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Apêndice I

A Gramática MAS-ML

Este apêndice apresenta duas gramáticas parcialmente descritas no Capítulo 5.3. A gramática MAS-ML ilustrada na Figura 119 define a estrutura das entidades, propriedades e relacionamentos descritos na entrada da fase de transformação das entidades e a estrutura dos relacionamentos e classes gerados na saída. A gramática descrita na Figura 120, que é um sub-conjunto da gramática MAS-ML, define a estrutura dos relacionamentos e classes descritos na entrada da fase de transformação dos relacionamentos e a estrutura do conjunto de classes de saída.

```
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Grammar
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

compounds
    != // /* */ /** <{ }>
    @associates @link @label @clientRole @clientCardinality
    @supplierRole @supplierCardinality
end compounds

tokens
    multi "\d+..\d+" | "\d+..\*" | "\d+"
end tokens

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% PROGRAM
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

define program
    [relationshipDescription+] [basicEntities] [otherEntities]
end define

define basicEntities
    [environment] [NL][NL]
    [organization] [NL][NL]
    [agentRole] [NL][NL]
    [agent] [NL][NL]
end define

define otherEntities
    [entity*]
end define

define entity
    [environment] [NL][NL]
    | [organization] [NL][NL]
```

```

    | [agentRole] [NL][NL]
    | [agent] [NL][NL]
    | [objectRole] [NL][NL]
    | [entityClass] [NL][NL]
end define

define relationshipDescription
    'RELATIONSHIP [relationship][NL] [NL]
end define

define relationship
    [ownership]
    | [inhabit]
    | [play]
    | [control]
    | [dependency]
    | [association]
    | [aggregation]
    | [specialization]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% RELATIONSHIPS
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ownership
define ownership
    [organizationMainID] '1 'OWNS [multiplicity][agentRoleID]
    | [organizationID] '1 'OWNS [multiplicity][objectRoleID]
end define

define organizationMainID
    [organizationID]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% inhabit
define inhabit
    [agentID][multiplicity] 'INHABITS '1 [environmentID]
    | [organizationMainID][multiplicity] 'INHABITS '1
    [environmentID]
    | [entityClassID][multiplicity] 'INHABITS '1 [environmentID]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% play
define play
    [agentID] '1 'PLAYS [multiplicity][agentRoleID] 'IN
    [organizationID]
    | [organizationID] '1 'PLAYS [multiplicity][agentRoleID] 'IN
    [organizationID]
    | [entityClassID] '1 'PLAYS [multiplicity][objectRoleID] 'IN
    [organizationID]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% specialization
define specialization
    [agentID] 'SPECIALIZES [agentID]
    | [organizationID] 'SPECIALIZES [organizationID]

```



```

| [environmentID] 'SPECIALIZES [environmentID]
| [agentRoleID] 'SPECIALIZES [agentRoleID]
| [objectRoleID] 'SPECIALIZES [objectRoleID]
| [entityClassID] 'SPECIALIZES [entityClassID]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% control
define control
    [agentRoleID] [multiplicity]                'CONTROLS
[multiplicity] [agentRoleID] [labelRel]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% dependency
define dependency
    [agentRoleID] [multiplicity] [role]          'DEPENDS      'ON
[role] [multiplicity] [agentRoleID] [labelRel]
| [agentRoleID] [multiplicity] [role]          'DEPENDS      'ON
[role] [multiplicity] [objectRoleID] [labelRel]
| [objectRoleID] [multiplicity] [role]          'DEPENDS      'ON
[role] [multiplicity] [objectRoleID] [labelRel]
| [entityClassID] [multiplicity] [role]          'DEPENDS      'ON
[role] [multiplicity] [entityClassID] [labelRel]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% association
define association
    [objectRoleID] [multiplicity] [role]          'ASSOCIATED    'WITH
[role] [multiplicity] [objectRoleID] [labelRel]
| [agentRoleID] [multiplicity] [role]          'ASSOCIATED    'WITH
[role] [multiplicity] [agentRoleID] [labelRel]
| [agentRoleID] [multiplicity] [role]          'ASSOCIATED    'WITH
[role] [multiplicity] [objectRoleID] [labelRel]
| [environmentID] [multiplicity] [role]          'ASSOCIATED    'WITH
[role] [multiplicity] [environmentID] [labelRel]
| [agentID] [multiplicity] [role]              'ASSOCIATED    'WITH
[role] [multiplicity] [entityClassID] [labelRel]
| [organizationID] [multiplicity] [role]          'ASSOCIATED    'WITH
[role] [multiplicity] [entityClassID] [labelRel]
| [entityClassID] [multiplicity] [role]          'ASSOCIATED    'WITH
[role] [multiplicity] [entityClassID] [labelRel]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% aggregation
define aggregation
    [objectRoleID] [multiplicity] [role]          'AGGREGATES
[role] [multiplicity] [objectRoleID] [labelRel]
| [agentRoleID] [multiplicity] [role]          'AGGREGATES
[role] [multiplicity] [objectRoleID] [labelRel]
| [entityClassID] [multiplicity] [role]          'AGGREGATES
[role] [multiplicity] [entityClassID] [labelRel]
end define

define role
    [id]
    | [empty]
end define

```

```

define multiplicity
    [multi]
    | [empty]
end define

define labelRel
    [id]
    | [empty]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENTITIES
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% AGENT
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

define agent
    'AGENT          [NL]          '(          [agentID]
[IN] [NL] [goal*] [NL] [belief*] [NL] [plan*] [NL] [actionPrePostCondition
*] [NL] [EX] ')
    | [entityClass*] %agent se transforma em class
end define

define agentID
    [id]
end define

define goal
    [leafGoal]
    | [compositeGoal]
end define

define leafGoal
    'GOAL '( [attrBody] [goalPlans+] ')'
    | 'objectGoal '= 'new 'LeafGoal '( [stringlit] ', [stringlit]
', [stringlit] ');[NL]
    'this.goals.add(objectGoal);[NL]
    [goalPlans+]
    | 'objectSubGoal '= 'new 'LeafGoal '( [stringlit] ',
[stringlit] ', [stringlit] ');[NL]
    'objectCompositeGoal.setSubGoal(objectSubGoal);[NL]
    [goalPlans+]
end define

define compositeGoal
    'GOAL '( [attrBody] [goalPlans*] 'SUBGOAL '( [goal+] ')')
    | 'objectCompositeGoal '= 'new 'CompositeGoal '( [stringlit]
', [stringlit] ', [stringlit] ');[NL]
    'this.goals.add(objectCompositeGoal);[NL]
    [goalPlans+]
    [goal*]
    | 'objectSubCompositeGoal '= 'new 'CompositeGoal '(
[stringlit] ', [stringlit] ', [stringlit] ');[NL]
    'objectCompositeGoal.setSubGoal(objectSubCompositeGoal);[NL]
    [goalPlans+]
    [goal*]
end define

define goalPlans

```

```

    'RELATED 'TO 'PLAN [stringlit]
    |'objectGoal.setPlan( [stringlit] ');[NL]
    |'objectCompositeGoal.setPlan( [stringlit] ');[NL]
    |'objectSubGoal.setPlan( [stringlit] ');[NL]
    |'objectSubCompositeGoal.setPlan( [stringlit] ');[NL]
end define

define attrBody
    [varType] ': [varName] '= [varValue]
end define

define varType
    [stringlit]
end define

define varName
    [stringlit]
end define

define varValue
    [stringlit]
    | 'null
end define

define belief
    'BELIEF '( [attrBody] '
    |'this.beliefs.add(new 'Belief '( [stringlit]',
[stringlit]', [stringlit]'));[NL]
    |'this.beliefs.add(new 'Belief '( [stringlit]',
[stringlit]', 'null '));[NL]
end define

define plan
    'PLAN '( [planName] [planActions*] [planGoal]')
    |[entityClass*]
    |'objectPlan '= 'new [planName] '();[NL]
    |'objectPlan.setAgent(this);[NL]
    |'this.plans.add(objectPlan);[NL]
    [planActions*]
    [planGoal]
    |'objectPlan '= 'new [planName] '();[NL]
    |'objectPlan.setOrganization(this);[NL]
    |'this.plans.add(objectPlan);[NL]
    [planActions*]
    [planGoal]
end define

define planActions
    'COMPOSED 'OF 'ACTION [stringlit]
    |'actionAux '= 'null;[NL]
    |'enumActions '= 'this.actions.elements();[NL]
    |'while(enumActions.hasMoreElements()) [NL]
    '{ [NL] [IN]
        |'actionAux '= '(Action)enumActions.nextElement();[NL]
        |'if '(actionAux.getClass().getName().equals(
[stringlit] ')) [NL]
        '{ [NL] [IN]
            |'objectPlan.setAction(actionAux);[NL] [EX]
        '}' [NL] [EX]
    '}' [NL]
end define

