TOWARDS SEMANTIC PROCESS INTEROPERABILITY

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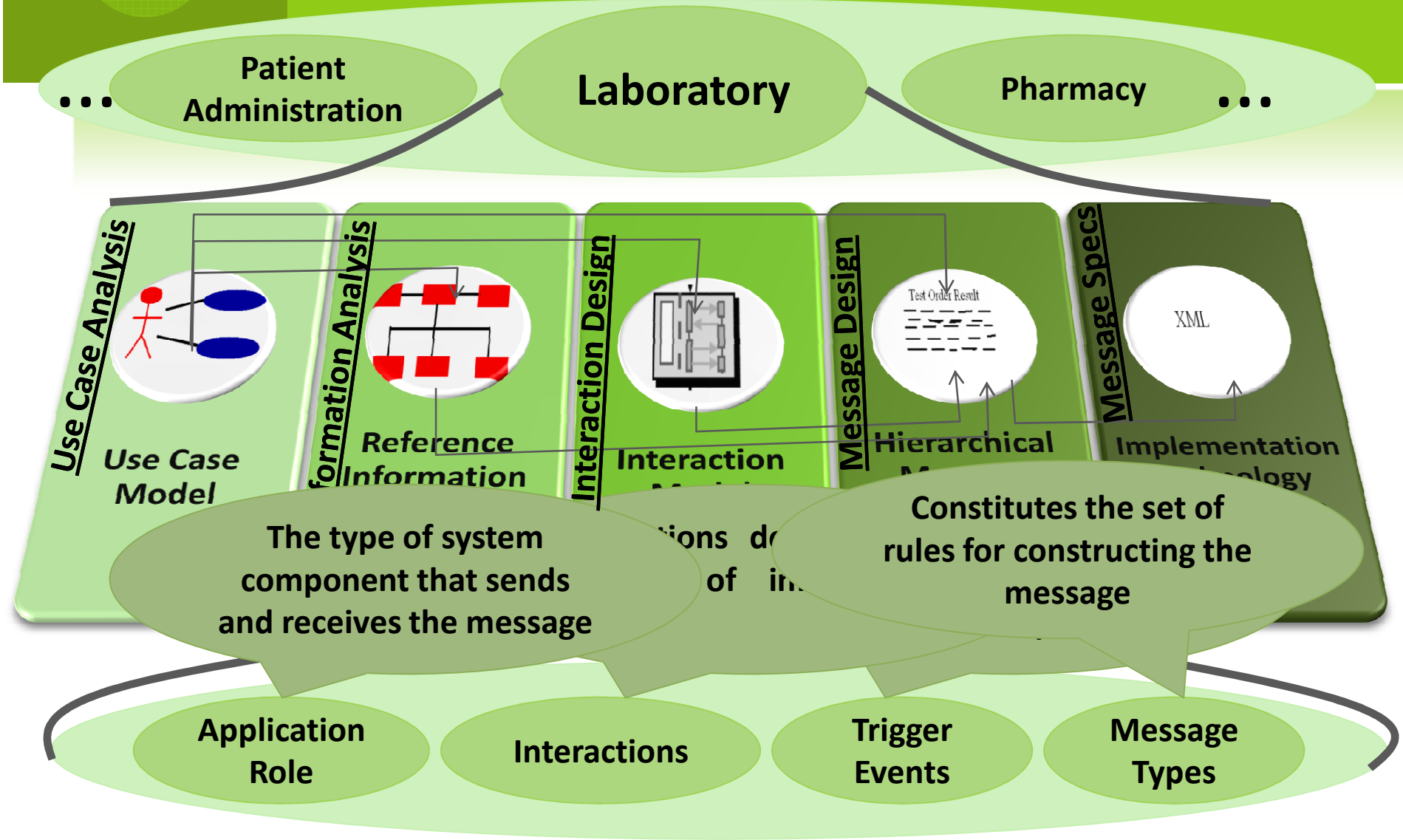
