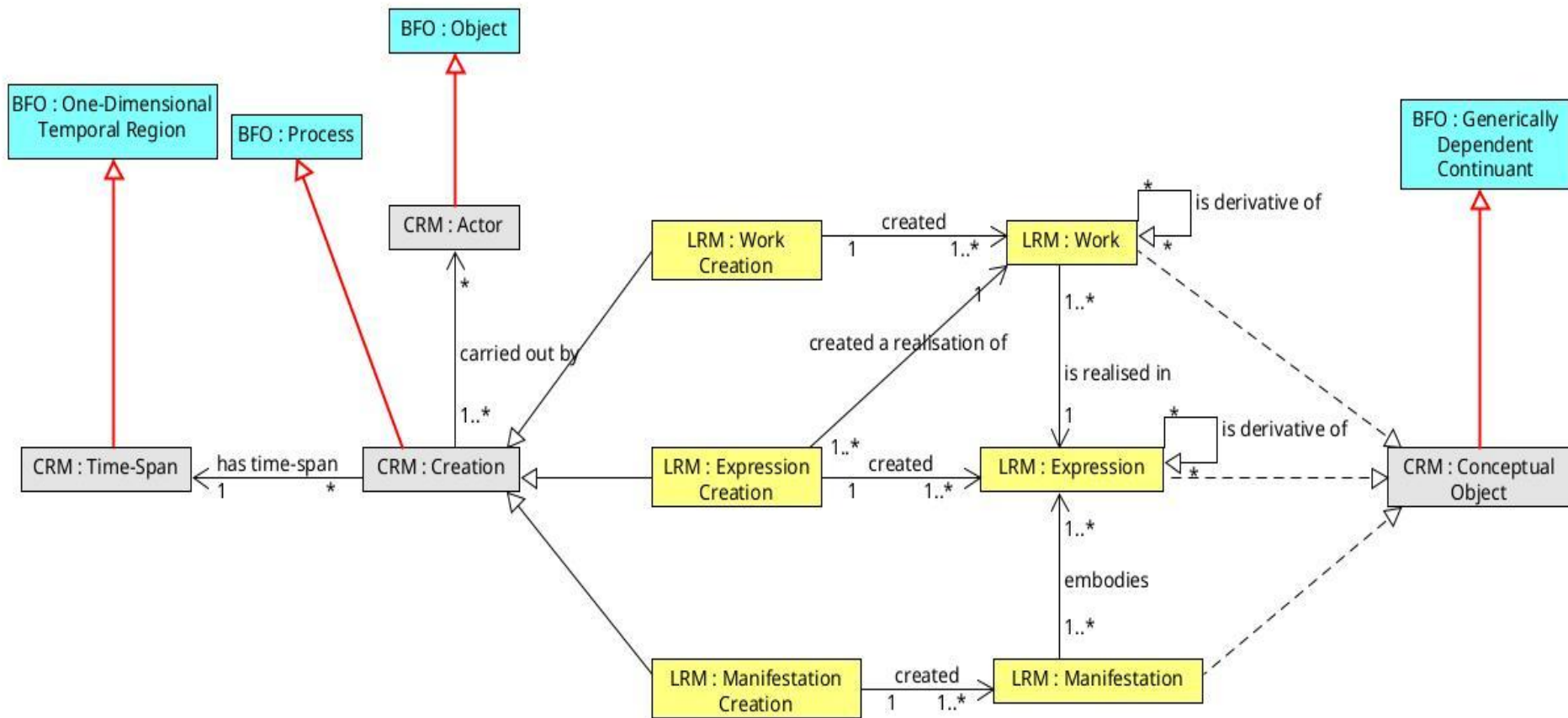## (LCO) LITERARY CHARACTER ONTOLOGY

Implementation detail 1

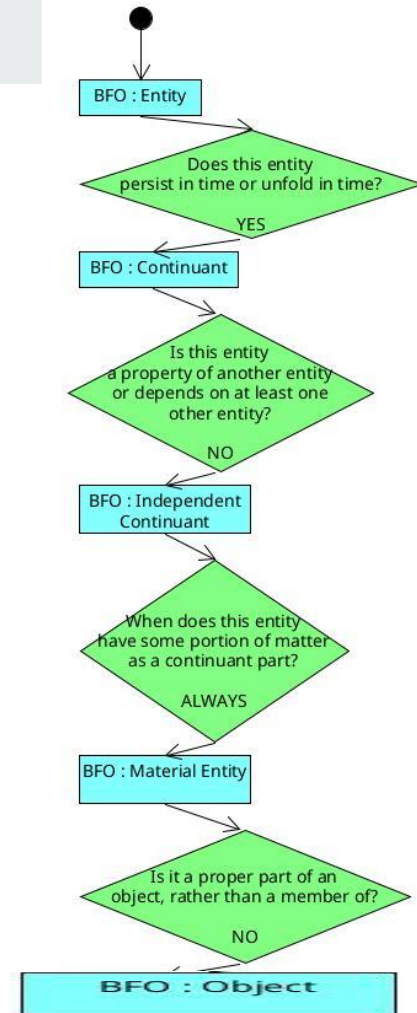# Sets mapping: BFO - CIDOC-CRM alignment

