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A1 Especificação XMLaw: Cenário de negociação

```

<Laws>
  <LawOrganization id="tacscm" name="TAC SCM">
    <Role id="customer" />
    <Role id="seller" />

    <Scene id="negotiation" time-to-live="infinity">
      <CriticalityAnalysis>
        <Weight ref="role" value="0.2"/>
        <Weight ref="message" value="0"/>
        <Increases>
          <Increase event-id="customer" event-type="role_activation"
            value="0.3">
            <Assignee role-ref="customer" role-
              instance="$customer.instance"/>
          </Increase>
          <Increase event-id="seller" event-type="role_activation" value="0.3">
            <Assignee role-ref="seller" role-instance="$seller.instance"/>
          </Increase>
          <Increase event-id="time-to-decide" event-type="clock_activation"
            value="0.385">
            <Assignee role-ref="customer" role-
              instance="$customer.instance"/>
          </Increase>
          <Increase event-id="customer-payment-voucher" event-
            type="norm_activation" value="0.07">
            <Assignee role-ref="customer" role-
              instance="$customer.instance"/>
          </Increase>
        </Increases>
        <Decreases>
          <Decrease event-id="customer" event-type="role_deactivation"
            value="0.3">
            <Assignee role-ref="customer" role-
              instance="$customer.instance"/>
          </Decrease>
          <Decrease event-id="seller" event-type="role_deactivation"
            value="0.3">
            <Assignee role-ref="seller" role-instance="$seller.instance"/>
          </Decrease>
          <Decrease event-id="time-to-decide" event-type="clock_deactivation"
            value="0.385">
            <Assignee role-ref="customer" role-
              instance="$customer.instance"/>
          </Decrease>
          <Decrease event-id="customer-payment-voucher" event-
            type="norm_deactivation" value="0.07">
            <Assignee role-ref="customer" role-
