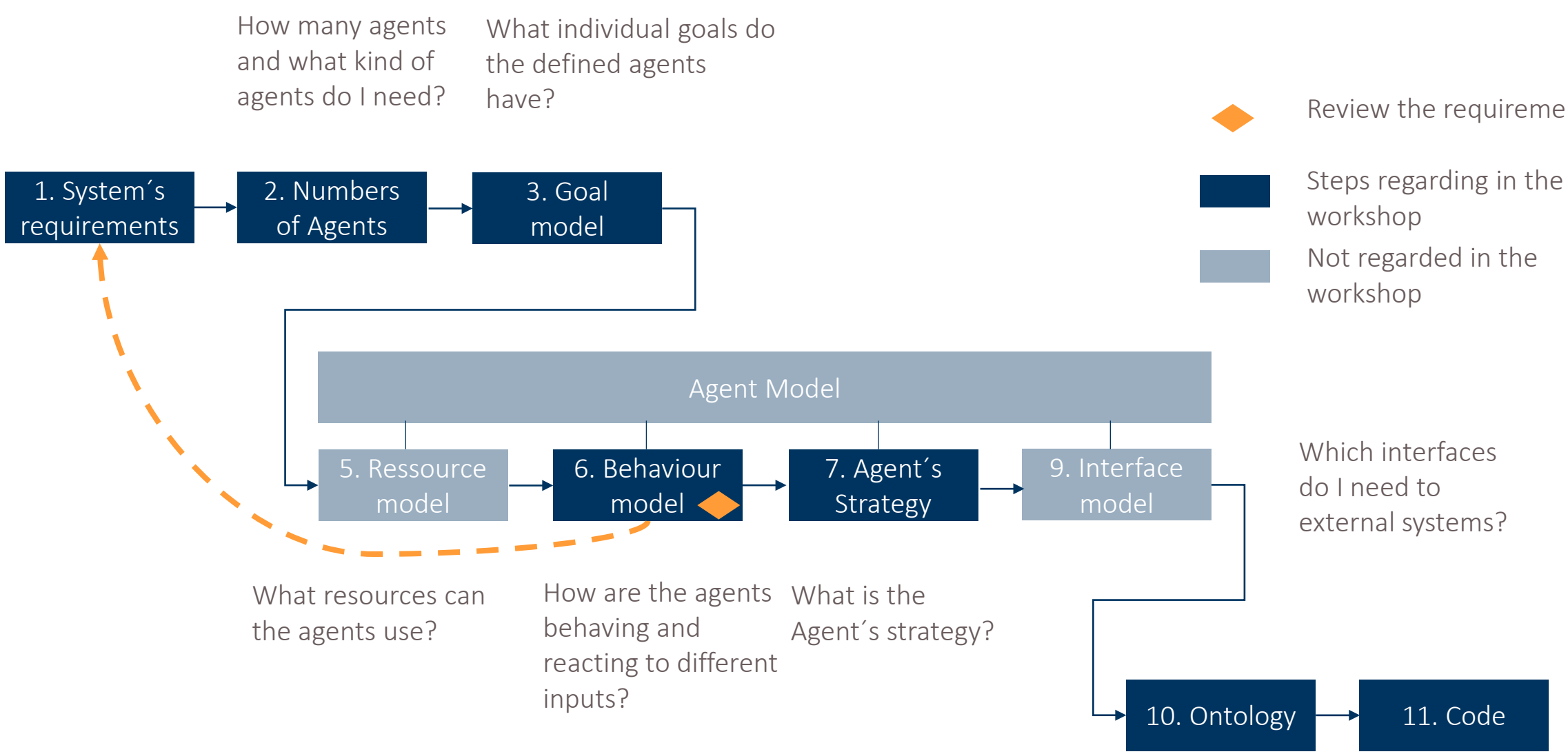
Institut für Automatisierungstechnik

How to develop Agent-based systems?

Maximilian Kilthau 15.07.2022

Helmut Schmidt Universität
Universität der Bundeswehr Hamburg

Engineering process for modelling agents



Base Planing

1. System´s requirements

- Agents can bid for books
- Agents can offer books
- Agents can communicate with other agents
- Agents can negotiate
- Agents can get to know to the other agents