```

```

define planGoal
  'RELATED 'TO 'GOAL [varName]
  | 'goalAux '= 'null;[NL]
  'enumGoals '= 'this.goals.elements();[NL]
  'while(enumGoals.hasMoreElements()) [NL]
  '{ [NL] [IN]
    'goalAux '= '(Goal)enumGoals.nextElement();[NL]
    'if '(goalAux.getName().equals( [stringlit]
  ')) [NL]
    '{ [NL] [IN]
      'objectPlan.setGoal(goalAux); [NL] [EX]
    '}[NL]
    'else[NL]
    '{ [NL] [IN]
      'if
[stringlit] ')) [NL]
        '{ [NL] [IN]
          'Vector 'vGoals '=
'goalAux.getSubGoals(); [NL]
          'Enumeration 'enumvGoals '=
'vGoals.elements(); [NL]
          'while '(enumvGoals.hasMoreElements
'()) [NL]
            '{ [NL] [IN]
              'Goal 'theGoal '= '(Goal)
'enumvGoals.nextElement(); [NL]
              'if(theGoal.getName().equals(
[stringlit] ')) [NL] [IN]
                'objectPlan.setGoal(theGoal); [NL] [EX] [EX]
                '}[NL] [EX]
              '}[NL] [EX]
            '}[NL] [EX]
          '}[NL]
        '}[NL]
      '}[NL]
    '}[NL]
  '}[NL]
end define

define goalName
  [stringlit]
end define

define planName
  [id]
end define

define actionPrePostCondition
  [action] [NL] [preCondition*] [postCondition*]
  |[entityClass*]
end define

define action
  'ACTION [actionAssignment]
  |'objectAction '= 'new [actionAssignment] '(); [NL]
  'this.actions.add(objectAction);
end define

define actionAssignment
  [id]
end define

define preCondition

```

```

    'PRECONDITION '( [attrBody] '
    |'objectCondition '= 'new 'Condition '( [stringlit] ',
[stringlit] ', [stringlit]');[NL]
    'objectAction.setPreCondition '(objectCondition);[NL]
end define

define postCondition
    'POSTCONDITION '( [attrBody] '
    |'objectCondition '= 'new 'Condition '( [stringlit] ',
[stringlit] ', [stringlit]');[NL]
    'objectAction.setPostCondition '(objectCondition);[NL]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ORGANIZATION

define organizationMain
    [organization]
end define

define organization
    'ORGANIZATION                                [NL]                                '(
[organizationID][IN][NL][goal*][NL][belief*][NL][plan*][NL][action
PrePostCondition*][NL][axiom*][NL][EX] ')
    | [entityClass*]
end define

define organizationID
    [id]
end define

define axiom
    'AXIOM '( [attrBody] '
    |'this.axioms.add(new 'Axiom '( [stringlit]', [stringlit]',
[stringlit]');[NL]
    |'this.axioms.add(new 'Axiom '( [stringlit]', [stringlit]',
'null '));[NL]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% AGENT ROLE

define agentRole
    'AGENTROLE                                [NL]
'([agentRoleID][IN][NL][roleGoal+][NL][belief*][NL][duty*][NL][rig
ht*][NL][protocolMessage*] [NL][EX]')
    |[entityClass*] %agentRole se transforma em class
end define

define agentRoleID
    [id]
end define

define roleGoal
    [roleLeafGoal]
    | [roleCompositeGoal]
end define

define roleLeafGoal
    'ROLEGOAL '( [attrBody] '

```

```

    |'objectGoal '= 'new 'LeafGoal '( [stringlit] ', [stringlit]
', [stringlit] ');[NL]
    |this.goals.add(objectGoal);[NL]
    |'objectSubGoal '= 'new 'LeafGoal '( [stringlit] ',
[stringlit] ', [stringlit] ');[NL]
    |'objectCompositeGoal.setSubGoal(objectSubGoal);[NL]
end define

define roleCompositeGoal
    'ROLEGOAL '( [attrBody] 'SUBGOAL '( [roleGoal+] ')')
    |'objectCompositeGoal '= 'new 'CompositeGoal '( [stringlit]
', [stringlit] ', [stringlit] ');[NL]
    |this.goals.add(objectCompositeGoal);[NL]
    [roleGoal*]
    |'objectSubCompositeGoal '= 'new 'CompositeGoal '(
[stringlit] ', [stringlit] ', [stringlit]');[NL]
    |'objectCompositeGoal.setSubGoal(objectSubCompositeGoal);[NL]
    [roleGoal*]
end define

define duty
    'DUTY [stringlit]
    |'this.duties.add(new 'Duty '( [stringlit] ')); [NL]
end define

define right
    'RIGHT [stringlit]
    |'this.rights.add(new 'Right '( [stringlit] ')); [NL]
end define

define protocolMessage
    [protocol][message+]
    |[entityClass*]
end define

define protocol
    'PROTOCOL [id]
    |'objectProtocol '= 'new [id] '(); [NL]
    |'this.protocols.add(objectProtocol); [NL]
end define

define message
    'MESSAGE [IN][NL]'( [labelMessage][NL][IN][opt
content][NL][sender][NL][receiver][NL][EX] ') [NL][EX]
    |'objectMessage '= 'new 'Message '( [stringlit] ',
[stringlit] ', [stringlit] ', [stringlit]'); [NL]
    |'objectProtocol.setMessage(objectMessage); [NL]
end define

define labelMessage
    'LABEL [stringlit]
end define

define content
    'CONTENT [stringlit]
end define

define sender
    'SENDER [stringlit]
end define

```

```

define receiver
  'RECEIVER [stringlit]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% OBJECT ROLE

define objectRole
  'OBJECTROLE [NL] ' (
[objectRoleID]' ([NL] [IN] [attributeDescription*] [NL] [methodDescription*] [NL] [EX]')')
end define

define objectRoleID
  [id]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% CLASS

define entityClass
  [opt importDef] [static] [visibility] [concret] 'class
[entityClassID] [inheritance*] [NL] '{ [NL] [IN] [attributeDescription*]
[methodDescription*] [EX]'} [NL] [NL]
  [entityClass*] % uma classe pode virar mais de uma classe
  [actionPrePostCondition*] % action se transforma em class
  [plan*] % plano se tranforma em class
  [protocolMessage*] % protocolo se transforma em class
end define

define importDef
  'import 'java.util.*; [NL]
end define

define inheritance
  'extends [entityClassID]
end define

define entityClassID
  [id]
end define

define static
  'static
  | [empty]
end define

define concret
  'abstract
  | [empty]
end define

define visibility
  'public
  | 'private
  | 'protected
end define

define attributeDescription