              instance="$customer.instance"/>
          </Decrease>
        </Decreases>
      </CriticalityAnalysis>
    </Scene>
  </LawOrganization>
</Laws>

```

```

</CriticalityAnalysis>
<Creators>
  <Creator role_ref="customer"/>
</Creators>
<Protocol>
  <Messages>
    <Message id="m1" performative="cfp">
      <Content>
        <Entry key="product" value="."/>
        <Entry key="type" value="."/>
        <Entry key="price" value="\d+"/>
        <Entry key="brand" value="."/>
      </Content>
      <Sender role-ref="customer"/>
      <Receivers>
        <Receiver role-ref="seller"/>
      </Receivers>
    </Message>
    <Message id="m2" performative="propose">
      <Content>
        <Entry key="product" value="."/>
        <Entry key="type" value="."/>
        <Entry key="price" value="\d+"/>
        <Entry key="brand" value="."/>
      </Content>
      <Sender role-ref="seller"/>
      <Receivers>
        <Receiver role-ref="customer"/>
      </Receivers>
    </Message>
    <Message id="m3" performative="accept-proposal">
      <Content>
        <Entry key="product" value="."/>
        <Entry key="type" value="."/>
        <Entry key="price" value="\d+"/>
        <Entry key="brand" value="."/>
      </Content>
      <Sender role-ref="customer"/>
      <Receivers>
        <Receiver role-ref="seller"/>
      </Receivers>
    </Message>
    <Message id="m4" performative="inform">
      <Content>
        <Entry key="payto" value="."/>
      </Content>
      <Sender role-ref="seller"/>
      <Receivers>
        <Receiver role-ref="customer"/>
      </Receivers>
    </Message>
    <Message id="m5" performative="inform">
      <Content>
        <Entry key="isPaid" value="yes"/>
      </Content>
      <Sender role-ref="customer"/>
      <Receivers>
        <Receiver role-ref="seller"/>
      </Receivers>
    </Message>
  </Messages>

```

```

    <Message id="m6" performative="refuse">
      <Content>
        <Entry key="info" value=".*"/>
      </Content>
      <Sender role-ref="seller"/>
      <Receivers>