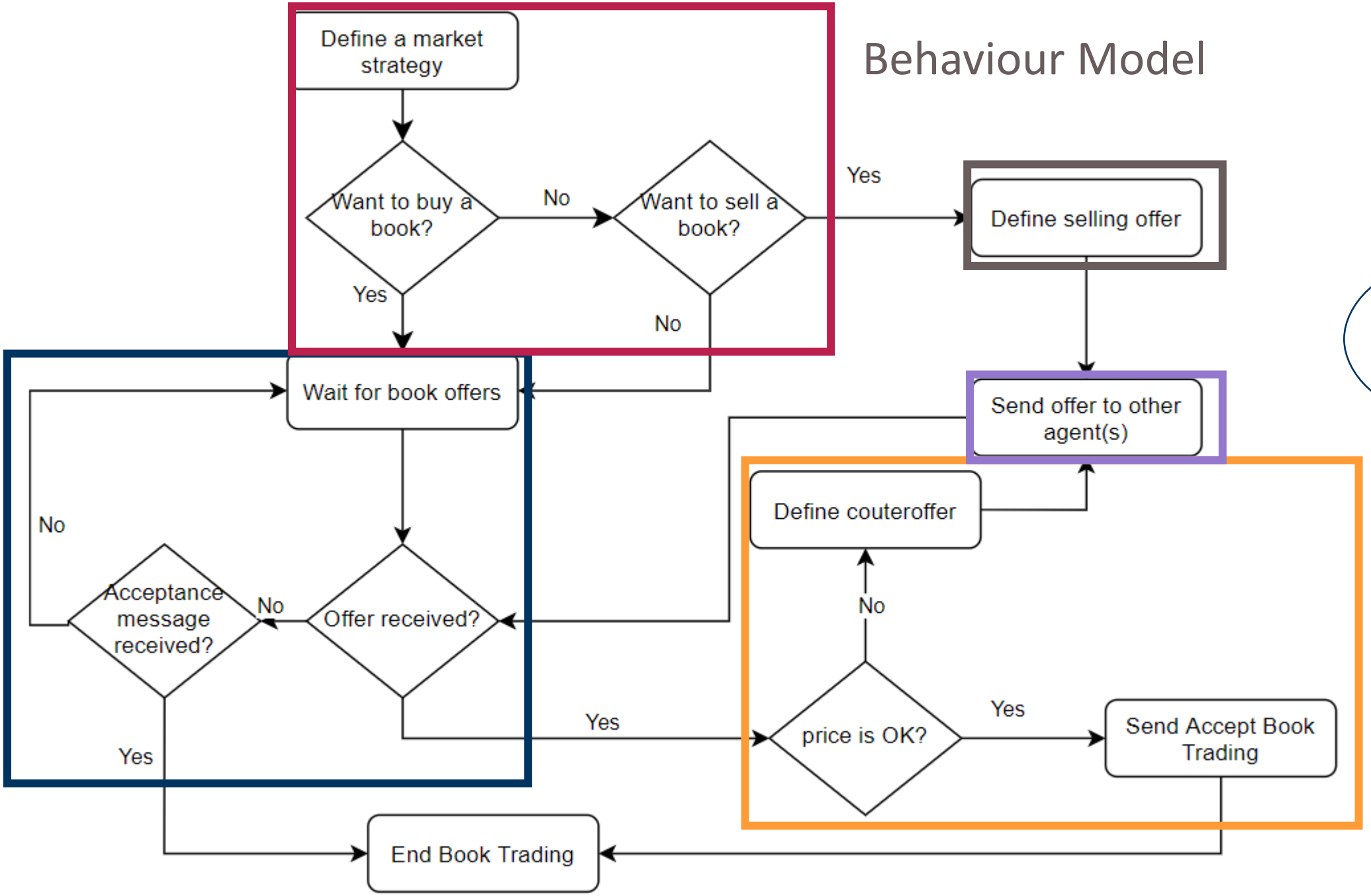
2. Numbers of Agents

- Role1: Seller
- Role2: Buyer

3. Goal model

- Agents want to have books based on their preferences
- Agents want to save as much money as possible

Behaviour Model



Setup()