```

```

[opt
[static][visibility][concret][attribType][attribName]
[attribValue]';[NL]
end define

define coments
  /** [NL]
  * '@associates <{[id]}>[NL]
  * '@link [id][NL]
  [opt comentsLabel]
  [opt comentsClientRole]
  [opt comentsClientCardinality]
  [opt comentsSupplierRole]
  [opt comentsSupplierCardinality]
  */[NL]
end define

define comentsLabel
  * '@label [id][NL]
end define

define comentsClientRole
  * '@clientRole [id][NL]
end define

define comentsClientCardinality
  * '@clientCardinality [multi][NL]
end define

define comentsSupplierRole
  * '@supplierRole [id][NL]
end define

define comentsSupplierCardinality
  * '@supplierCardinality [multi][NL]
end define

define methodDescription
  [static][visibility][concret][outParameter][assignment]'(
[list inParameter] ') [method*][NL]
end define

define method
  [NL]'{ [NL][IN][methodBody*][EX][NL] ' }
  | ';
end define

define methodBody
  [not 'import][not visibility][not 'ENVIRONMENT][not
'ORGANIZATION][not 'AGENTROLE][not 'AGENT]
  [not 'OBJECTROLE][token]
  |
  [goal+][belief*][actionPrePostCondition+][plan+][axiom*]
  | [goal+][belief*][actionPrePostCondition+][plan+]
  | [roleGoal+][belief*][duty*][right*][protocolMessage*]
end define

define assignment
  [id]
end define

```



```

define outParameter
  [id]
  | 'void
  | [empty]
end define

define inParameter
  [attribType][attribName]
  | [empty]
end define

define attribType
  [id]
end define

define attribName
  [id]
end define

define attribValue
  [id]
  | [stringlit]
  | 'new 'Vector()
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENVIRONMENT

define environment
  [proactiveEnvironment]
  | [reactiveEnvironment]
end define

define environmentID
  [id]
end define

define proactiveEnvironment
  'ENVIRONMENT [NL]'( [NL][IN][agent] [NL][EX]')
  | [agent*] %environment se transforma em agent para depois
se transformar em classe
end define

define reactiveEnvironment
  'ENVIRONMENT [NL]'( [NL][IN][entityClass] [NL][EX]')
  | [entityClass*] %environment se transforma em classe
end define

```

Figura 119 – A gramática MAS-ML usada na fase de transformação das entidades.

```

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% Grammar
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

compounds
  != // /* */ /** <{ }> /*#
  @associates @link @label @clientRole @clientCardinality
  @supplierRole @supplierCardinality
end compounds

tokens
  multi "\d+..\d+" | "\d+..\*" | "\d+"

```

```

end tokens

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% PROGRAM
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

define program
    [UMLprogram*]
end define

define UMLprogram
    [relationshipDescription*][entityClass*]
end define

define relationshipDescription
    'RELATIONSHIP [relationship] [NL] [NL]
end define

define relationship
    [ownership]
    | [inhabit]
    | [play]
    | [control]
    | [dependency]
    | [association]
    | [aggregation]
    | [specialization]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% RELATIONSHIPS
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ownership
define ownership
    [id] [multiplicity] 'OWNS [multiplicity] [id]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% inhabit
define inhabit
    [id] [multiplicity] 'INHABITS '1 [id]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% play
define play
    [id] [multiplicity] 'PLAYS [multiplicity] [id] 'IN [id]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% specialization
define specialization
    [id] 'SPECIALIZES [id]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% control
define control
    [id] [multiplicity] 'CONTROLS [multiplicity][id][labelRel]

```

```

end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% dependency
define dependency
    [id][multiplicity][role]          'DEPENDS'          'ON'
    [role][multiplicity][id][labelRel]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% association
define association
    [id][multiplicity][role]          'ASSOCIATED'       'WITH'
    [role][multiplicity][id][labelRel]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% aggregation
define aggregation
    [id][multiplicity][role]          'AGGREGATES'
    [role][multiplicity][id][labelRel]
end define

define role
    [id]
    | [empty]
end define

define multiplicity
    [multi]
    | [empty]
end define

define labelRel
    [id]
    | [empty]
end define

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% ENTITIES
%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
% CLASS

define entityClass
    [opt importDef][static][visibility][concret] 'class'
    [entityClassID][inheritance*][NL]'{[NL][IN]
    [comentsAttrib*][methodDescription*][EX]'}[NL][NL]
end define

define comentsAttrib
    [generalComents*][attributeDescription*]
end define

define importDef
    'import java.util.*;[NL]
end define

define static
    'static

```

```

    | [empty]
end define

define visibility
    'public
    | 'private
    | 'protected
end define

define concret
    'abstract
    | [empty]
end define

define entityClassID
    [id]
end define

define inheritance
    'extends [entityClassID]
end define

define attributeDescription
    [static][visibility][concret][attribType][attribName]      '='
    [attribValue]';[NL]
end define

define generalComents
    '/**
    [NL]
    [coments*]
    '* '@link [id][NL]
    [opt comentsLabel]
    [opt comentsClientRole]
    [opt comentsClientCardinality]
    [opt comentsSupplierRole]
    [opt comentsSupplierCardinality]
    '*/[NL]
    [comentsDepAttrib*]
end define

define coments
    '* '@associates <{[id]}>[NL]
    | '* '@associates [token][NL]
end define

define comentsLabel
    '* '@label [labelRel][NL]
end define

define comentsClientRole
    '* '@clientRole [role][NL]
end define

define comentsClientCardinality
    '* '@clientCardinality [multiplicity][NL]
end define

define comentsSupplierRole
    '* '@supplierRole [role][NL]

```

```

end define

define comentsSupplierCardinality
  '* '@supplierCardinality [multiplicity][NL]
end define

define comentsDepAttrib
  '/*# [id] [id] '; '*/[NL]
  |[attributeDescription]
end define

define varType
  [stringlit]
  |[id]
end define

define varName
  [stringlit]
  |[id]
end define

define varValue
  [stringlit]
  |[id]
  | 'null
end define

define methodDescription
  [static][visibility][concret][outParameter][assignment]'(
  [list inParameter] ') [method*][NL]
end define

define outParameter
  [id]
  | 'void
  | [empty]
end define

define assignment
  [id]
end define

define inParameter
  [attribType][attribName]
  | [empty]
end define

define attribType
  [id]
end define

define attribName
  [id]
end define

define attribValue
  [id]
  |[stringlit]
  | 'new 'Vector()
end define

```

```

define method
    [NL] '{
[NL] [IN] [partialAttribDescription*] [methodBody*] [EX] [NL] ' }
    | ';
end define

define partialAttribDescription
    [attribType][attribName] '= [attribValue]';[NL]
end define

define methodBody
    [token]';[NL]
    | [NL] '{[NL] [IN] [token]
    | [NL] [EX] '}[NL]
    | [not 'import][not visibility][token]
end define

```

Figura 120 – O sub-conjunto da gramática MAS-ML usada na fase de transformação dos relacionamentos.