        <Receiver role-ref="customer"/>
      </Receivers>
    </Message>
    <Message id="m7" performative="reject-proposal">
      <Content>
        <Entry key="info" value=".*"/>
      </Content>
      <Sender role-ref="customer"/>
      <Receivers>
        <Receiver role-ref="seller"/>
      </Receivers>
    </Message>
    <Message id="m8" performative="cancel">
      <Content>
        <Entry key="info" value=".*"/>
      </Content>
      <Sender role-ref="seller"/>
      <Receivers>
        <Receiver role-ref="customer"/>
      </Receivers>
    </Message>
    <Message id="m9" performative="propose">
      <Content>
        <Entry key="product" value=".*"/>
        <Entry key="type" value=".*"/>
        <Entry key="price" value="\d+"/>
        <Entry key="brand" value=".*"/>
      </Content>
      <Sender role-ref="seller"/>
      <Receivers>
        <Receiver role-ref="customer"/>
      </Receivers>
    </Message>
  </Messages>
  <States>
    <State id="s0" type="initial" label="Ready for starting negotiations"/>
    <State id="s1" type="execution" label="Call for proposal requested"/>
    <State id="s2" type="execution" label="Proposal sent"/>
    <State id="s3" type="execution" label="Proposal accepted"/>
    <State id="s4" type="execution" label="Bank informed"/>
    <State id="s5" type="success" label="Payment done"/>
    <State id="s6" type="failure" label="Refuse sending proposal"/>
    <State id="s7" type="execution" label="Proposal rejected"/>
    <State id="s8" type="failure" label="Too long time to decide"/>
  </States>
  <Transitions>
    <Transition id="t0" from="s0" to="s1" ref="m1" event-
      type="message_arrival">
      <Constraint class="br.pucRio.inf.les.law.application.negotiation.
        EnforceValueConstraint" semantics="Gets value on price" />
    </Transition>
    <Transition id="t1" from="s1" to="s2" ref="m2" event-
      type="message_arrival">

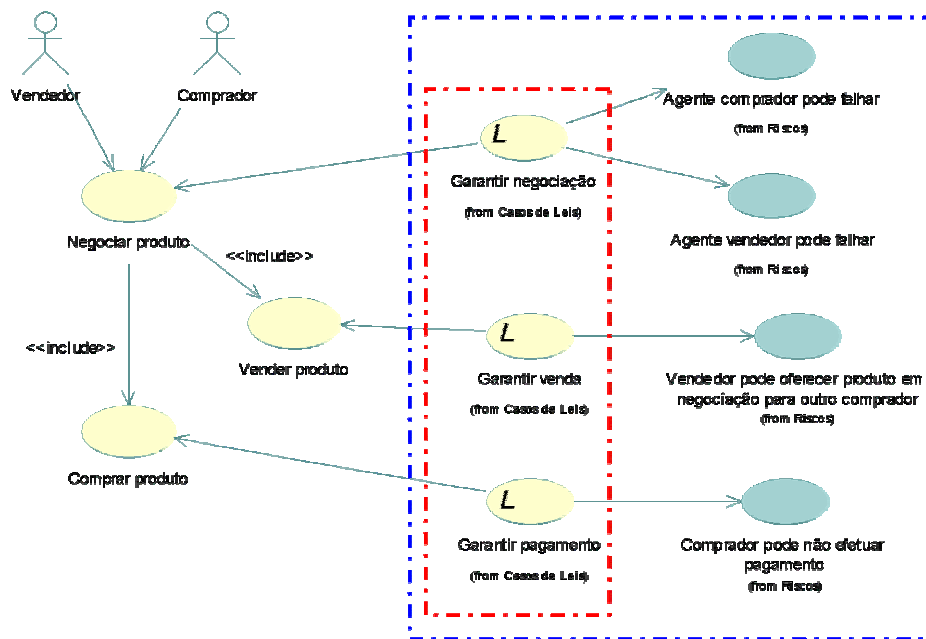
```

```

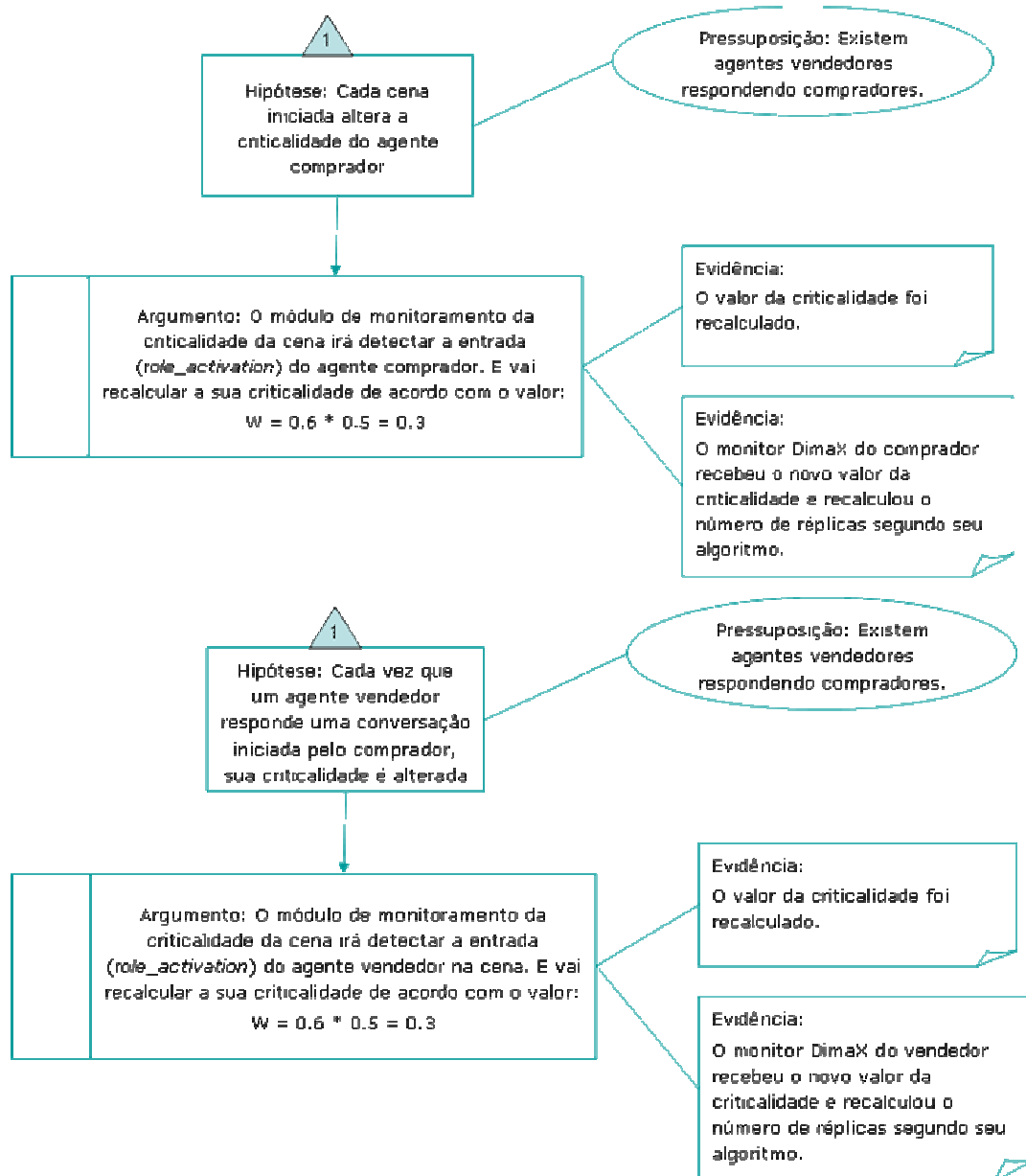
        <Constraint class="br.pucrio.inf.les.law.application.negotiation.