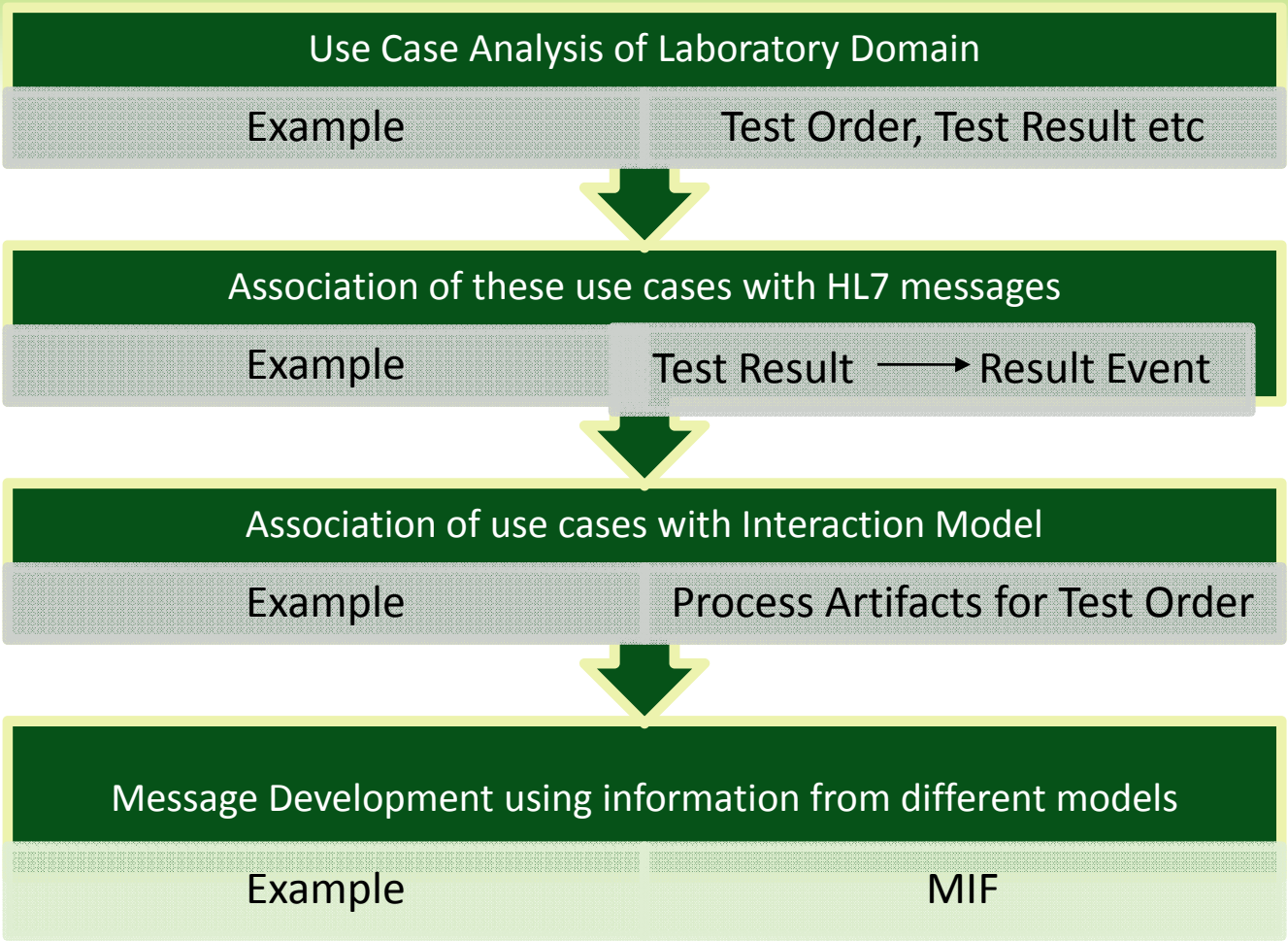
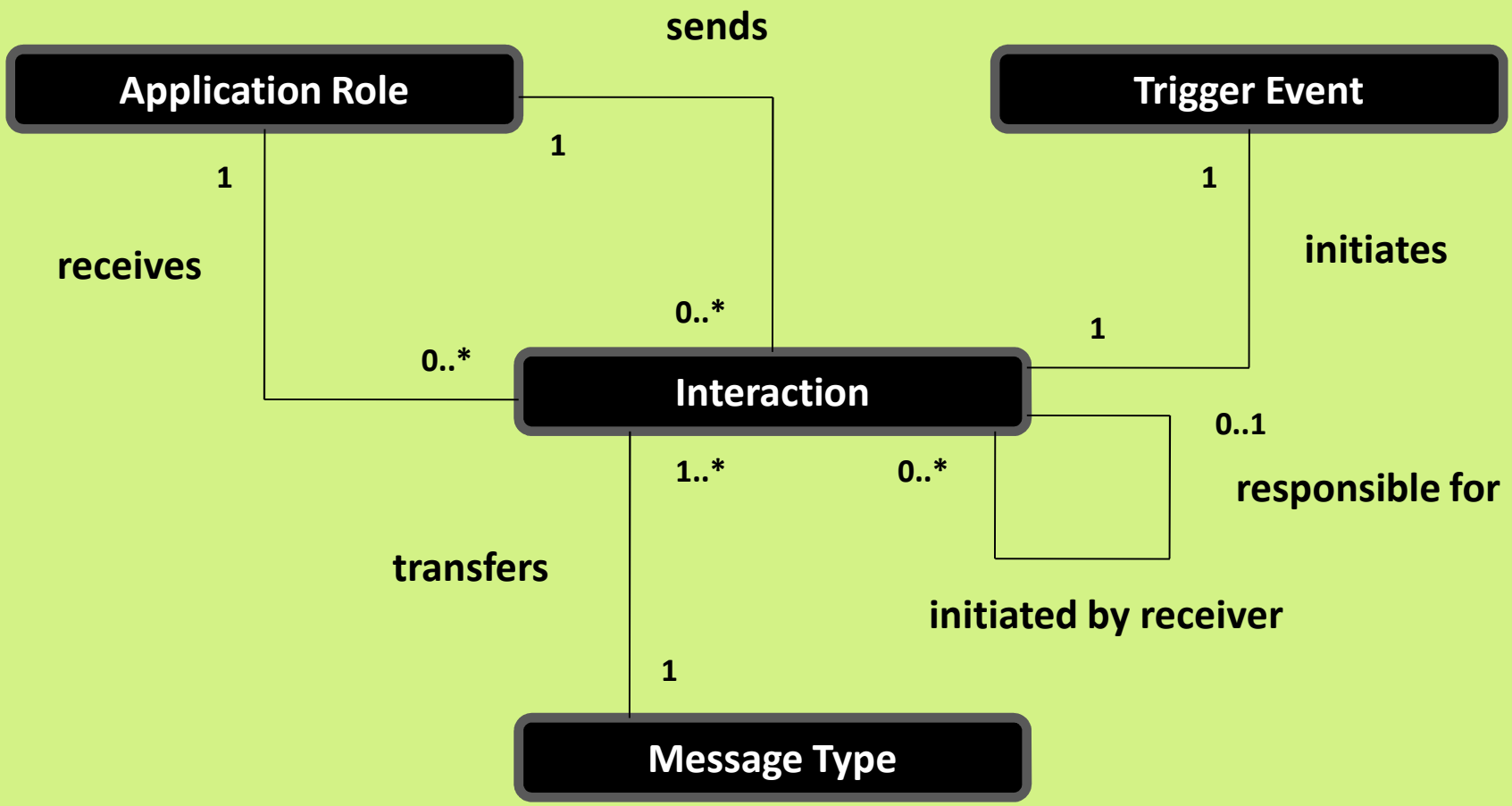
Introduction