Apêndice II

A Descrição Textual do Exemplo do Virtual Marketplace

Os diagramas estruturais de MAS-ML que modelam o exemplo *Virtual Marketplace* foram descritos usando a gramática MAS-ML (Apêndice I). A descrição textual do exemplo está ilustrada na Figura 121.

```

RELATIONSHIP General_Store 1..* INHABITS 1 Virtual_Marketplace
RELATIONSHIP User_Agent 0..* INHABITS 1 Virtual_Marketplace
RELATIONSHIP Store_Agent 0..* INHABITS 1 Virtual_Marketplace
RELATIONSHIP Second_hand_Bookstore 0..* INHABITS 1
Virtual_Marketplace
RELATIONSHIP Imported_Bookstore 0..* INHABITS 1
Virtual_Marketplace

RELATIONSHIP General_Store 1 OWNS 0..* Buyer
RELATIONSHIP General_Store 1 OWNS 0..* Seller
RELATIONSHIP General_Store 1 OWNS 0..* Market_of_Special_Goods
RELATIONSHIP General_Store 1 OWNS 0..* Market_of_Used_Goods
RELATIONSHIP General_Store 1 OWNS 0..* Desire
RELATIONSHIP General_Store 1 OWNS 0..* Offer

RELATIONSHIP User_Agent 1 PLAYS 0..* Buyer IN General_Store
RELATIONSHIP Store_Agent 1 PLAYS 0..* Seller IN General_Store
RELATIONSHIP Book 1 PLAYS 0..* Desire IN General_Store
RELATIONSHIP Book 1 PLAYS 0..* Offer IN General_Store

RELATIONSHIP Second_hand_Bookstore 1 PLAYS 0..*
Market_of_Used_Goods IN General_Store
RELATIONSHIP Imported_Bookstore 1 PLAYS 0..*
Market_of_Special_Goods IN General_Store

RELATIONSHIP Second_hand_Bookstore 1 OWNS 0..*
Buyer_of_Second_hand_Books
RELATIONSHIP Second_hand_Bookstore 1 OWNS 0..*
Seller_of_Second_hand_Books
RELATIONSHIP Second_hand_Bookstore 1 OWNS 0..*
Desire_of_Second_hand_Books
RELATIONSHIP Second_hand_Bookstore 1 OWNS 0..*
Offer_of_Second_hand_Books

RELATIONSHIP User_Agent 1 PLAYS 0..* Buyer_of_Second_hand_Books
IN Second_hand_Bookstore
RELATIONSHIP User_Agent 1 PLAYS 0..* Seller_of_Second_hand_Books
IN Second_hand_Bookstore
RELATIONSHIP Second_hand_Book 1 PLAYS 0..*
Desire_of_Second_hand_Books IN Second_hand_Bookstore
RELATIONSHIP Second_hand_Book 1 PLAYS 0..*
Offer_of_Second_hand_Books IN Second_hand_Booksstore

RELATIONSHIP Imported_Bookstore 1 OWNS 0..*
Buyer_of_Imported_Books

```

```

RELATIONSHIP Imported_Bookstore 1 OWNS 0..*
                Seller_of_Imported_Books
RELATIONSHIP Imported_Bookstore 1 OWNS 0..*
                Desire_of_Imported_Books
RELATIONSHIP Imported_Bookstore 1 OWNS 0..*
                Offer_of_Imported_Books

RELATIONSHIP User_Agent 1 PLAYS 0..* Buyer_of_Imported_Books IN
                Imported_Bookstore
RELATIONSHIP Store_Agent 1 PLAYS 0..* Seller_of_Imported_Books IN
                Imported_Bookstore
RELATIONSHIP Imported_Book 1 PLAYS 0..* Desire_of_Imported_Books
                IN Imported_Bookstore
RELATIONSHIP Imported_Book 1 PLAYS 0..* Offer_of_Imported_Books
                IN Imported_Booksstore

RELATIONSHIP Desire_of_Second_hand_Books SPECIALIZES Desire
RELATIONSHIP Desire_of_Imported_Books SPECIALIZES Desire
RELATIONSHIP Offer_of_Second_hand_Books SPECIALIZES Offer
RELATIONSHIP Offer_of_Imported_Books SPECIALIZES Offer

RELATIONSHIP Seller_of_Imported_Books SPECIALIZES Seller
RELATIONSHIP Seller_of_Second_hand_Books SPECIALIZES
                Seller_of_Imported_Books

RELATIONSHIP Buyer_of_Second_hand_Books 0..* ASSOCIATED WITH 0..*
                Desire_of_Second_hand_Books
RELATIONSHIP Seller_of_Second_hand_Books 0..* ASSOCIATED WITH 0..*
                Offer_of_Second_hand_Books
RELATIONSHIP Buyer 1 ASSOCIATED WITH 0..* Desire
RELATIONSHIP Seller 1 ASSOCIATED WITH 0..* Offer

RELATIONSHIP Seller 0..* ASSOCIATED WITH 0..* Buyer

RELATIONSHIP Buyer 0..* ASSOCIATED WITH 0..*
                Market_of_Special_Goods
RELATIONSHIP Buyer 0..* ASSOCIATED WITH 0..* Market_of_Used_Goods
RELATIONSHIP Seller_of_Second_hand_Books 0..* ASSOCIATED WITH 1..*
                Market_of_Used_Goods
RELATIONSHIP Seller_of_Second_hand_Books 0..* ASSOCIATED WITH 0..*
                Buyer_of_Second_hand_Books

RELATIONSHIP Buyer 1 AGGREGATES 0..* Buyer_of_Second_hand_Books
RELATIONSHIP Buyer 1 AGGREGATES 0..* Buyer_of_Imported_Books

RELATIONSHIP Buyer_of_Imported_Books 1 ASSOCIATED WITH 0..*
                Desire_of_Imported_Books
RELATIONSHIP Market_of_Special_Goods 1 ASSOCIATED WITH 0..*
                Buyer_of_Imported_Books
RELATIONSHIP Market_of_Special_Goods 1 ASSOCIATED WITH 0..*
                Seller_of_Imported_Books
RELATIONSHIP Buyer_of_Imported_Books 1 ASSOCIATED WITH 0..*
                Seller_of_Imported_Books
RELATIONSHIP Seller_of_Imported_Books 1 ASSOCIATED WITH 0..*
                Offer_of_Imported_Books

RELATIONSHIP Book SPECIALIZES Item
RELATIONSHIP Imported_Book SPECIALIZES Book
RELATIONSHIP Second_hand_Book SPECIALIZES Book

```



```

RELATIONSHIP Virtual_Marketplace 0..* ASSOCIATED WITH 0..*
                                Virtual_Marketplace
RELATIONSHIP Virtual_Marketplace 1 habitat ASSOCIATED WITH member
0..* Item

ENVIRONMENT
(
import java.util.*;
public class Virtual_Marketplace
{
    public Vector getItems ()
    {
        return this.theItem;
    }
    public void setItems (Item newItem)
    {
        this.theItem.add (newItem);
    }
    public void sellItem (Item newItem)
    {
        newItem.setSold();
    }
    public Vector getItems ()
    {
        return this.theItem;
    }
    public Vector getOtherEnvironments ()
    {
        return this.theVirtual_Marketplace;
    }
    public void setOtherEnvironments (Environment newEnvironment)
    {
        this.theVirtual_Marketplace.add (newEnvironment);
    }
    public boolean checkAgentCanLeave (Agent newAgent)
    {
    }
}
)

ORGANIZATION
( General_Store
    GOAL ( "boolean" : "management_of_sellers" = "true"
          RELATED TO PLAN "Creating_sellers"
        )
    GOAL ( "boolean" : "management_of_orders" = "true"
          RELATED TO PLAN "Update_environment_plan"
        )
    GOAL ( "boolean" : "management_of_profit" = "true"
          RELATED TO PLAN "Evaluating_profit"
        )
    BELIEF ("boolean" : "management" = "false")
    BELIEF ("boolean" : "management_of_sellers" = "false")
    BELIEF ("boolean" : "management_of_orders" = "false")
    BELIEF ("Vector" : "sales" = null)
    BELIEF ("Vector" : "sellers" = null)
    BELIEF ("Vector" : "buyers" = null)
    PLAN ( Creating_sellers
          COMPOSED OF ACTION "Create_seller"
          COMPOSED OF ACTION "Inform_buyer_of_seller"
        )
)