MessageReceiveBehaviour

GetOffer-Behaviour

SetMarket-Strategy

SendOffer-Message

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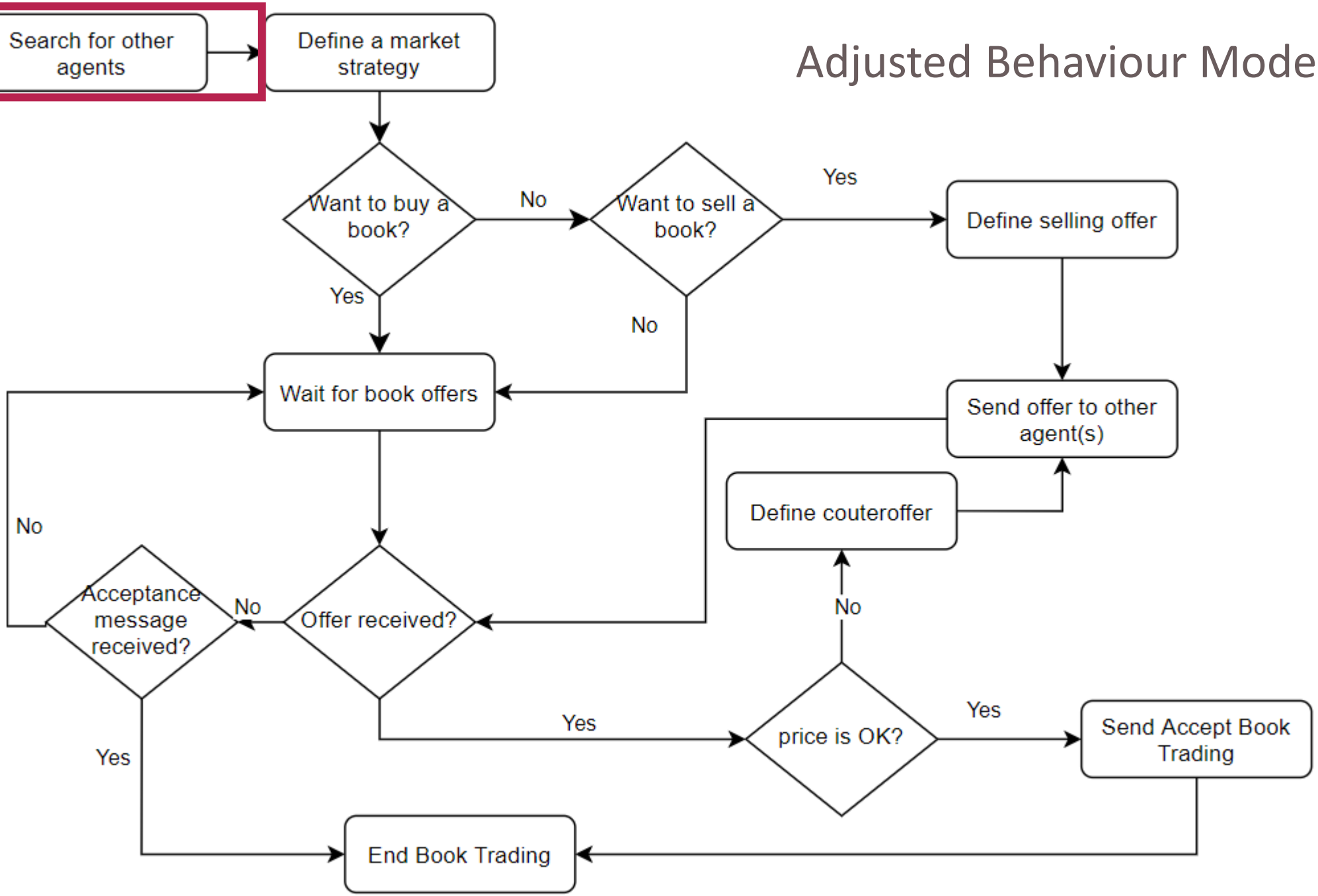
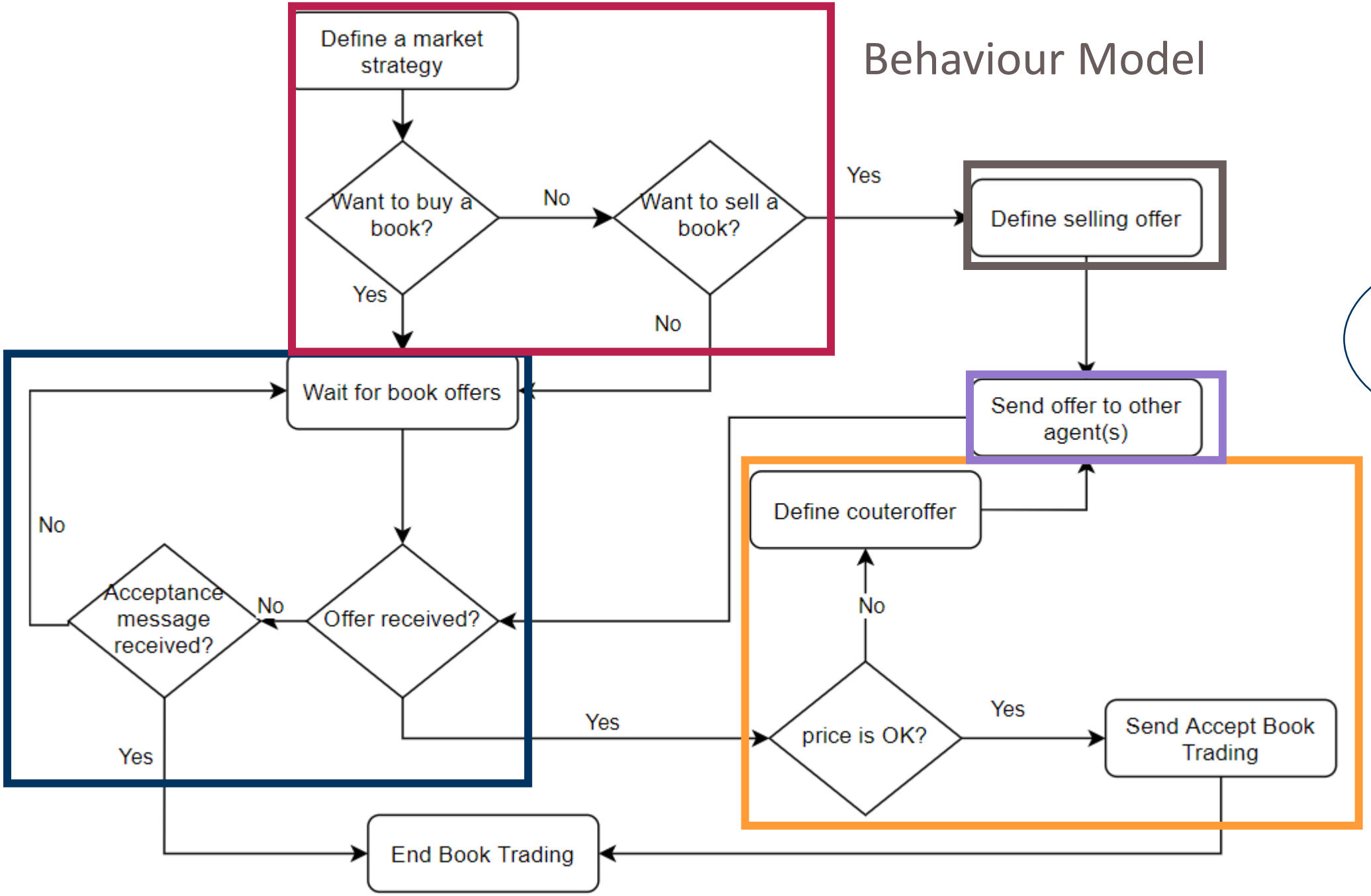
Adjusted Behaviour Model



Behaviour Model



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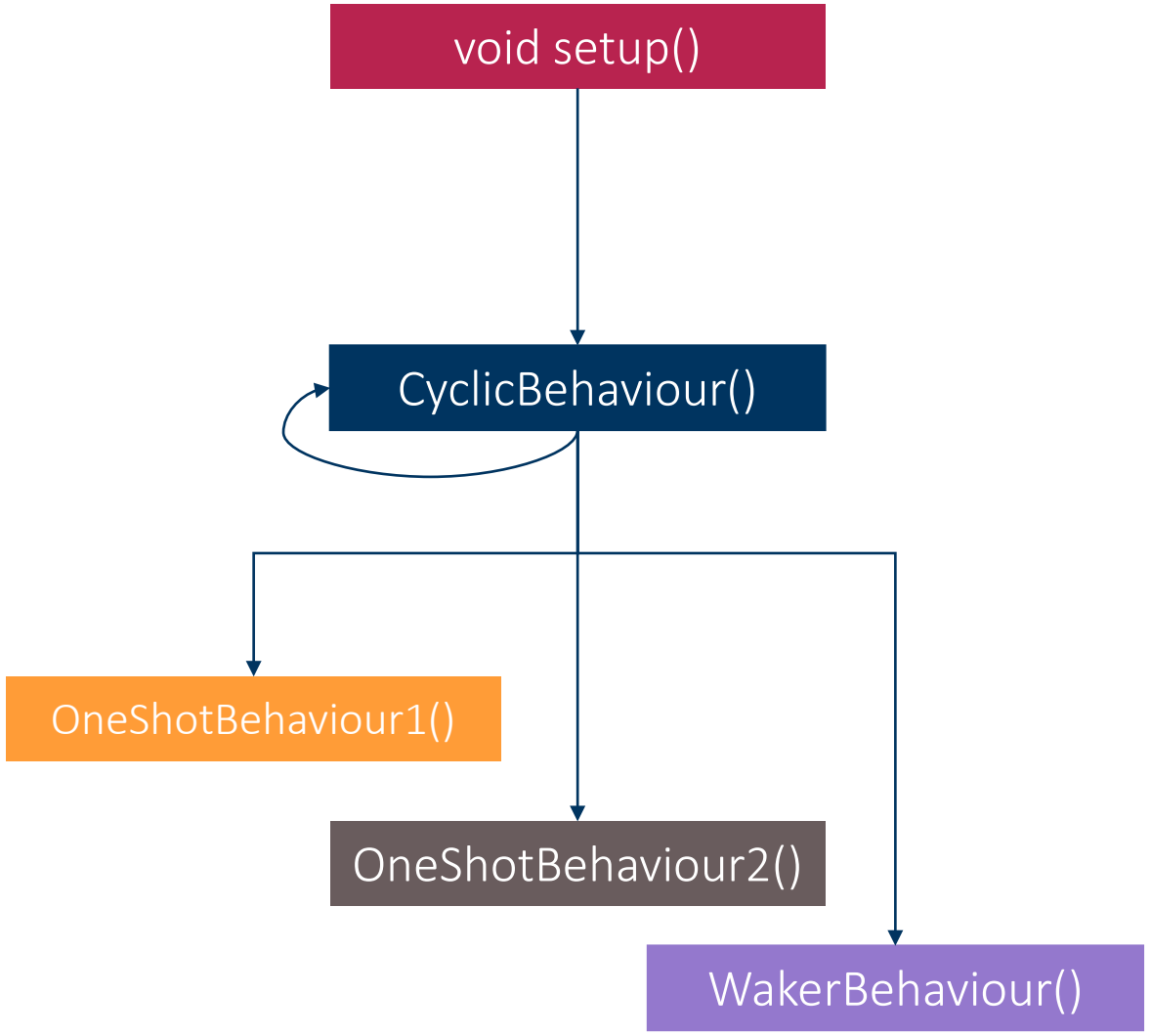
Architecture of an JADE-agent