HL7 Laboratory Domain Specifications



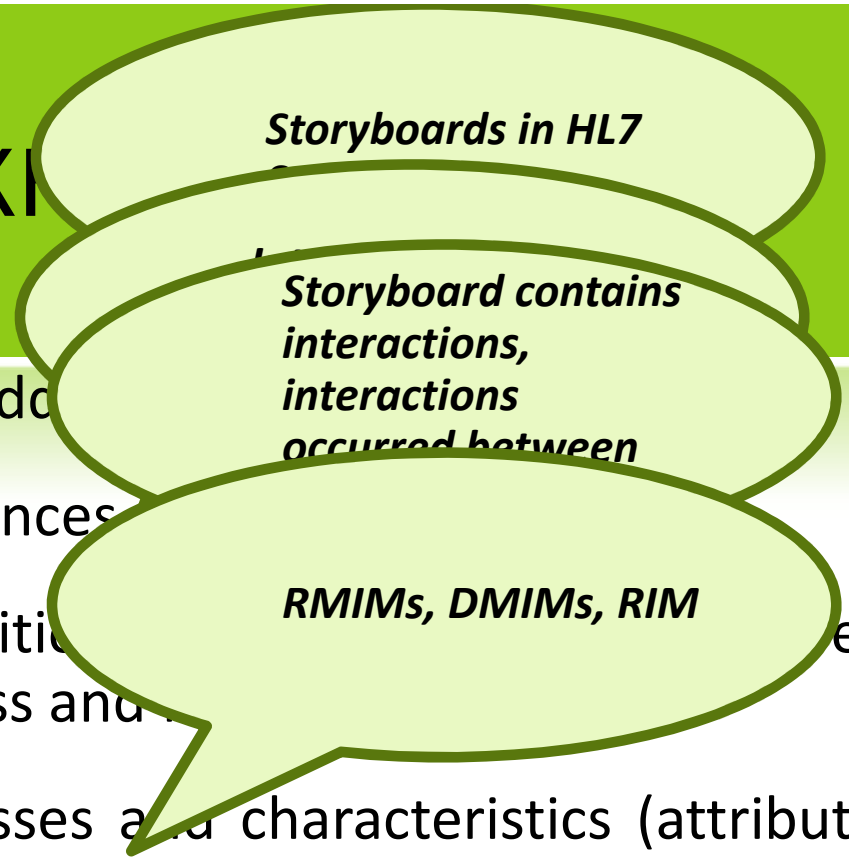
Interaction Meta Model



Motivation

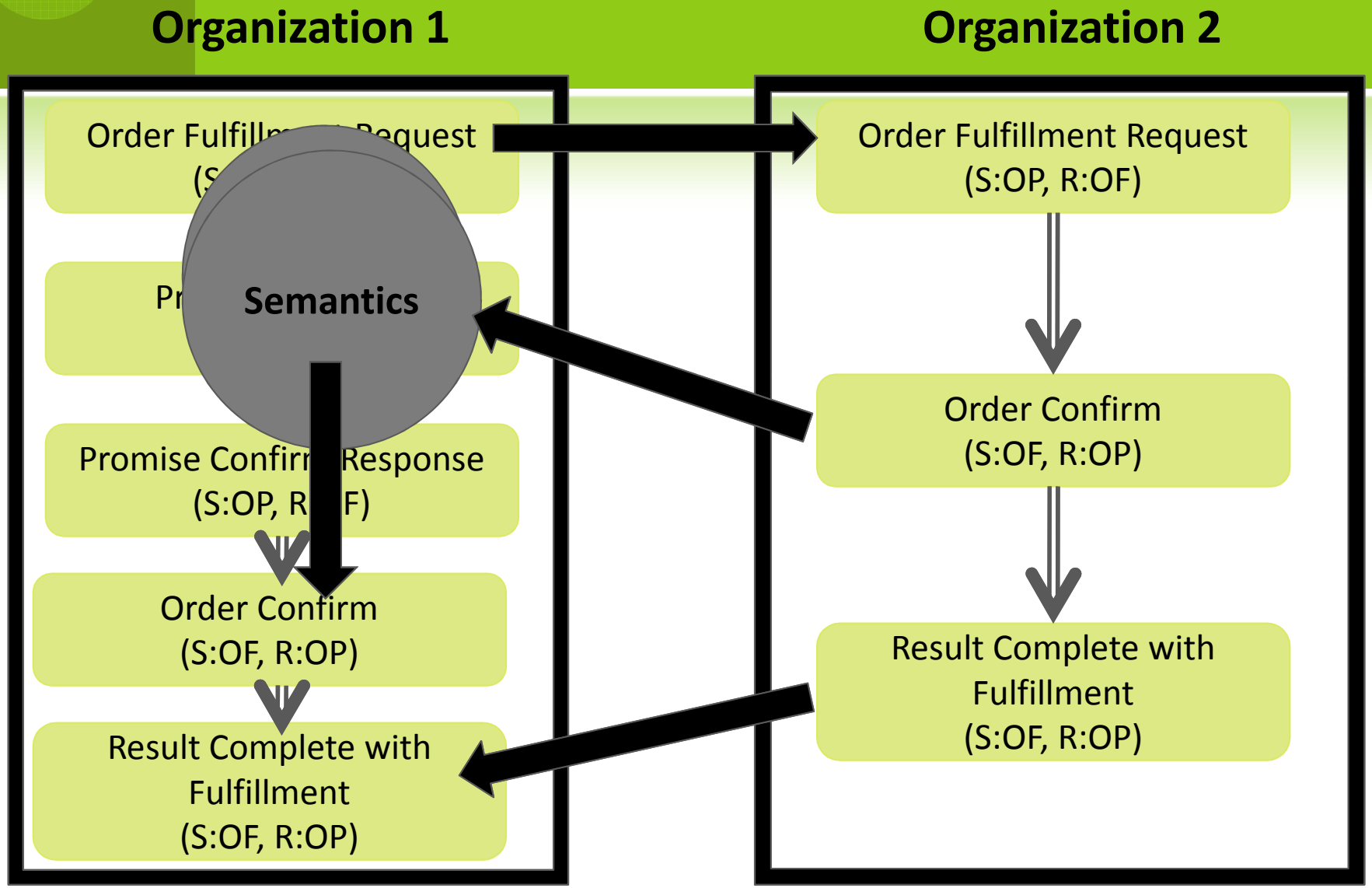
- Perspectives of Semantic interoperability in HL7 V3
  - Data (common terminologies)
  - Process (still a grey area)