```

```

        RELATED TO GOAL "management_of_sellers"
    )
    PLAN ( Update_environment_plan
          COMPOSED OF ACTION "Update_environment_action"
          RELATED TO GOAL "management_of_orders"
    )
    PLAN ( Evaluating_profit
          COMPOSED OF ACTION "Evaluate_profit"
          COMPOSED OF ACTION "Register_sale"
          RELATED TO GOAL "management_of_profit"
    )
    ACTION Create_seller
    ACTION Inform_buyer_of_seller
    ACTION Update_environment_action
    ACTION Evaluate_profit
    ACTION Register_order
    AXIOM ("boolean" : "Send_information_about_sale" = "true")
)

AGENTROLE
( Buyer
  ROLEGOAL ("boolean" : "itemBought" = "true"
  )
  DUTY "Search_for_seller"
  RIGHT "Send_answer_proposal_accept"
  RIGHT "Send_answer_proposal_reject"
  PROTOCOL SimpleNegotiation
  MESSAGE
    (LABEL "Request"
      CONTENT "ItemDescription"
      SENDER "Buyer"
      RECEIVER "Seller"
    )
  MESSAGE
    (LABEL "Proposal"
      CONTENT "ItemDescription"
      SENDER "Seller"
      RECEIVER "Buyer"
    )
  MESSAGE
    (LABEL "AnswerProposal"
      CONTENT "RejectItemDescription"
      SENDER "Buyer"
      RECEIVER "Seller"
    )
  MESSAGE
    (LABEL "AnswerProposal"
      CONTENT "AcceptItemDescription"
      SENDER "Buyer"
      RECEIVER "Seller"
    )
  MESSAGE
    (LABEL "Inform"
      CONTENT "Bill"
      SENDER "Seller"
      RECEIVER "Buyer"
    )
  MESSAGE
    (LABEL "Inform"
      CONTENT "Payment"

```

```

        SENDER "Buyer"
        RECEIVER "Seller"
    )

    PROTOCOL To_request_to_enter_in_market_of_Special_Goods
    MESSAGE
    (LABEL "Request"
        CONTENT "OrgGoals"
        SENDER "Buyer"
        RECEIVER "Market_of_Special_Goods"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "OrgGoals"
        SENDER "Market_of_Special_Goods"
        RECEIVER "Buyer"
    )
    MESSAGE
    (LABEL "Request"
        CONTENT "Roles"
        SENDER "Buyer"
        RECEIVER "Market_of_Special_Goods"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "Roles"
        SENDER "Market_of_Special_Goods"
        RECEIVER "Buyer"
    )
    MESSAGE
    (LABEL "Request"
        CONTENT "RoleToPlay"
        SENDER "Buyer"
        RECEIVER "Market_of_Special_Goods"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "PermissionAccept"
        SENDER "Market_of_Special_Goods"
        RECEIVER "Buyer"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "PermissionReject"
        SENDER "Market_of_Special_Goods"
        RECEIVER "Buyer"
    )
)

    PROTOCOL To_enter_in_market_of_Used_Goods
    MESSAGE
    (LABEL "Resquest"
        CONTENT "OrgGoals"
        SENDER "Buyer"
        RECEIVER "Market_of_Used_Goods"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "OrgGoals"
        SENDER "Market_of_Used_Goods"
        RECEIVER "Buyer"
    )
)