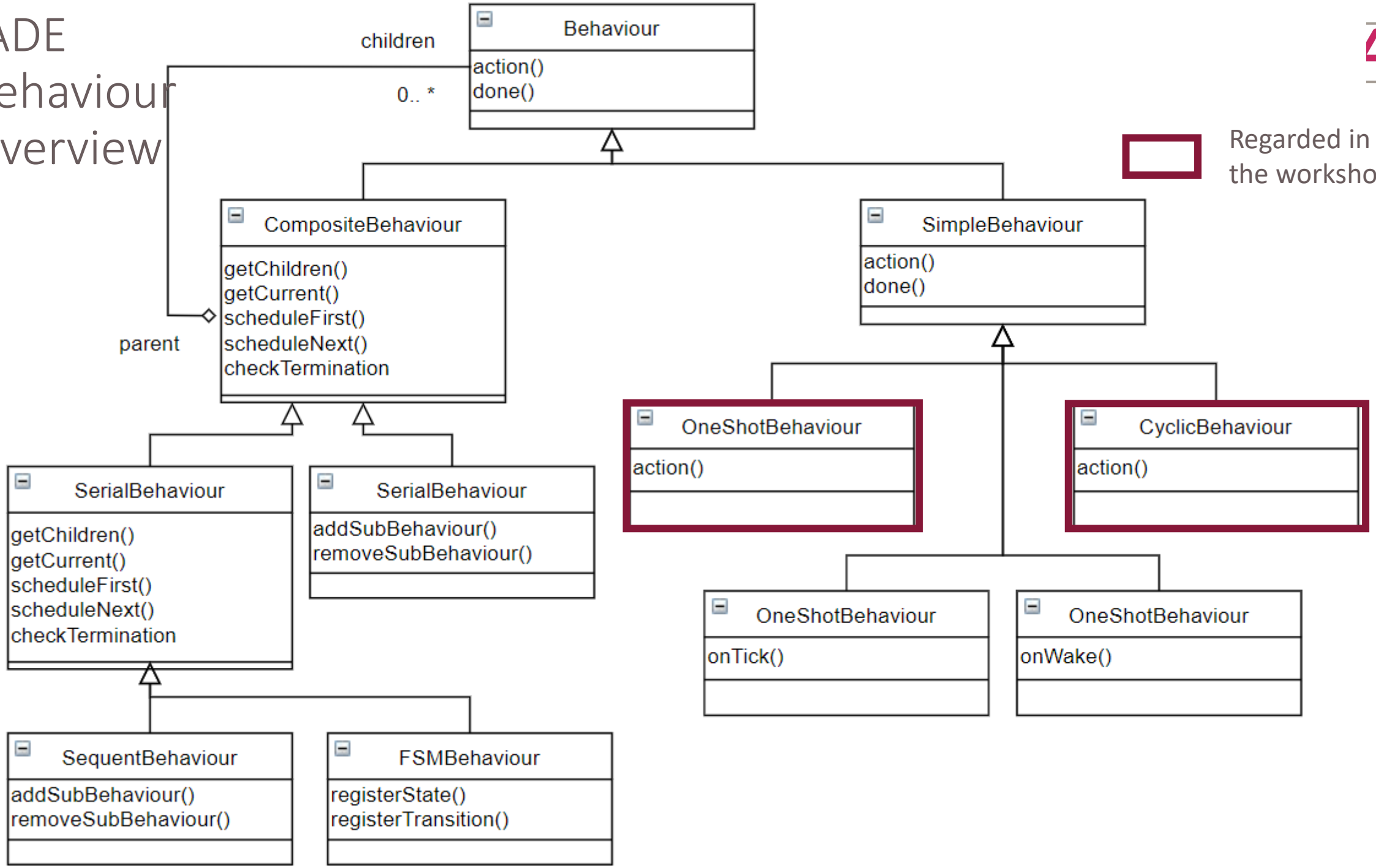


- setup-Method is called **once** when the agent is started
- Here, the general setup has to be done

- CyclicBehaviour() is a while loop which checks all the time if there is an incoming message
- Checks incoming messages and calls the corresponding OneShotBehaviour()