WORKI



- Process – values add
- Flow – time sequences
- Concept – definiti een concepts in process and
- Information – classes a characteristics (attributes) for information regarding the concepts in the concept model
- To achieve semantic process interoperability we have to standardize the processes, flows, concepts and information
- HL7 provides storyboards capturing limited scenarios, no time sequences of interactions, no association of interaction with interaction sequences

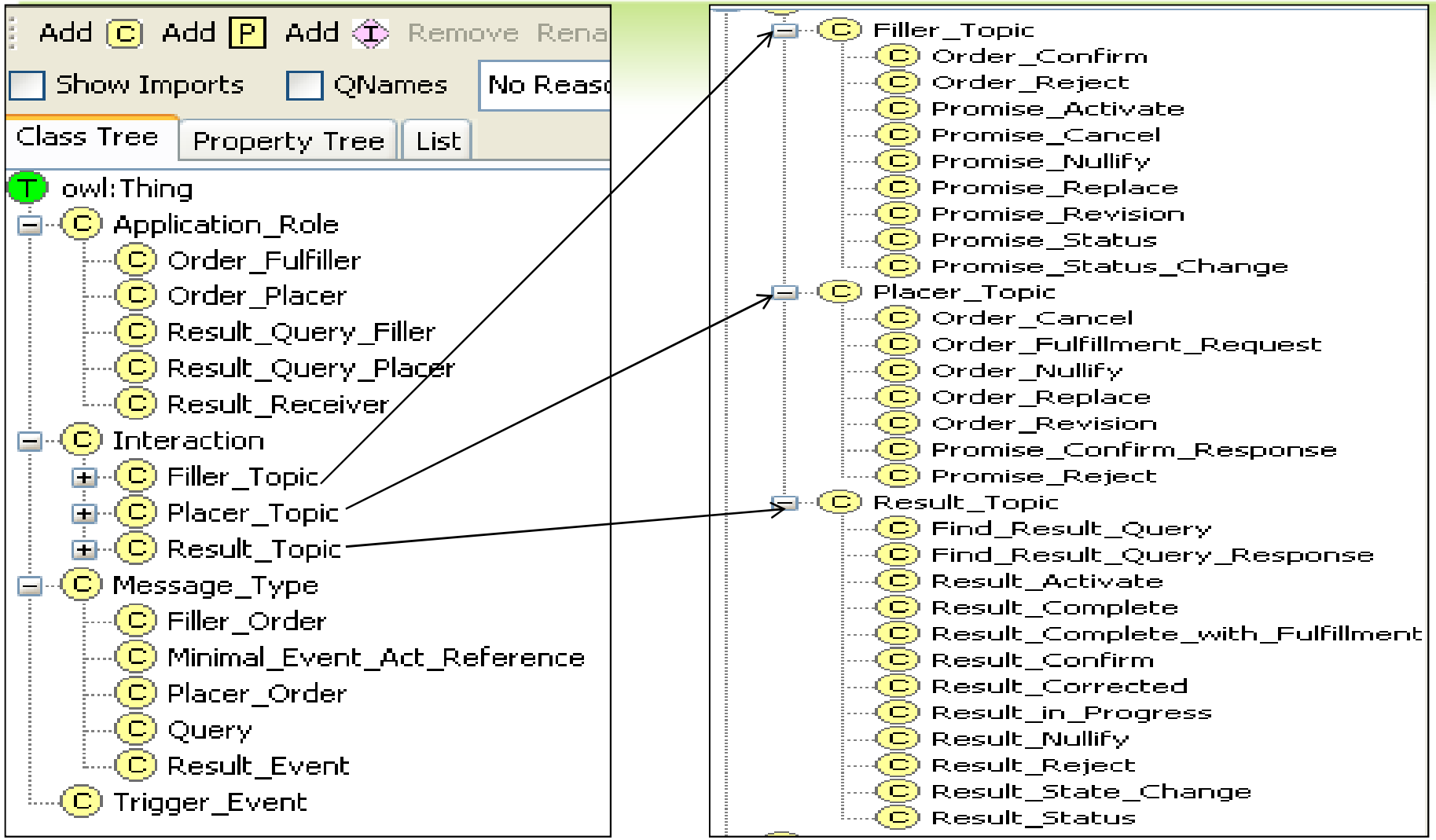
Workflows for Test Order



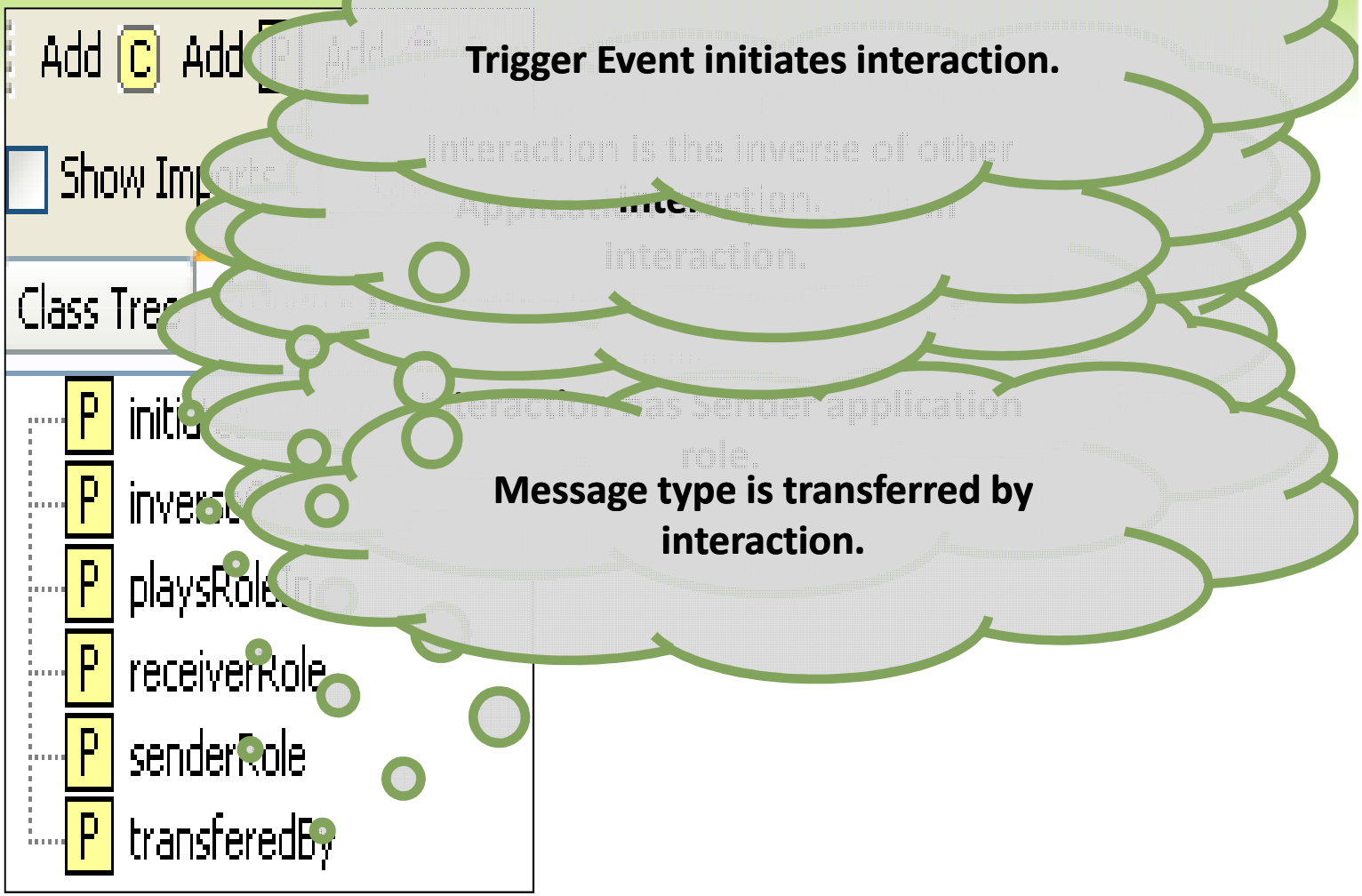
Requirement and Approach

- Requirement
  - Automate the process
  - Semantics in Process Artifacts