```

```

MESSAGE
  (LABEL "Request"
   CONTENT "Roles"
   SENDER "Buyer"
   RECEIVER "Market_of_Used_Goods"
  )
MESSAGE
  (LABEL "Inform"
   CONTENT "Roles"
   SENDER "Market_of_Used_Goods"
   RECEIVER "Buyer"
  )
MESSAGE
  (LABEL "Inform"
   CONTENT "RoleToPlay"
   SENDER "Buyer"
   RECEIVER "Market_of_Used_Goods"
  )
)

AGENT
( User_Agent
  GOAL ( "boolean" : "itemBought" = "true"
    SUBGOAL (
      GOAL ( "boolean" : "searchSeller" = "true"
        RELATED TO PLAN "Searching_seller"
      )
      GOAL ( "boolean" : "negotiate" = "true"
        RELATED TO PLAN "Buying_item"
        RELATED TO PLAN "Complex_Buying_item"
      )
      GOAL ( "boolean" : "enterOrganization" = "true"
        RELATED TO PLAN "Entering_organization"
        RELATED TO PLAN "Leaving_environment"
      )
    )
  )
  GOAL ( "boolean" : "itemSold" = "true"
    SUBGOAL (
      GOAL ( "boolean" : "announce" = "false"
        RELATED TO PLAN "Announcing_item"
      )
      GOAL ( "boolean" : "negotiate" = "true"
        RELATED TO PLAN "Selling_item"
      )
    )
  )
  BELIEF ("Item" : "itemBought" = "false")
  BELIEF ("Item" : "itemSold" = "false")
  BELIEF ("Item" : "item" = "null")
  PLAN ( Searching_seller
    COMPOSED OF ACTION "Search_for_seller"
    RELATED TO GOAL "searchSeller"
  )
  PLAN ( Buying_item
    COMPOSED OF ACTION "Create_item"
    COMPOSED OF ACTION "Send_request_item"
    COMPOSED OF ACTION "Eval_proposal"
    COMPOSED OF ACTION "Send_answer_proposal_accept"
    COMPOSED OF ACTION "Send_answer_proposal_reject"
  )
)

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        COMPOSED OF ACTION "Check_bill"
        COMPOSED OF ACTION "Send_payment"
        RELATED TO GOAL "negotiate"
    )
    PLAN ( Complex_Buying_item
        COMPOSED OF ACTION "Create_item"
        COMPOSED OF ACTION "Send_request_item"
        COMPOSED OF ACTION "Eval_proposal"
        COMPOSED OF ACTION "Create_counter_proposal"
        COMPOSED OF ACTION "Check_bill"
        COMPOSED OF ACTION "Send_payment"
        RELATED TO GOAL "negotiate"
    )
    PLAN ( Entering_organization
        COMPOSED OF ACTION "Search_for_organization"
        COMPOSED OF ACTION "Check_organization_goals"
        COMPOSED OF ACTION "Check_organization_roles"
        COMPOSED OF ACTION "Select_role_to_play"
        COMPOSED OF ACTION
    "Register_itself_in_organization"
        COMPOSED OF ACTION "Search_for_announcement"
        RELATED TO GOAL "enterOrganization"
    )
    PLAN ( Leaving_environment
        COMPOSED OF ACTION "Search_for_environment"
        COMPOSED OF ACTION "Search_for_organization"
        COMPOSED OF ACTION "Check_organization_goals"
        COMPOSED OF ACTION "Check_organization_roles"
        COMPOSED OF ACTION "Select_role_to_play"
        COMPOSED OF ACTION
    "Register_itself_in_organization"
        RELATED TO GOAL "enterOrganization"
    )
    PLAN ( Announcing_item
        COMPOSED OF ACTION "Announce"
        RELATED TO GOAL "announce"
    )
    PLAN ( Selling_item
        COMPOSED OF ACTION "Create_proposal"
        COMPOSED OF ACTION "Eval_counter_proposal"
        COMPOSED OF ACTION
    "Send_answer_counter_proposal_accept"
        COMPOSED OF ACTION
    "Send_answer_counter_proposal_reject"
        COMPOSED OF ACTION "Calculate_bill"
        COMPOSED OF ACTION "Inform_organization"
        RELATED TO GOAL "negotiate"
    )
    ACTION Search_for_seller POSTCONDITION ( "boolean" :
"seller" = "true")
    ACTION Create_item
    ACTION Send_request_item
    ACTION Eval_proposal PRECONDITION ( "boolean" : "proposal" =
"true")
    ACTION Send_answer_proposal
    ACTION Send_answer_proposal_accept
    ACTION Send_answer_proposal_reject
    ACTION Check_bill
    ACTION Create_item
    ACTION Eval_proposal
    ACTION Create_counter_proposal

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ACTION Send_payment
ACTION Search_for_organization
ACTION Check_organization_goals
ACTION Check_organization_roles
ACTION Select_role_to_play
ACTION Register_itself_in_organization
ACTION Search_for_announcement
ACTION Search_for_environment
ACTION Announce
ACTION Create_proposal
ACTION Eval_counter_proposal
ACTION Send_answer_counter_proposal_accept
ACTION Send_answer_counter_proposal_reject
ACTION Calculate_bill
ACTION Inform_organization
)

AGENT
( Store_Agent
  GOAL ( "boolean" : "itemSold" = "true"
        RELATED TO PLAN "Selling_item"
        RELATED TO PLAN "Informing_organization_about_sale"
      )
  BELIEF ("Item" : "itemSold" = "false")

  PLAN ( Selling_item
        COMPOSED OF ACTION "Create_proposal"
        COMPOSED OF ACTION "Calculate_bill"
        COMPOSED OF ACTION "Inform_organization"
        RELATED TO GOAL "itemSold"
      )
  PLAN ( Informing_organization_about_sale
        COMPOSED OF ACTION "Inform_organization"
        RELATED TO GOAL "itemSold"
      )
  ACTION Create_proposal
  ACTION Calculate_bill
  ACTION Inform_organization
)

AGENTROLE
( Seller
  ROLEGOAL ("boolean" : "itemSold" = "true"
  )
  DUTY "Inform_organization"
  PROTOCOL SimpleNegotiation
  MESSAGE
    (LABEL "Request"
      CONTENT "ItemDescription"
      SENDER "Buyer"
      RECEIVER "Seller"
    )
  MESSAGE
    (LABEL "Proposal"
      CONTENT "ItemDescription"
      SENDER "Seller"
      RECEIVER "Buyer"
    )
  MESSAGE
    (LABEL "AnswerProposal"
      CONTENT "RejectItemDescription"
    )
)

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        SENDER "Buyer"
        RECEIVER "Seller"
    )
    MESSAGE
    (LABEL "AnswerProposal"
     CONTENT "AcceptItemDescription"
     SENDER "Buyer"
     RECEIVER "Seller"
    )
    MESSAGE
    (LABEL "Inform"
     CONTENT "Bill"
     SENDER "Seller"
     RECEIVER "Buyer"
    )
    MESSAGE
    (LABEL "Inform"
     CONTENT "Payment"
     SENDER "Buyer"
     RECEIVER "Seller"
    )
)

ORGANIZATION
( Second_hand_Bookstore
  GOAL ( "boolean" : "management_of_entrance" = "true"
        RELATED TO PLAN "Managing_entrance"
      )
  GOAL ( "boolean" : "management_of_announcement" = "true"
        RELATED TO PLAN "Managing_announcement"
      )
  GOAL ( "boolean" : "management_of_order" = "true"
        RELATED TO PLAN "Registering_sale"
      )
  BELIEF ( "boolean" : "management_of_entrance" = "false")
  BELIEF ( "boolean" : "management_of_announcement" = "false")
  BELIEF ( "boolean" : "management_of_order" = "false")
  BELIEF ( "Vector" : "sales" = null)
  BELIEF ( "Vector" : "announcements" = null)

  PLAN ( Managing_entrance
        COMPOSED OF ACTION "Get_Organization_Goals"
        COMPOSED OF ACTION "Get_Organization_Roles"
        COMPOSED OF ACTION "Register_new_buyer"
        RELATED TO GOAL "management_of_entrance"
      )
  PLAN ( Managing_announcement
        COMPOSED OF ACTION "Register_announcement"
        COMPOSED OF ACTION "Get_Announcement"
        COMPOSED OF ACTION "Inform_Announcement_and_Seller"
        RELATED TO GOAL "management_of_announcement"
      )
  PLAN ( Registering_sale
        COMPOSED OF ACTION "Register_sale"
        COMPOSED OF ACTION "Inform_supplier_organization"
        RELATED TO GOAL "management_of_order"
      )
  ACTION Get_Organization_Goals
  ACTION Get_Organization_Roles
  ACTION Register_new_buyer

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ACTION Register_announcement
ACTION Get_Announcement
ACTION Inform_Announcement_and_Seller
ACTION Register_sale
ACTION Inform_supper_organization
AXIOM ("boolean" : "Send_information_about_sale" = "true")
)

ORGANIZATION
( Imported_Bookstore
  GOAL ( "boolean" : "management_of_buyers" = "true"
        RELATED TO PLAN "Analyzing_entrance"
      )
  GOAL ( "boolean" : "management_of_sellers" = "true"
        RELATED TO PLAN "Creating_sellers"
      )
  GOAL ( "boolean" : "management_of_orders" = "true"
        RELATED TO PLAN "Registering_sale"
      )
  BELIEF ( "boolean" : "management_of_buyers" = "false")
  BELIEF ( "boolean" : "management_of_sellers" = "false")
  BELIEF ( "boolean" : "management_of_orders" = "false")
  BELIEF ( "Vector" : "sellers" = null)
  BELIEF ( "Vector" : "buyers" = null)
  BELIEF ( "Vector" : "sales" = null)
  BELIEF ( "Organization" : "main_organization" = null)
  PLAN ( Analyzing_entrance
        COMPOSED OF ACTION "Get_Organization_Goals"
        COMPOSED OF ACTION "Get_Organization_Roles"
        COMPOSED OF ACTION "Analyze_entrance"
        COMPOSED OF ACTION "Register_new_buyer"
        RELATED TO GOAL "management_of_buyers"
      )
  PLAN ( Creating_sellers
        COMPOSED OF ACTION "Create_seller"
        COMPOSED OF ACTION "Inform_buyer_of_seller"
        RELATED TO GOAL "management_of_sellers"
      )
  PLAN ( Registering_sale
        COMPOSED OF ACTION "Register_sale"
        COMPOSED OF ACTION "Inform_supper_organization"
        COMPOSED OF ACTION "Update_environment_action"
        RELATED TO GOAL "management_of_order"
      )
)

ACTION Get_Organization_Goals
ACTION Get_Organization_Roles
ACTION Analyze_entrance
ACTION Register_new_buyer
ACTION Create_seller
ACTION Inform_buyer_of_seller
ACTION Register_sale
ACTION Inform_supper_organization
ACTION Update_environment_action
AXIOM ("boolean" : "Send_information_about_sale" = "true")
)

AGENTROLE
( Market_of_Used_Goods
  ROLEGOAL ("boolean" : "management_of_entrance" = "true"
  )
)

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ROLEGOAL ("boolean" : "management_of_announcement" = "true"
)
ROLEGOAL ( "boolean" : "management_of_orders" = "true"
)
PROTOCOL To_enter_in_market_of_Used_Goods
  MESSAGE
    (LABEL "Request"
      CONTENT "OrgGoals"
      SENDER "Buyer"
      RECEIVER "Market_of_Used_Goods"
    )
  MESSAGE
    (LABEL "Inform"
      CONTENT "OrgGoals"
      SENDER "Market_of_Used_Goods"
      RECEIVER "Buyer"
    )
  MESSAGE
    (LABEL "Request"
      CONTENT "Roles"
      SENDER "Buyer"
      RECEIVER "Market_of_Used_Goods"
    )
  MESSAGE
    (LABEL "Inform"
      CONTENT "Roles"
      SENDER "Market_of_Used_Goods"
      RECEIVER "Buyer"
    )
  MESSAGE
    (LABEL "Inform"
      CONTENT "RoleToPlay"
      SENDER "Buyer"
      RECEIVER "Market_of_Used_Goods"
    )

PROTOCOL Buyer_registration
  MESSAGE
    (LABEL "Inform"
      CONTENT "Buyer_of_Second_hand_Books"
      SENDER "Buyer_of_Second_hand_Books"
      RECEIVER "Market_of_Used_Goods"
    )

PROTOCOL To_announce
  MESSAGE
    (LABEL "Inform"
      CONTENT "Offer_Seller"
      SENDER "Seller_of_Second_hand_Books"
      RECEIVER "Market_of_Used_Goods"
    )

PROTOCOL To_search_announcement
  MESSAGE
    (LABEL "Request"
      CONTENT "Announcement"
      SENDER "Buyer_of_Second_hand_Books"
      RECEIVER "Market_of_Used_Goods"
    )
  MESSAGE
    (LABEL "Inform"
      CONTENT "Announcement"
      SENDER "Market_of_Used_Goods"