- Here, the OneShotBehaviour executes whatever should be done with the incoming message.
- A OneShotBehaviour can call another OneShotBehaviour as well

JADE Behaviour Overview



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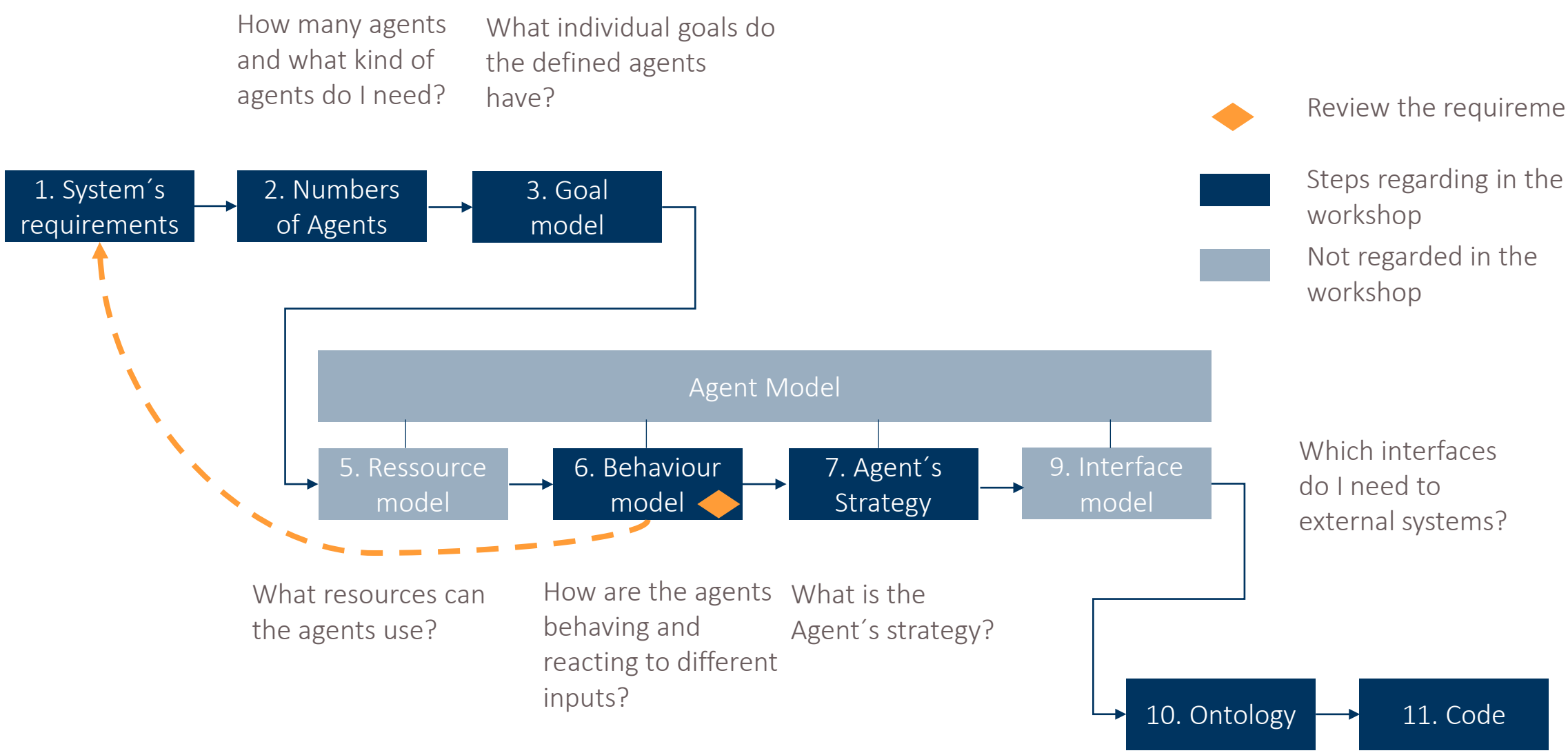
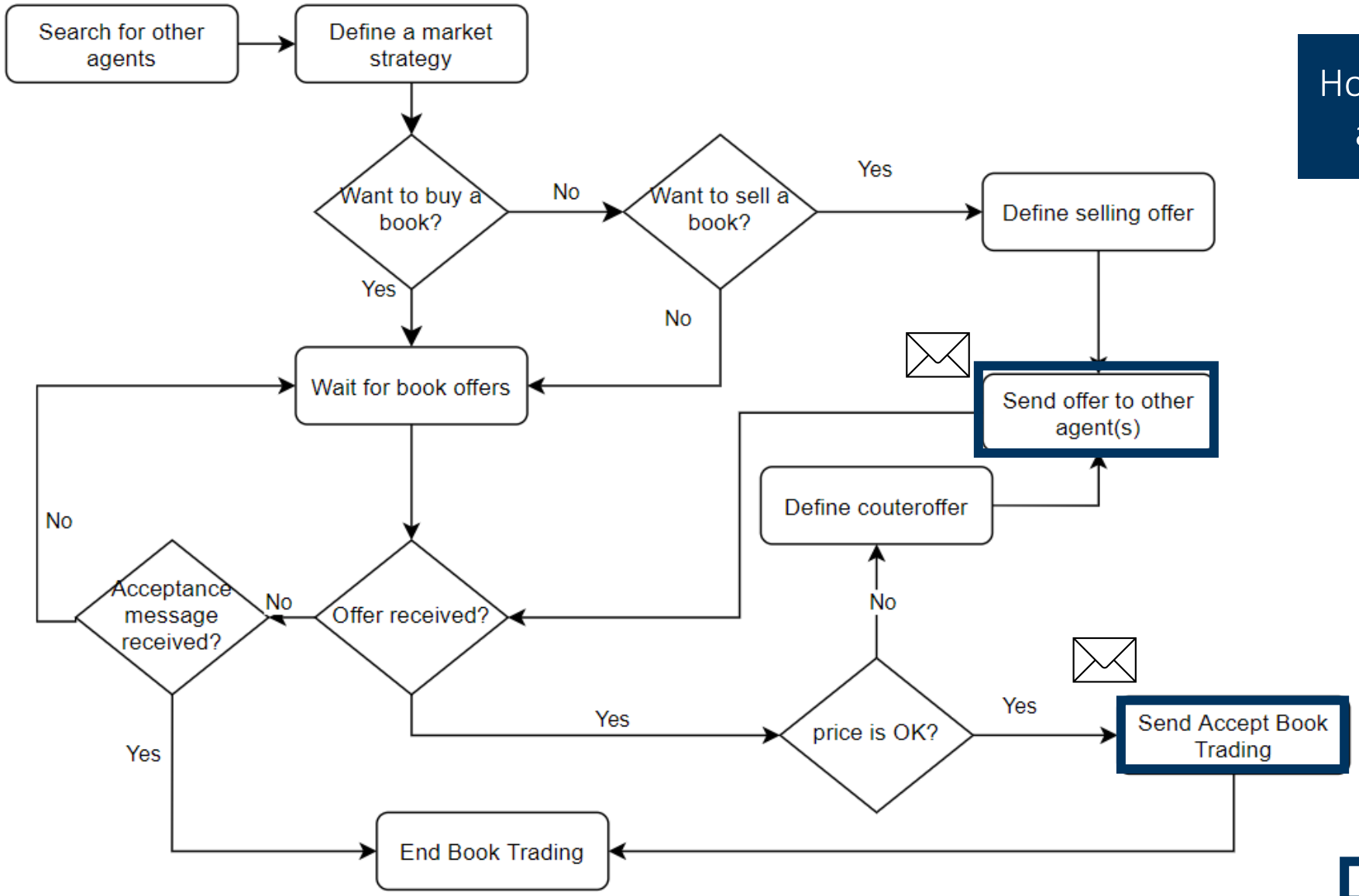