- Approach
  - Ontologies
    - For interaction model constructs
  - Rules
    - Based on message contents

Interaction Ontology (Hierarchy of Entities)



Interaction Ontology (Properties)



Interaction Ontology (Application Role)

Application Role

Disjoint with:
Interaction
Trigger Event
Message Type

Superclass of:
Result Query Placer
Result Query Filler
Order Fulfiller
Result Receiver
Order Placer

Domain of:
playsRoleIn

Range of:
receiverRole
senderRole

Interaction Ontology (Interaction)

Interaction

Disjoint with:
Application_Role
Trigger_Event
Message_Type

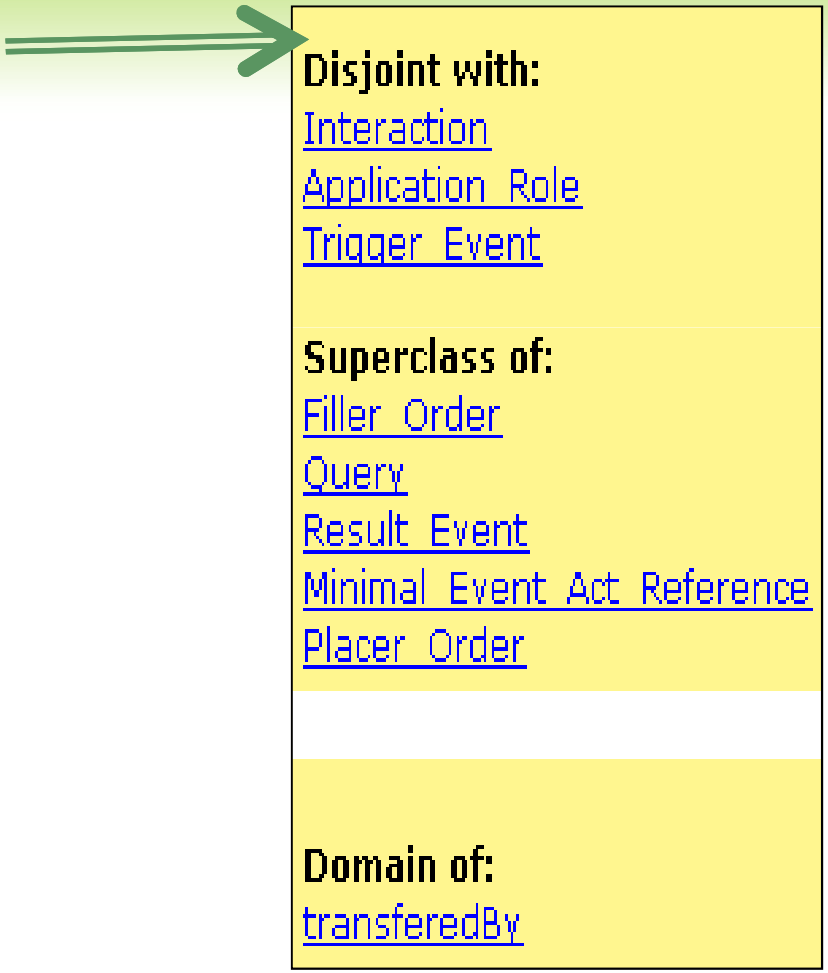
Superclass of:
Filler_Topic
Placer_Topic
Result_Topic