        EnforceValueConstraint" semantics="Gets value on price" />
    </Transition>
    <Transition id="t2" from="s2" to="s3" ref="m3" event-
    type="message_arrival" />
    <Transition id="t3" from="s3" to="s4" ref="m4" event-
    type="message_arrival" />
    <Transition id="t4" from="s4" to="s5" ref="m5" event-
    type="message_arrival" />
    <Transition id="t5" from="s1" to="s6" ref="m6" event-
    type="message_arrival" />
    <Transition id="t6" from="s2" to="s7" ref="m7" event-
    type="message_arrival" />
    <Transition id="t7" from="s2" to="s8" ref="m8" event-
    type="message_arrival" />
    <Transition id="t8" from="s7" to="s2" ref="m9" event-
    type="message_arrival" />
</Transitions>
</Protocol>
<Clock id="time-to-decide" type="once" tick-period="20000"> <!-- 20 sec. -->
    <Assignee role-ref="customer" role-instance="$customer.instance"/>
    <Activations>
        <Element ref="t1" event-type="transition_activation"/>
        <Element ref="t8" event-type="transition_activation"/>
    </Activations>
    <Deactivations>
        <Element ref="t2" event-type="transition_activation"/>
        <Element ref="t6" event-type="transition_activation"/>
    </Deactivations>
</Clock>
<Norm type="permission" id="seller-permission-to-cancel">
    <Assignee role-ref="seller" role-instance="$seller.instance"/>
    <Activations>
        <Element ref="time-to-decide" event-type="clock_timeout"/>
    </Activations>
</Norm>
<Norm type="obligation" id="customer-payment-voucher">
    <Assignee role-ref="customer" role-instance="$customer.instance"/>
    <Activations>
        <Element ref="t3" event-type="transition_activation"/>
    </Activations>
    <Deactivations>
        <Element ref="t4" event-type="transition_activation"/>
    </Deactivations>
</Norm>
<Entrance>
    <Participant role_ref="customer" limit="1">
        <State ref="s0"/>
    </Participant>
    <Participant role_ref="seller" limit="1">
        <State ref="s1"/>
    </Participant>
</Entrance>
</Scene>
</LawOrganization>
</Laws>

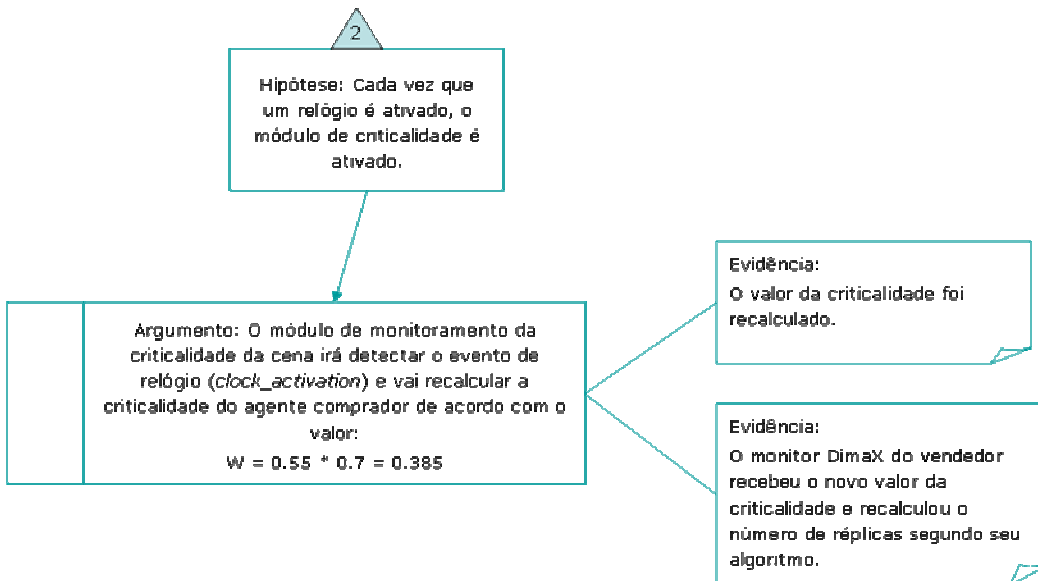
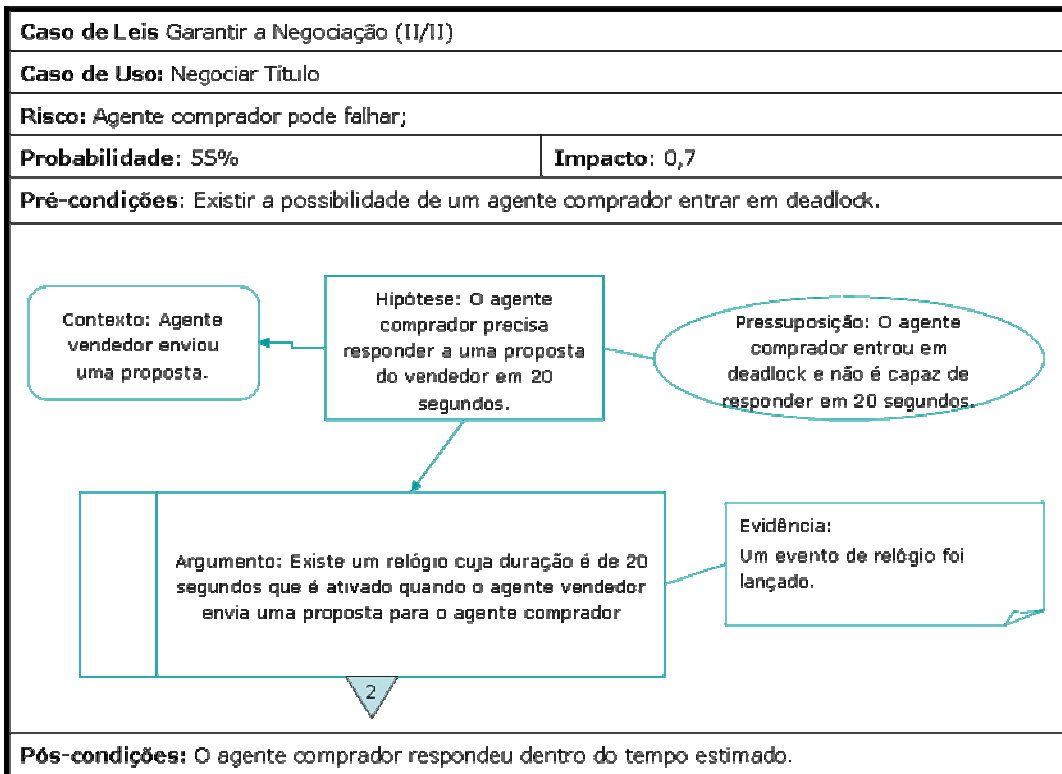
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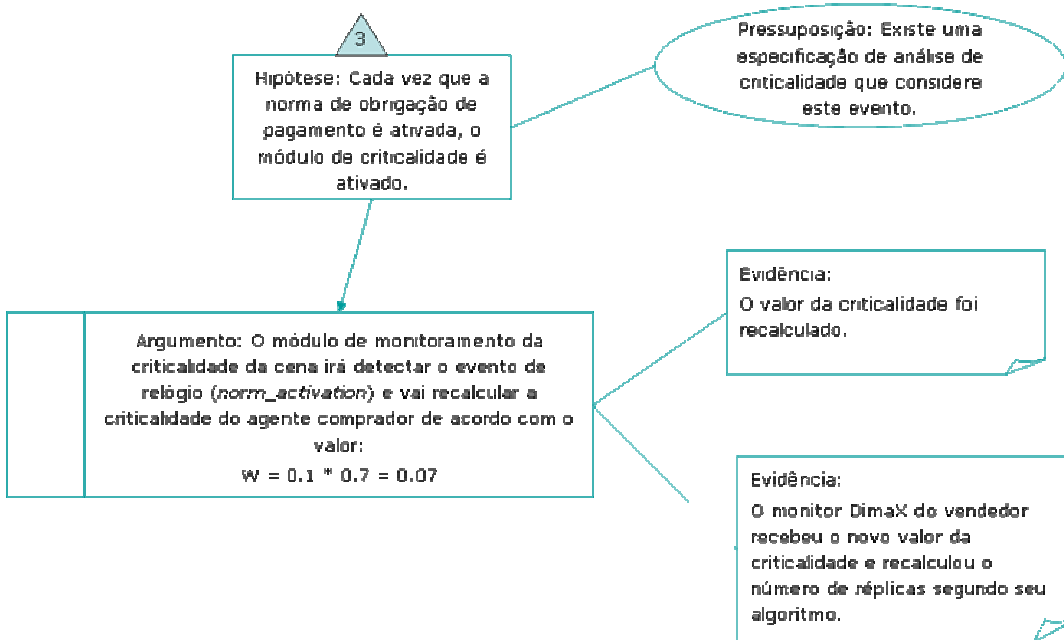