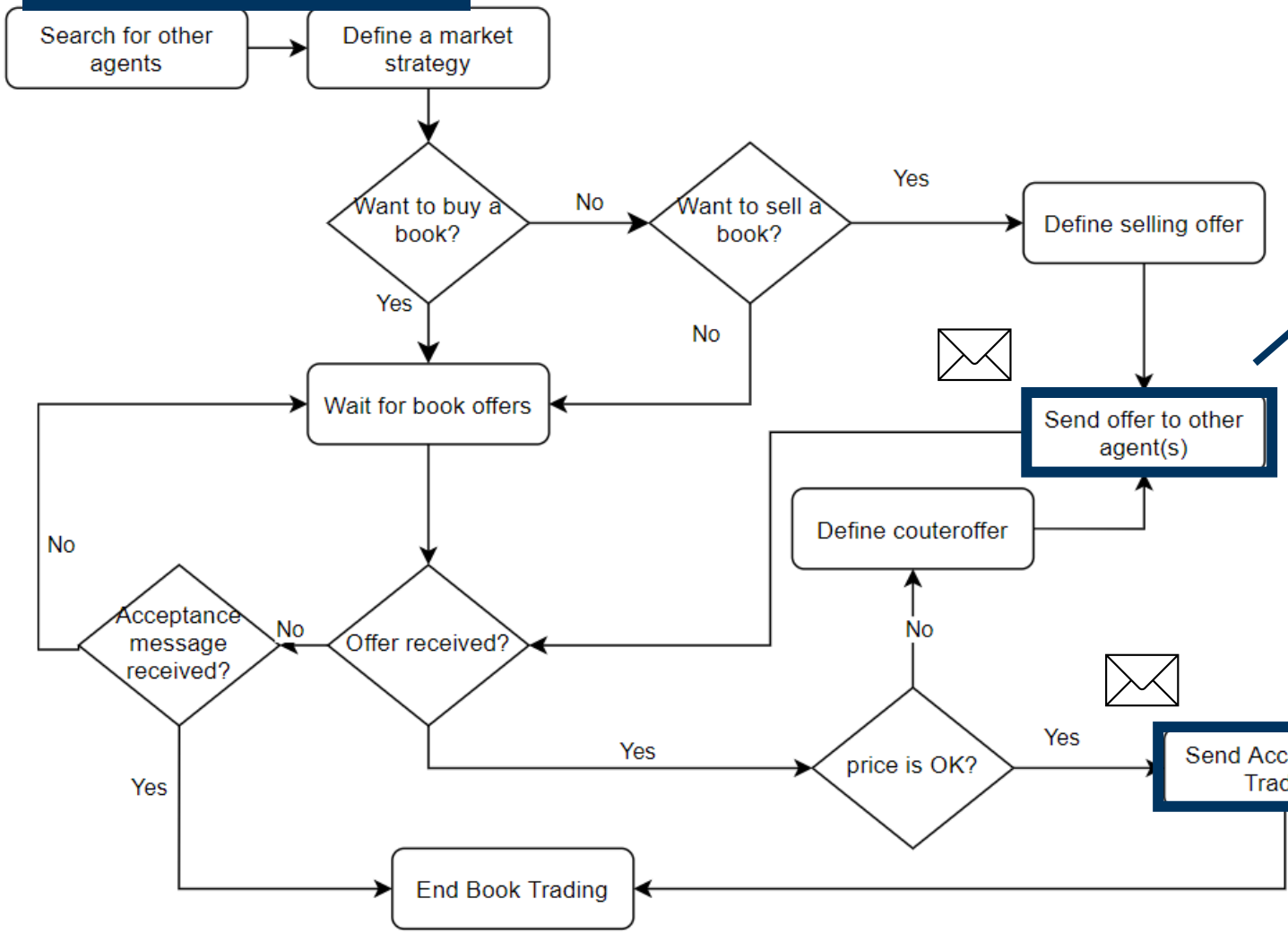


How is ontology applied in agent-based systems?