Domain of:
receiverRole
inverseOf
senderRole

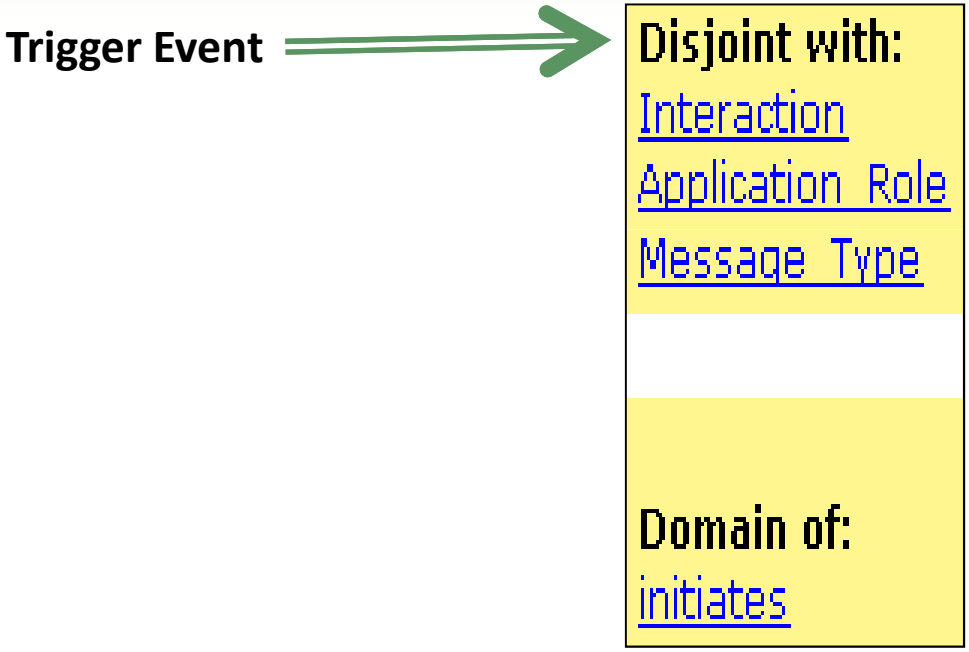
Range of:
transferedBy
inverseOf
playsRoleIn
initiates

Interaction Ontology (Message Type)

Message Type

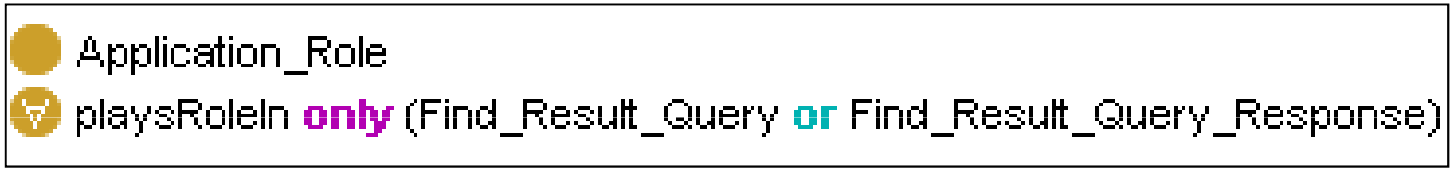


Interaction Ontology (Trigger Event)

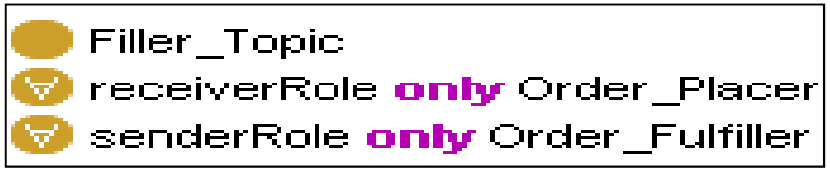


INTERACTION ONTOLOGY (RESTRICTIONS)