BFO - CIDOC-CRM alignment

| BFO	CIDOC-CRM
Process	Creation
Generically dependent continuant	Conceptual object
One-dimensional temporal region	Time-span
Object	Actor

The flow on the right exemplifies the application of the BFO-Classifier, used to align CIDOC classes of interest, in the case of the "Actor" class.

BFO : Entity

Does this entity persist in time or unfold in time?
YES

BFO : Continuant

Is this entity a property of another entity or depends on at least one other entity?
NO

BFO : Independent Continuant

When does this entity have some portion of matter as a continuant part?
ALWAYS

BFO : Material Entity

Is it a proper part of an object, rather than a member of?
NO

BFO : Object

Implementation detail 2

Sets mapping: LCO - LRMoo harmonisation through (IAO) Information Artifact Ontology
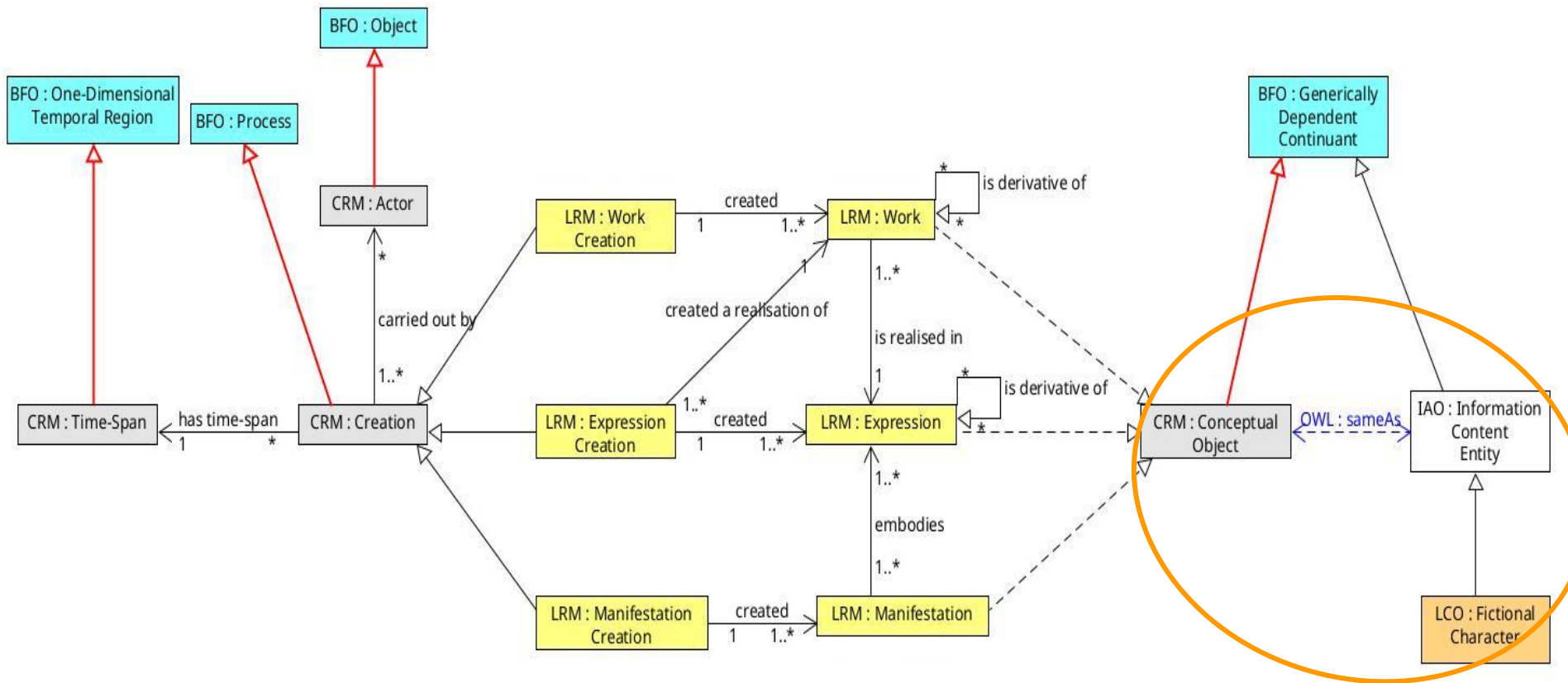
Mapping of key harmonised classes