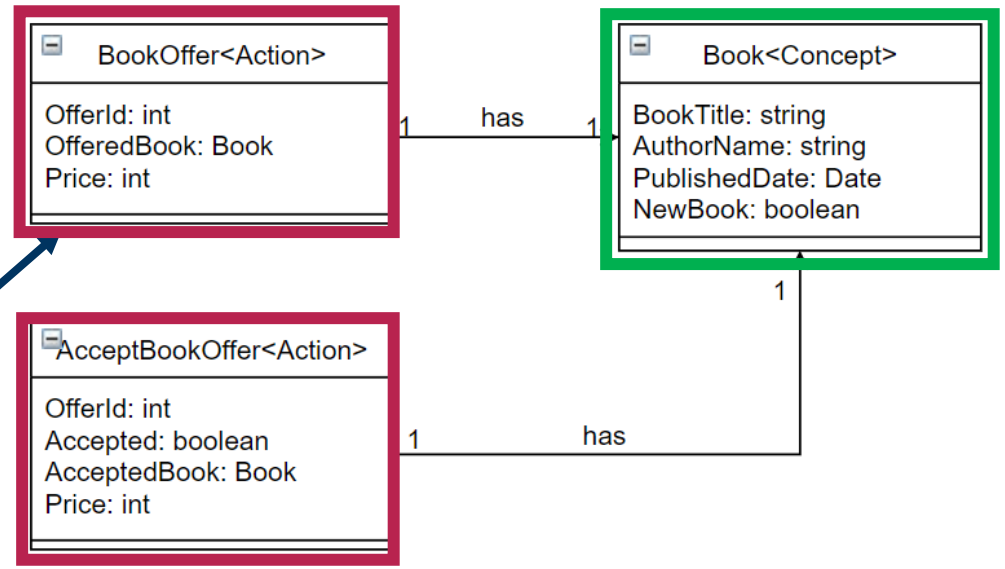
- Describes data structure (concept)
- Describes relationships between concepts
- Describes data structure of communication
- Provide heterogenous data models
- Validation of data syntax
- Modular data extension