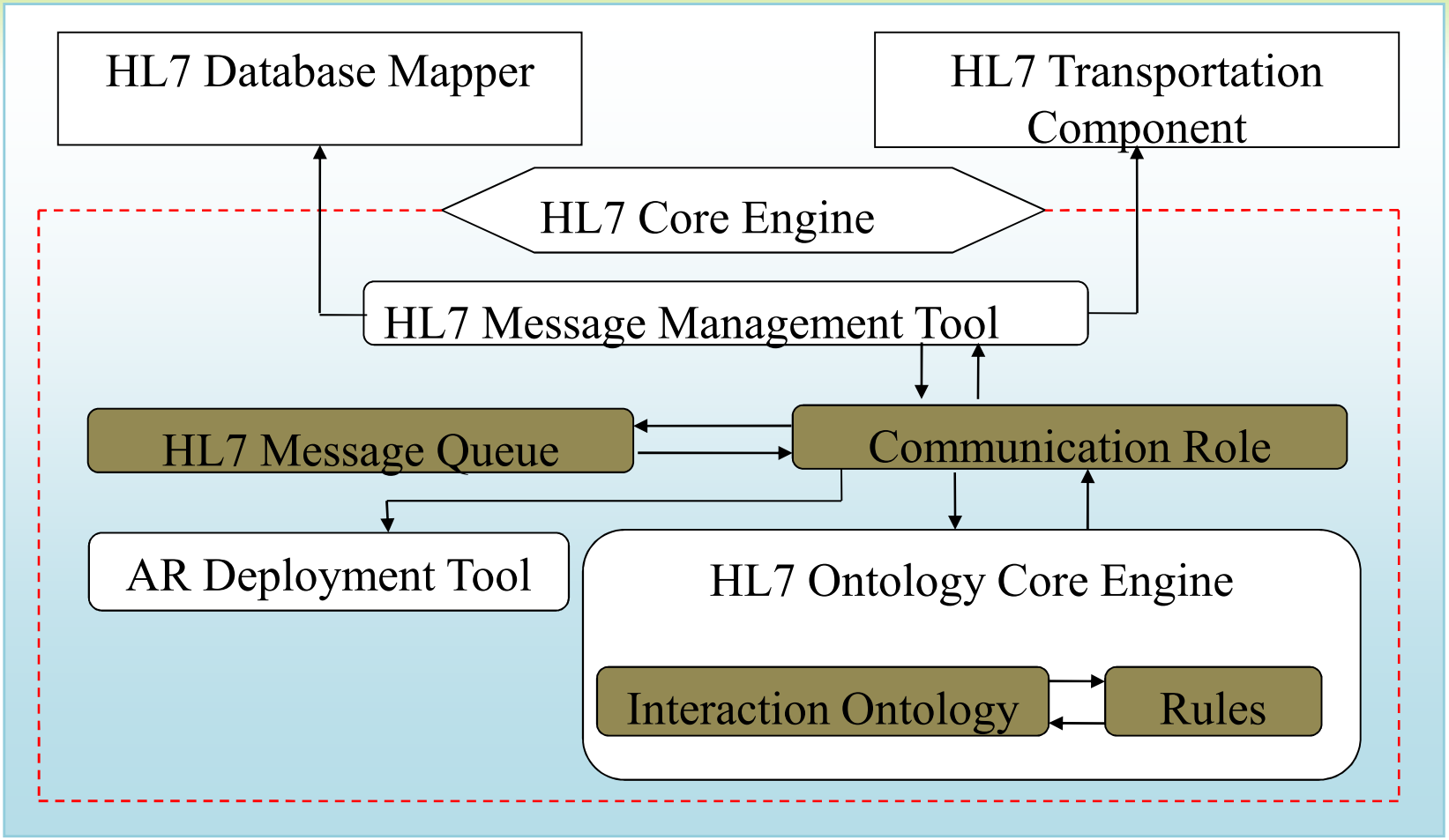
- Result Query Filler



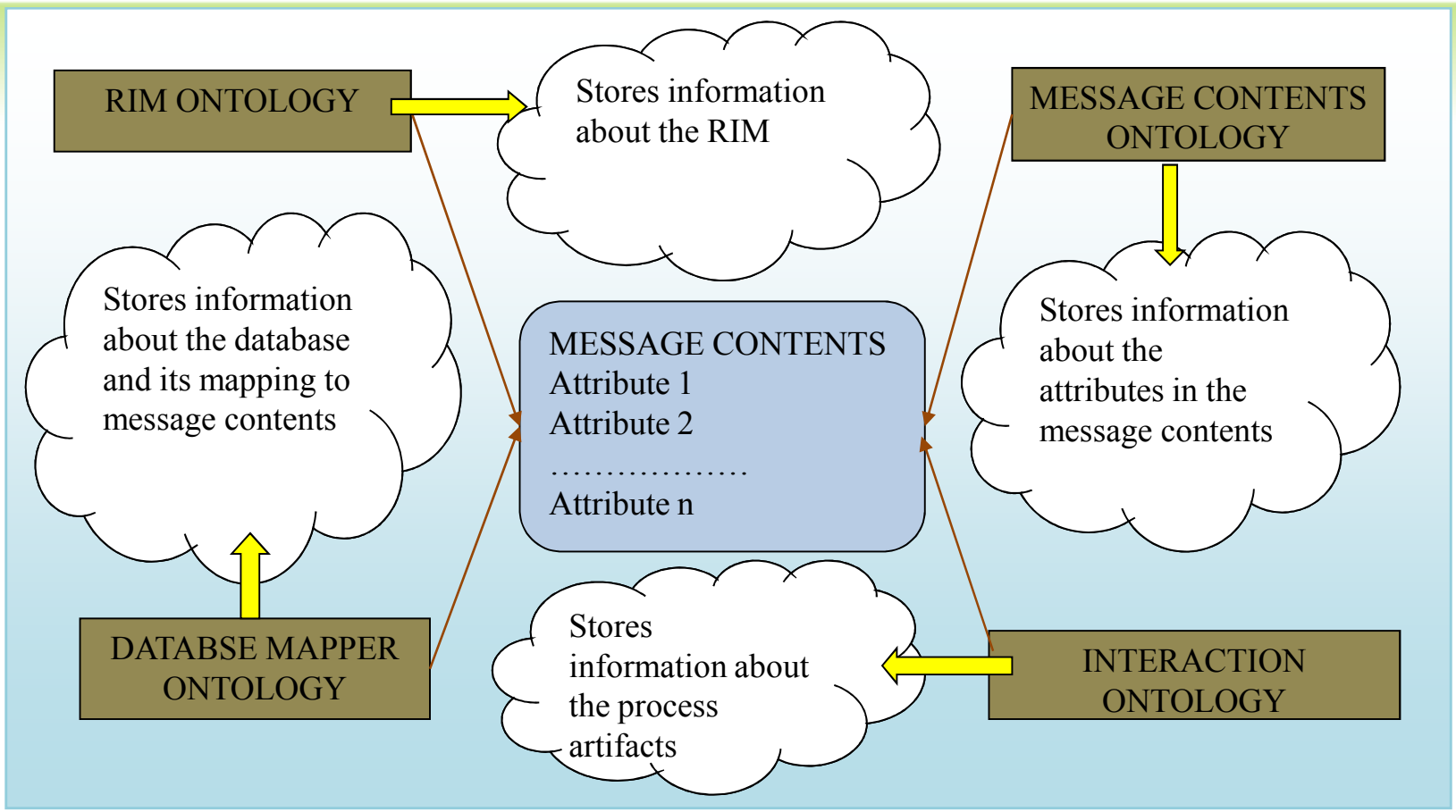
- Order Confirm



Proposed Extended Architecture



Relationship of Interaction Ontology with Other Ontologies



CITI Lab Example

- Scenario
  - Mrs. Bushra is examined by Dr. Jamil and reports extreme thirst, fatigue, and recent unexplained weight loss.
  - She also reports having a family history of diabetes.
  - Dr. Jamil wants to rule out diabetes and wants to order the GTT tests.