    )

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        RECEIVER "Buyer_of_Second_hand_Books"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "Seller"
        SENDER "Market_of_Used_Goods"
        RECEIVER "Buyer_of_Second_hand_Books"
    )
    PROTOCOL To_register_sale
    MESSAGE
    (LABEL "Inform"
        CONTENT "ItemSold_Buyer_Payment"
        SENDER "Seller_of_Second_hand_Books"
        RECEIVER "Market_of_Used_Goods"
    )
)

AGENTROLE
( Market_of_Special_Goods
    ROLEGOAL ("boolean" : "management_of_buyers" = "true"
    )
    ROLEGOAL ( "boolean" : "management_of_sellers" = "true"
    )
    ROLEGOAL ( "boolean" : "management_of_orders" = "true"
    )
    DUTY "Analyze_entrance"

    PROTOCOL To_request_to_enter_in_market_of_Special_Goods
    MESSAGE
    (LABEL "Request"
        CONTENT "OrgGoals"
        SENDER "Buyer"
        RECEIVER "Market_of_Special_Goods"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "OrgGoals"
        SENDER "Market_of_Special_Goods"
        RECEIVER "Buyer"
    )
    MESSAGE
    (LABEL "Request"
        CONTENT "Roles"
        SENDER "Buyer"
        RECEIVER "Market_of_Special_Goods"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "Roles"
        SENDER "Market_of_Special_Goods"
        RECEIVER "Buyer"
    )
    MESSAGE
    (LABEL "Request"
        CONTENT "RoleToPlay"
        SENDER "Buyer"
        RECEIVER "Market_of_Special_Goods"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "PermissionAccept"

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        SENDER "Market_of_Special_Goods"
        RECEIVER "Buyer"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "PermissionReject"
        SENDER "Market_of_Special_Goods"
        RECEIVER "Buyer"
    )
    PROTOCOL Buyer_registration
    MESSAGE
    (LABEL "Inform"
        CONTENT "Buyer_of_Imported_Books"
        SENDER "Buyer_of_Imported_Books"
        RECEIVER "Market_of_Special_Goods"
    )
    PROTOCOL To_search_for_seller
    MESSAGE
    (LABEL "Request"
        CONTENT "Seller?"
        SENDER "Buyer_of_Imported_Books"
        RECEIVER "Market_of_Special_Goods"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "Seller"
        SENDER "Market_of_Special_Goods"
        RECEIVER "Buyer_of_Imported_Books"
    )
    PROTOCOL To_register_sale
    MESSAGE
    (LABEL "Inform"
        CONTENT "ItemSold_Buyer_Payment"
        SENDER "Seller_of_Imported_Books"
        RECEIVER "Market_of_Special_Goods"
    )
)
AGENTROLE
( Buyer_of_Imported_Books
    ROLEGOAL ("boolean" : "itemBought" = "true"
    )
    DUTY "Register_itself_in_organization"
    PROTOCOL Buyer_registration
    MESSAGE
    (LABEL "Inform"
        CONTENT "Buyer_of_Imported_Books"
        SENDER "Buyer_of_Imported_Books"
        RECEIVER "Market_of_Special_Goods"
    )
    PROTOCOL To_search_for_seller
    MESSAGE
    (LABEL "Request"
        CONTENT "Seller?"
        SENDER "Buyer_of_Imported_Books"
        RECEIVER "Market_of_Special_Goods"
    )
    MESSAGE
    (LABEL "Inform"
        CONTENT "Seller"
        SENDER "Market_of_Special_Goods"
    )
)

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        RECEIVER "Buyer_of_Imported_Books"
    )
    PROTOCOL SimpleNegotiation
    MESSAGE
    (LABEL "Request"
    CONTENT "ItemDescription"
    SENDER "Buyer_of_Imported_Books"
    RECEIVER "Seller_of_Imported_Books"
    )
    MESSAGE
    (LABEL "Proposal"
    CONTENT "ItemDescription"
    SENDER "Seller_of_Imported_Books"
    RECEIVER "Buyer_of_Imported_Books"
    )
    MESSAGE
    (LABEL "AnswerProposal"
    CONTENT "RejectItemDescription"
    SENDER "Buyer_of_Imported_Books"
    RECEIVER "Seller_of_Imported_Books"
    )
    MESSAGE
    (LABEL "AnswerProposal"
    CONTENT "AcceptItemDescription"
    SENDER "Buyer_of_Imported_Books"
    RECEIVER "Seller_of_Imported_Books"
    )
    MESSAGE
    (LABEL "Inform"
    CONTENT "Bill"
    SENDER "Seller_of_Imported_Books"
    RECEIVER "Buyer_of_Imported_Books"
    )
    MESSAGE
    (LABEL "Inform"
    CONTENT "Payment"
    SENDER "Buyer_of_Imported_Books"
    RECEIVER "Seller_of_Imported_Books"
    )
)

AGENTROLE
( Buyer_of_Second_hand_Books
  ROLEGOAL ("boolean" : "itemBought" = "true"
  )
  DUTY "Register_itself_in_organization"
  PROTOCOL Buyer_registration
  MESSAGE
  (LABEL "Inform"
    CONTENT "Buyer_of_Second_hand_Books"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Market_of_Used_Goods"
  )
  PROTOCOL SimpleNegotiation
  MESSAGE
  (LABEL "Request"
    CONTENT "ItemDescription"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Seller_of_Second_hand_Books"
  )
  MESSAGE

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        (LABEL "Proposal"
          CONTENT "ItemDescription"
          SENDER "Seller_of_Second_hand_Books"
          RECEIVER "Buyer_of_Second_hand_Books"
        )
    MESSAGE
    (LABEL "AnswerProposal"
      CONTENT "RejectItemDescription"
      SENDER "Buyer_of_Second_hand_Books"
      RECEIVER "Seller_of_Second_hand_Books"
    )
    MESSAGE
    (LABEL "AnswerProposal"
      CONTENT "AcceptItemDescription"
      SENDER "Buyer_of_Second_hand_Books"
      RECEIVER "Seller_of_Second_hand_Books"
    )
    MESSAGE
    (LABEL "Inform"
      CONTENT "Bill"
      SENDER "Seller_of_Second_hand_Books"
      RECEIVER "Buyer_of_Second_hand_Books"
    )
    MESSAGE
    (LABEL "Inform"
      CONTENT "Payment"
      SENDER "Buyer_of_Second_hand_Books"
      RECEIVER "Seller_of_Second_hand_Books"
    )

    PROTOCOL ComplexNegotiation
    MESSAGE
    (LABEL "Call_for_proposal"
      CONTENT "Item"
      SENDER "Buyer_of_Second_hand_Books"
      RECEIVER "Seller_of_Second_hand_Books"
    )
    MESSAGE
    (LABEL "Proposal"
      CONTENT "Item"
      SENDER "Seller_of_Second_hand_Books"
      RECEIVER "Buyer_of_Second_hand_Books"
    )
    MESSAGE
    (LABEL "Counter_proposal"
      CONTENT "Item"
      SENDER "Buyer_of_Second_hand_Books"
      RECEIVER "Seller_of_Second_hand_Books"
    )
    MESSAGE
    (LABEL "Reject_counter_proposal"
      CONTENT ""
      SENDER "Seller_of_Second_hand_Books"
      RECEIVER "Buyer_of_Second_hand_Books"
    )
    MESSAGE
    (LABEL "Accept_counter_proposal"
      CONTENT ""
      SENDER "Seller_of_Second_hand_Books"
      RECEIVER "Buyer_of_Second_hand_Books"
    )

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MESSAGE
  (LABEL "Inform"
    CONTENT "Bill"
    SENDER "Seller_of_Second_hand_Books"
    RECEIVER "Buyer_of_Second_hand_Books"
  )
MESSAGE
  (LABEL "Inform"
    CONTENT "Payment"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Seller_of_Second_hand_Books"
  )
MESSAGE
  (LABEL "Accept_propose"
    CONTENT "Item"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Seller_of_Second_hand_Books"
  )
)
PROTOCOL To_search_announcement
MESSAGE
  (LABEL "Request"
    CONTENT "Announcement"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Market_of_Used_Goods"
  )
MESSAGE
  (LABEL "Inform"
    CONTENT "Announcement"
    SENDER "Market_of_Used_Goods"
    RECEIVER "Buyer_of_Second_hand_Books"
  )
MESSAGE
  (LABEL "Inform"
    CONTENT "Seller"
    SENDER "Market_of_Used_Goods"
    RECEIVER "Buyer_of_Second_hand_Books"
  )
)
AGENTROLE
( Seller_of_Imported_Books
  ROLEGOAL ("boolean" : "itemSold" = "true"
  )
  DUTY "Inform_organization"
  PROTOCOL SimpleNegotiation
  MESSAGE
    (LABEL "Request"
      CONTENT "ItemDescription"
      SENDER "Buyer_of_Imported_Books"
      RECEIVER "Seller_of_Imported_Books"
    )
  MESSAGE
    (LABEL "Proposal"
      CONTENT "ItemDescription"
      SENDER "Seller_of_Imported_Books"
      RECEIVER "Buyer_of_Imported_Books"
    )
  MESSAGE
    (LABEL "AnswerProposal"
      CONTENT "RejectItemDescription"
      SENDER "Buyer_of_Imported_Books"
    )
)

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        RECEIVER "Seller_of_Imported_Books"
    )
    MESSAGE
    (LABEL "AnswerProposal"
      CONTENT "AcceptItemDescription"
      SENDER "Buyer_of_Imported_Books"
      RECEIVER "Seller_of_Imported_Books"
    )
    MESSAGE
    (LABEL "Inform"
      CONTENT "Bill"
      SENDER "Seller_of_Imported_Books"
      RECEIVER "Buyer_of_Imported_Books"
    )
    MESSAGE
    (LABEL "Inform"
      CONTENT "Payment"
      SENDER "Buyer_of_Imported_Books"
      RECEIVER "Seller_of_Imported_Books"
    )
    PROTOCOL To_register_sale
    MESSAGE
    (LABEL "Inform"
      CONTENT "ItemSold_Buyer_Payment"
      SENDER "Seller_of_Imported_Books"
      RECEIVER "Market_of_Special_Goods"
    )
)
AGENTROLE
( Seller_of_Second_hand_Books
  ROLEGOAL ("boolean" : "itemSold" = "true"
  )
  DUTY "Inform_organization"
  PROTOCOL SimpleNegotiation
  MESSAGE
  (LABEL "Request"
    CONTENT "ItemDescription"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Seller_of_Second_hand_Books"
  )
  MESSAGE
  (LABEL "Proposal"
    CONTENT "ItemDescription"
    SENDER "Seller_of_Second_hand_Books"
    RECEIVER "Buyer_of_Second_hand_Books"
  )
  MESSAGE
  (LABEL "AnswerProposal"
    CONTENT "RejectItemDescription"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Seller_of_Second_hand_Books"
  )
  MESSAGE
  (LABEL "AnswerProposal"
    CONTENT "AcceptItemDescription"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Seller_of_Second_hand_Books"
  )
  MESSAGE
  (LABEL "Inform"

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        CONTENT "Bill"
        SENDER "Seller_of_Second_hand_Books"
        RECEIVER "Buyer_of_Second_hand_Books"
    )
MESSAGE
(LABEL "Inform"
    CONTENT "Payment"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Seller_of_Second_hand_Books"
)
PROTOCOL To_register_sale
MESSAGE
(LABEL "Inform"
    CONTENT "ItemSold_Buyer_Payment"
    SENDER "Seller_of_Imported_Books"
    RECEIVER "Market_of_Special_Goods"
)
PROTOCOL ComplexNegotiation
MESSAGE
(LABEL "Call_for_proposal"
    CONTENT "Item"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Seller_of_Second_hand_Books"
)
MESSAGE
(LABEL "Proposal"
    CONTENT "Item"
    SENDER "Seller_of_Second_hand_Books"
    RECEIVER "Buyer_of_Second_hand_Books"
)
MESSAGE
(LABEL "Counter_proposal"
    CONTENT "Item"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Seller_of_Second_hand_Books"
)
MESSAGE
(LABEL "Reject_counter_proposal"
    CONTENT ""
    SENDER "Seller_of_Second_hand_Books"
    RECEIVER "Buyer_of_Second_hand_Books"
)
MESSAGE
(LABEL "Accept_counter_proposal"
    CONTENT ""
    SENDER "Seller_of_Second_hand_Books"
    RECEIVER "Buyer_of_Second_hand_Books"
)
MESSAGE
(LABEL "Inform"
    CONTENT "Bill"
    SENDER "Seller_of_Second_hand_Books"
    RECEIVER "Buyer_of_Second_hand_Books"
)
MESSAGE
(LABEL "Inform"
    CONTENT "Payment"
    SENDER "Buyer_of_Second_hand_Books"
    RECEIVER "Seller_of_Second_hand_Books"
)
MESSAGE