Excerpts from the scope documentation of the classes

IAO : Information content entity	CIDOC : Conceptual object
Generically depends on some material entity	Can exist on more than one particular carrier at the same time such as paper, …, human memories, etc.
Specifically depends on a quality (bearer)	
Stands in a (specific type of) about-ness relation to some entity	Is non-material product of human mind and other human produced data (that have become objects of a discourse about their identity)
Is the outcome of the following processes: thinking, speaking, writing, reading, hearing	

Implementation detail 3

Sets mapping: LRMoo - LTO alignment
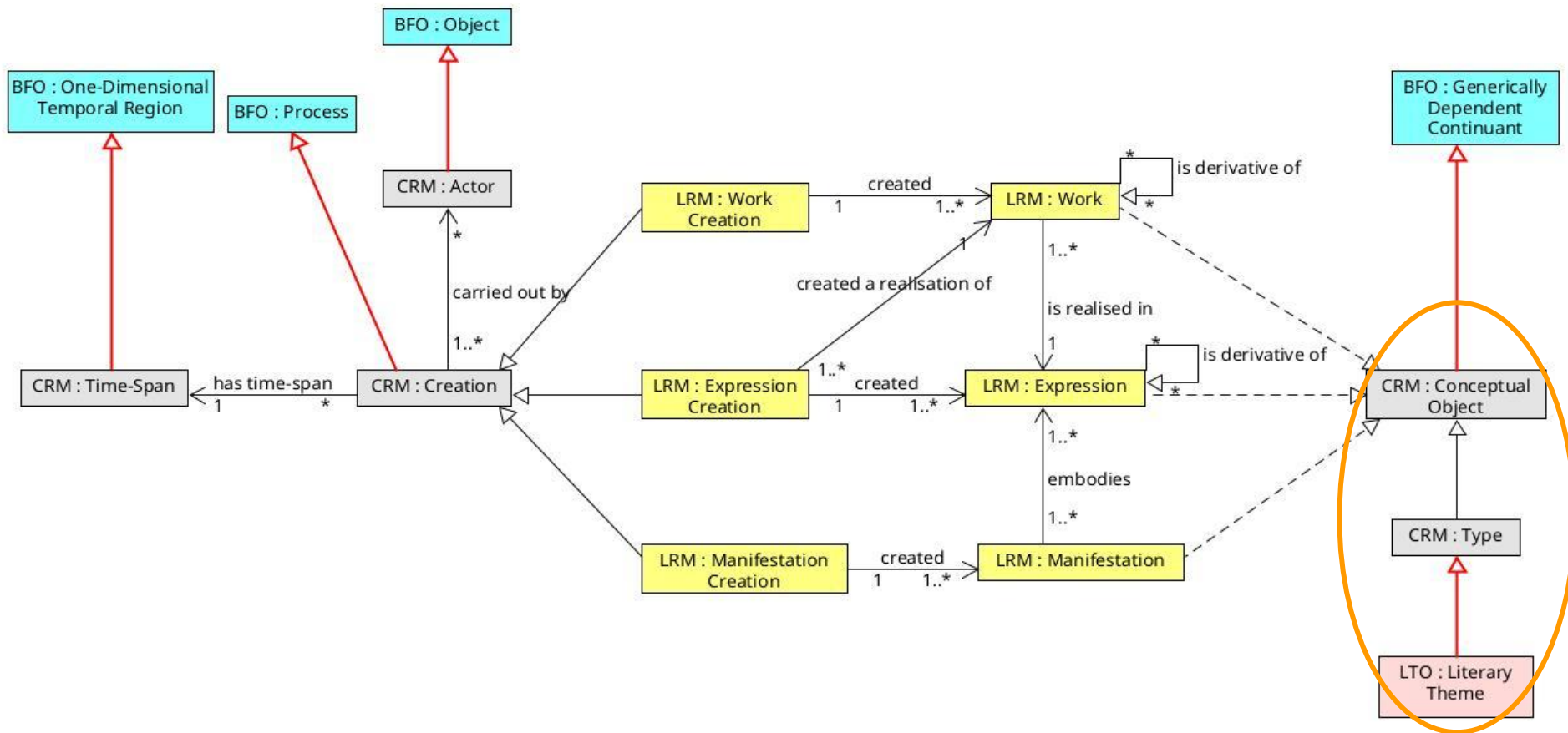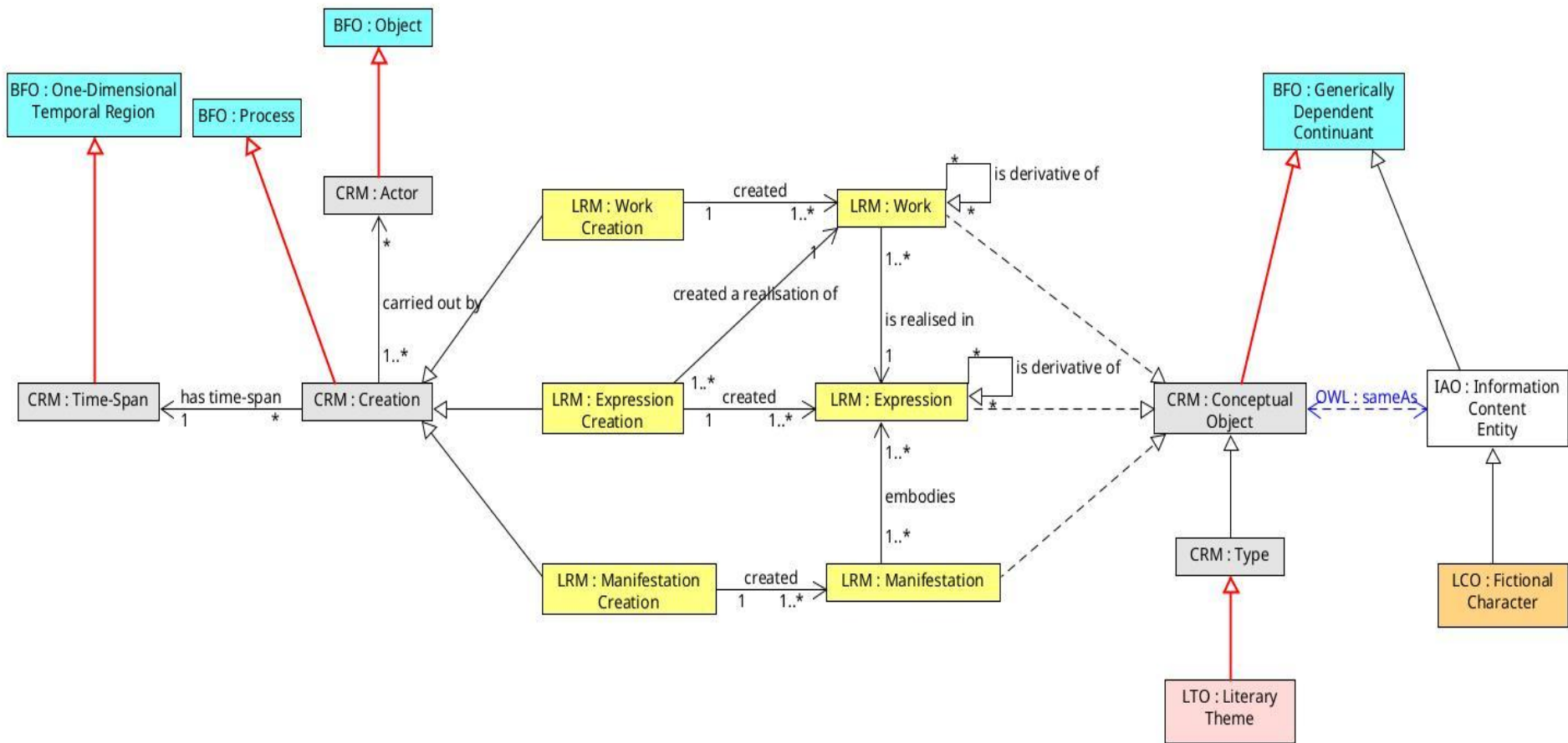
"CIDOC-CRM's interface to domain-specific ontologies"

CLASS	E55 Type
Scope note:	E55 Type is the CIDOC-CRM's interface to domain specific ontologies and thesauri. These can be represented in the CIDOC CRM as subclasses of E55 Type, forming hierarchies of terms

Wrapping up

Full mapping outcome

Literature

D'Andrea, Andrea. "Mapping, Embedding and Extending: Pathways to Semantic Interoperability, the Case of Numismatic Collections." Fifth European Semantic Web …, 2008.

Emeruem, C., C. M. Keet, Zubeida C. Dawood, and S. Wang, 'BFO Classifier: Aligning Domain Ontologies to BFO', CEUR Workshop Proceedings, Jönköping University, Sweden, 15-19 August 2022, 2022 <https://researchspace.csir.co.za/dspace/handle/10204/12591>

Kalfoglou, Yannis, and Marco Schorlemmer, 'Ontology Mapping: The State of the Art', 2 (2003)