Data to send which needs a defined data structure

Behaviour-Model



Ontology-Example

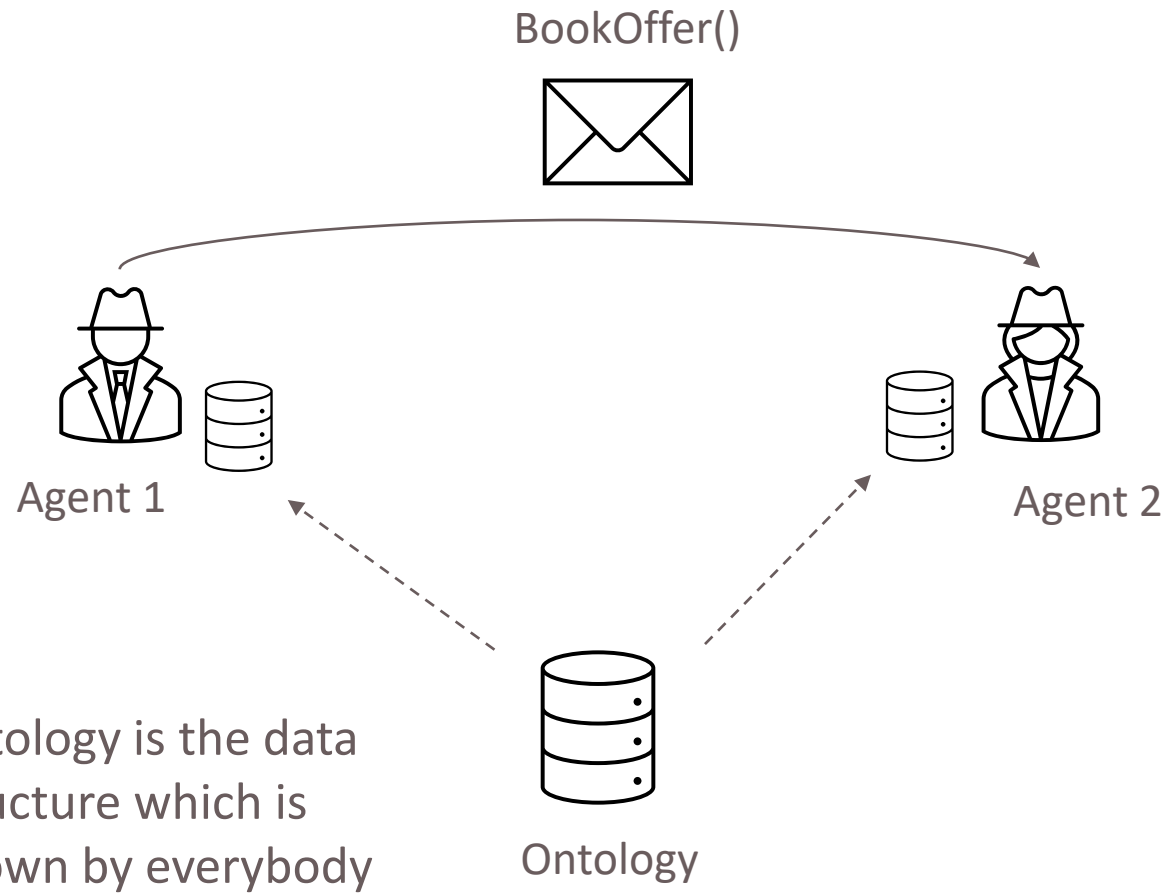


Concept – Communication Data

Action – Communication Data

Data to send which needs a defined data structure

Ontology Example for Book Trading Agents

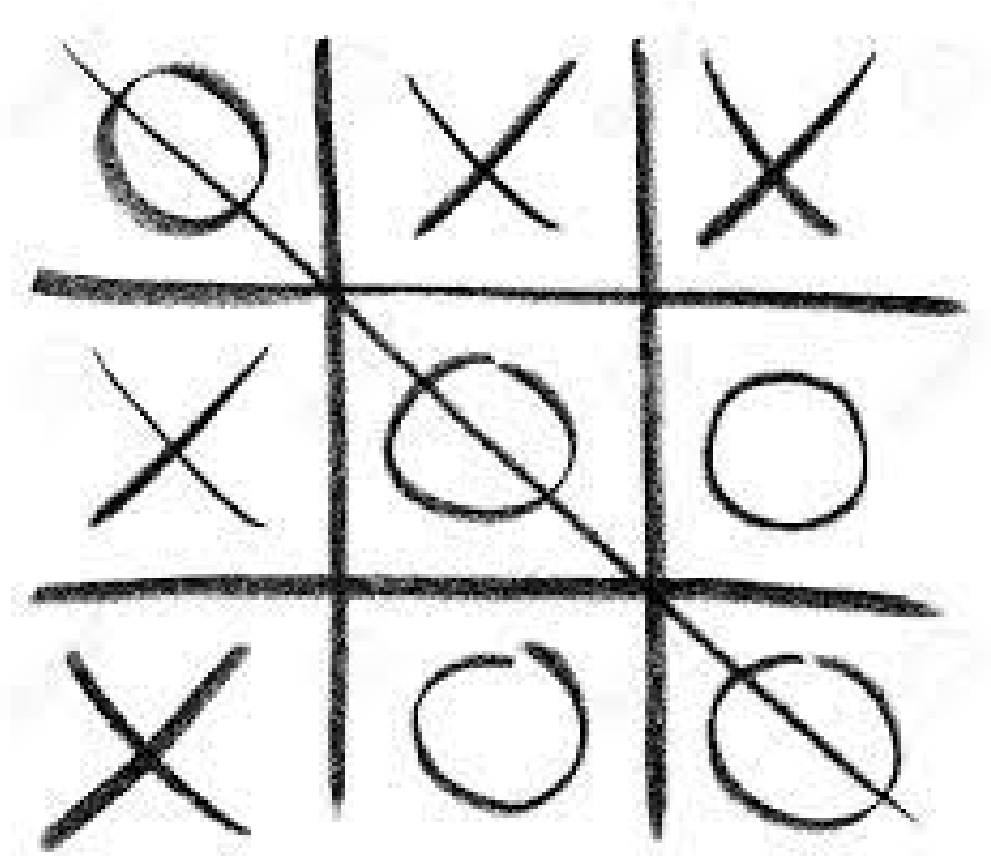


Ontology is the data structure which is known by everybody

```
public class BookOffer() {
    int offerID;
    Book offeredBook;
    int price;
    …
}

public class Book() {
    String bookTitle;
    String authorName;
    Date publishedDate;
    boolean newBook;
    …
}
```

Time for Tic Tac Toe



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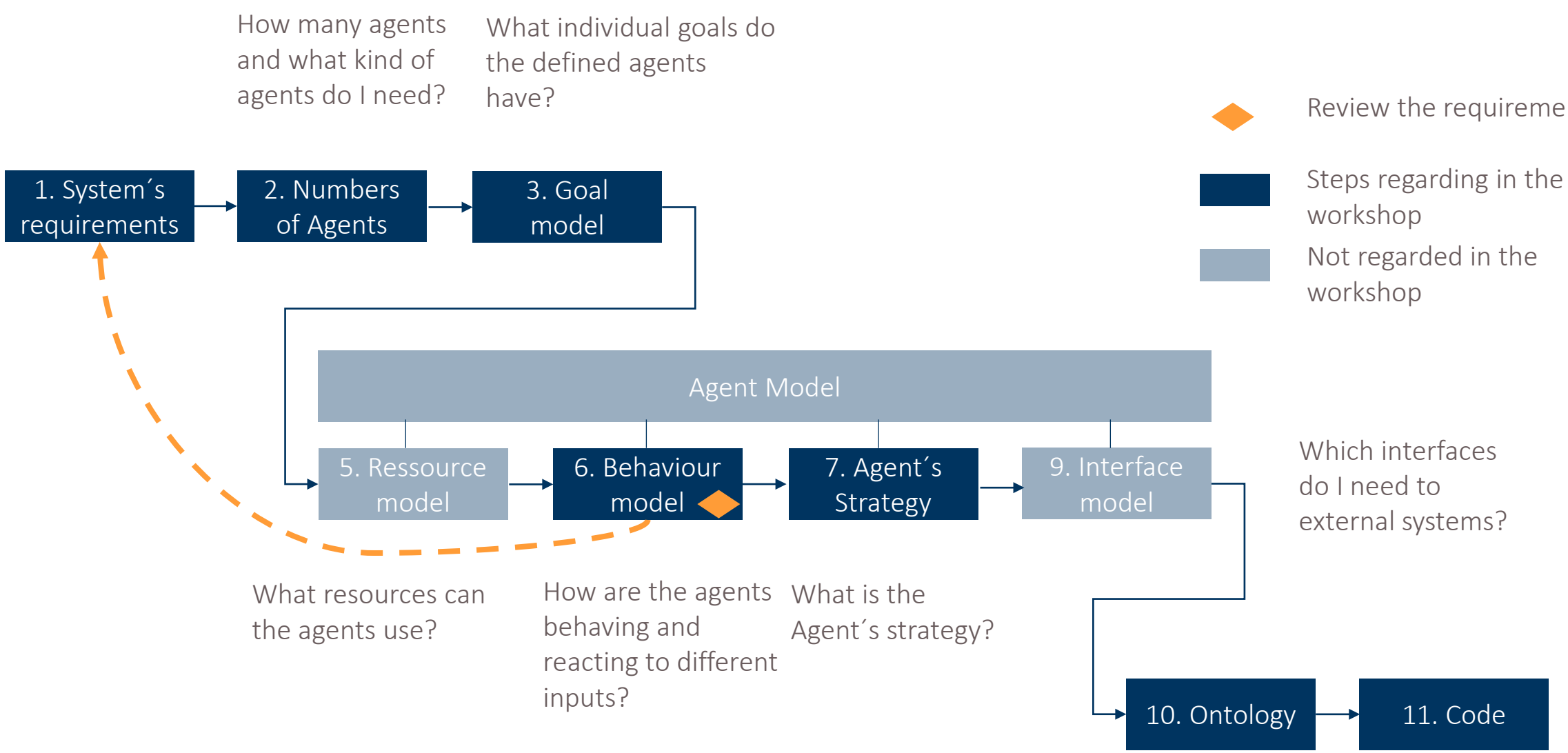

Contact Details

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