```



```

        (LABEL "Accept_propose"
          CONTENT "Item"
          SENDER "Buyer_of_Second_hand_Books"
          RECEIVER "Seller_of_Second_hand_Books"
        )
    )
    PROTOCOL To_announce
    MESSAGE
    (LABEL "Offer_Seller"
      CONTENT "Offer_Seller"
      SENDER "Seller_of_Second_hand_Books"
      RECEIVER "Market_of_Used_Goods"
    )
  )

import java.util.*;
public class Item
{
    protected boolean sold = false;
    public boolean getSold ()
    {
        return this.sold;
    }
    public void setSold ()
    {
        this.sold = true;
    }
}

import java.util.*;
public class Book extends Item
{
    protected String title = null;
    protected String author = null;
    protected String ISBN = null;
    protected int price = null;
    public String getTitle ()
    {
        return this.title;
    }
    public String getAuthor ()
    {
        return this.author;
    }
    public String getISBN ()
    {
        return this.ISBN;
    }
    public int getPrice ()
    {
        return this.price;
    }
    public void setTitle (String title)
    {
        this.title = title;
    }
    public void setAuthor (String author)
    {
        this.author = author;
    }
    public void setISBN (String ISBN)
    {

```

```

        this.ISBN = ISBN;
    }
    public void setPrice (int price)
    {
        this.price = price;
    }
}

import java.util.*;
public class Imported_Book extends Book
{
    protected String origin = null;
    public String getOrigin ()
    {
        return this.origin;
    }
    public void setOrigin (String origin)
    {
        this.origin = origin;
    }
}

import java.util.*;
public class Second_hand_Book extends Book
{
    protected String appearance = null;
    public String getAppearance ()
    {
        return this.appearance;
    }
    public void setAppearance (String appearance)
    {
        this.appearance = appearance;
    }
}

OBJECTROLE
( Desire (
    public int getPrice ()
    {
        return object.getPrice();
    }
    public void setTitle (String title)
    {
        object.setTitle(title);
    }
    public void setAuthor (String author)
    {
        object.setAuthor(author);
    }
    public void setISBN (String ISBN)
    {
        object.setISBN(ISBN);
    }
})

OBJECTROLE
( Offer (
    public void setPrice (int price)
    {
        object.setPrice(price);
    }

```

```

    }
    public String getTitle ()
    {
        return this.title;
    }
    public String getAuthor ()
    {
        return this.author;
    }
    public String getISBN ()
    {
        return this.ISBN;
    }
    })

OBJECTROLE
( Desire_of_Imported_Books (
    public void setOrigin (String origin)
    {
        object.setOrigin(origin);
    }
    })

OBJECTROLE
( Offer_of_Imported_Books (
    public String getOrigin ()
    {
        return object.getOrigin();
    }
    })

OBJECTROLE
( Desire_of_Second_hand_Books (
    public void setAppearance (String appearance)
    {
        object.setAppearance(appearance);
    }
    })

OBJECTROLE
( Offer_of_Second_hand_Books (
    public String getAppearance ()
    {
        return object.getAppearance();
    }
    })

```

Figura 121 – Descrição textual do exemplo do *Virtual Marketplace*.