CITI Lab Example (cont)

- Working
  - Two Systems: Ordering System and Laboratory System
- Steps
  - Test Order
    - Ordering System to Laboratory System

Message (m1) ∧ hasMessageContent (m1, mc1) ∧ TestOrder (mc1) ⟶

Message Type (m1, mt1) ∧ PlacerOrder (mt1) ∧ InteractionID (m1, id1) ∧ POLB_IN211100GB (id1) ∧ SendingApplicationRole (m1,sar) ∧ OrderPlacer (sar) ∧ ReceivingApplicationRole (m1,rar) ∧ OrderFulfiller (rar) ∧ TriggerEvent (m1,te) ∧ OrderFulfillmentRequest (te)

CITI LAB EXAMPLE (CONT)

- Steps
  - Test Order Confirm
    - Laboratory System to Ordering System

Message (m1) ∧ hasMessageContent (m1, mc1) ∧ TestOrderResult (mc1) ⟶

Message Type (m1, mt1) ∧ PlacerOrder (mt1) ∧ InteractionID (m1, id1) ∧ POLB_IN221000GB (id1) ∧ SendingApplicationRole (m1,sar) ∧ OrderFulfiller (sar) ∧ ReceivingApplicationRole (m1,rar) ∧ OrderPlacer (rar) ∧ TriggerEvent (m1,te) ∧ OrderConfirm (te)

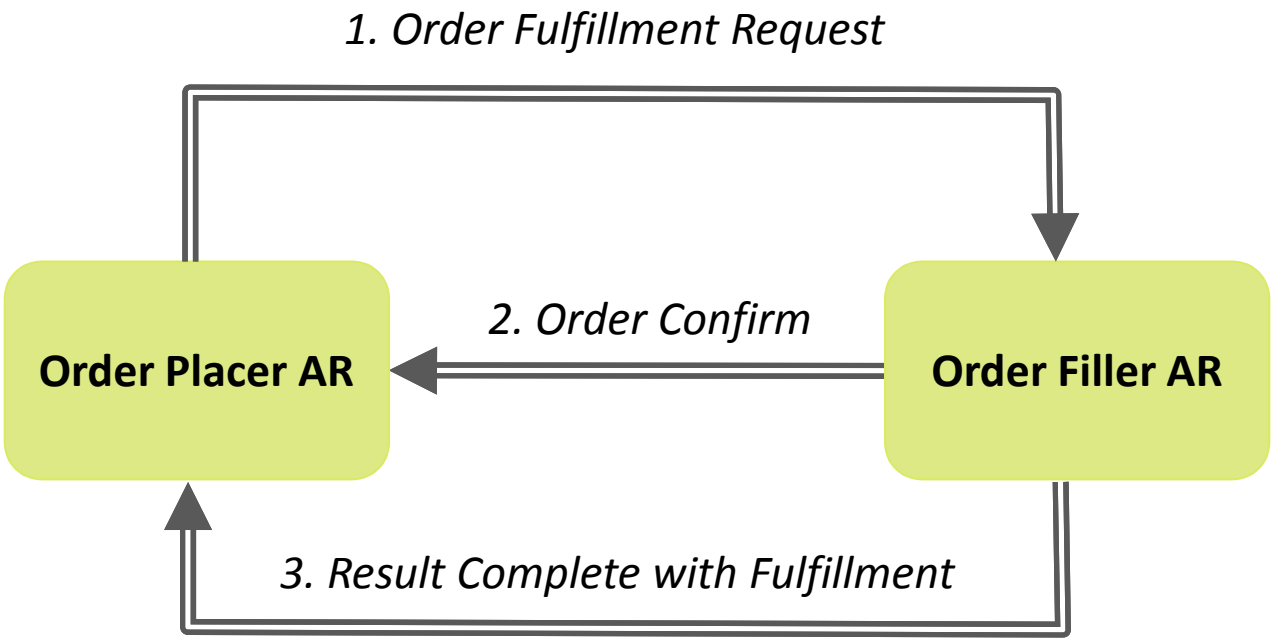
CITI Lab Example (cont)

- Steps
  - Test Order Completion
    - Laboratory System to Ordering System

Message (m1) ∧ hasMessageContent (m1, mc1) ∧ TestOrderCompletion(mc1)

Message Type (m1, mt1) ∧ ResultEvent(mt1) ∧ InteractionID (m1, id1) ∧ POLB_IN224200UV (id1) ∧ SendingApplicationRole (m1,sar) ∧ OrderFulfiller (sar) ∧ ReceivingApplicationRole (m1,rar) ∧ OrderPlacer (rar) ∧ TriggerEvent (m1,te) ∧ ResultCompleteWithFulfillment (te)

Interaction Workflow of CITI Lab Example



CONCLUSION

- Semantics is necessary for intelligent processing
- Complete Semantic Interoperability depended not only on data but process as well
- Semantic Data Interoperability is less effective without Semantic Process Interoperability
- Semantics in communicating components is required for process automation

Future Work

- Requirement of many Ontologies and their Interactions
- Using Data Mining Techniques for pattern recognition of HL7 messages
  - Segmentation of group of patients on the basis of health patterns
  - Creation of rules on the basis of patterns identified for finding out process artifacts
  - On the basis of those patterns the rules are to be defined and ontologies would be used for achieving semantic interoperability

THANKS

Questions