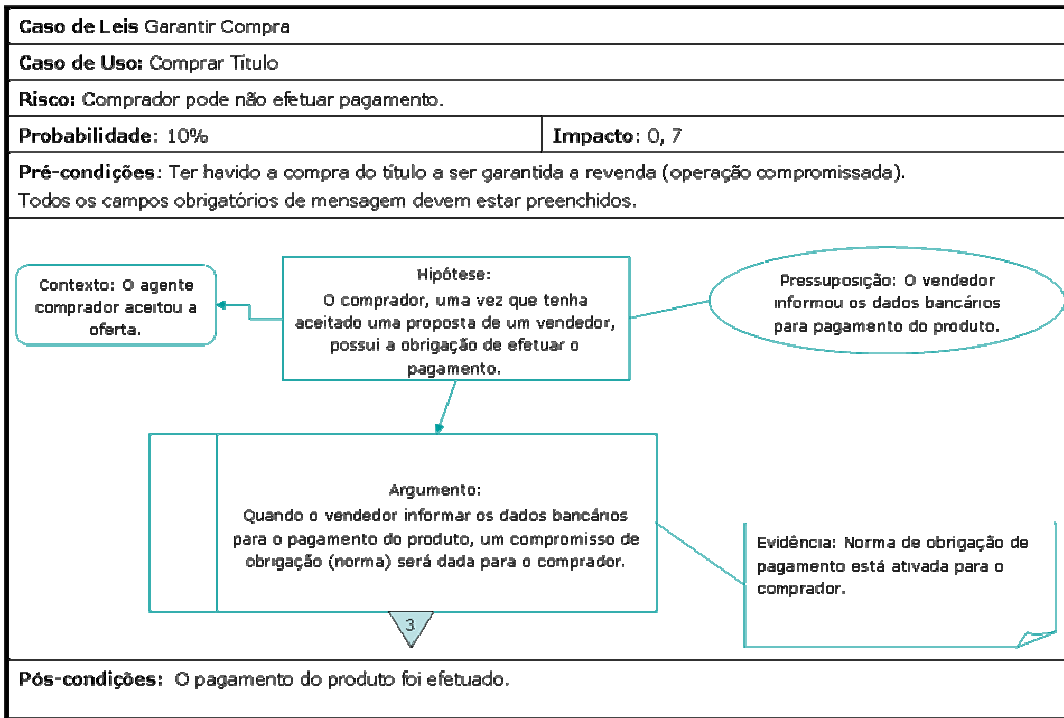
A2 Casos de Leis: Cenário de negociação



Caso de Lei Garantir a Negociação (I/II)	
Caso de Uso: Negociar Título	
Risco: Agente comprador pode falhar; Agente vendedor pode falhar.	
Probabilidade: 60%	Impacto: 0,5
Pré-condições: Existir negociação em execução.	
<div style="border: 1px solid black; padding: 10px;"> <div style="display: flex; justify-content: space-between; align-items: flex-start;"> <div style="border: 1px solid black; padding: 5px; width: 20%;">Contexto: Existe Comprador e Vendedor para produto</div> <div style="border: 1px solid black; padding: 5px; width: 30%;">Hipótese: Os agentes compradores e vendedores não podem falhar.</div> <div style="border: 1px solid black; border-radius: 50%; padding: 5px; width: 30%;">Pressuposição: Agentes hostis tentam derrubar agentes em negociação</div> </div> <div style="margin-top: 10px; border: 1px solid black; padding: 5px; width: 80%;">Argumento: O sistema irá monitorar a criticalidade do agentes ao longo da negociação.</div> <div style="margin-top: 10px; border: 1px solid black; padding: 5px; width: 30%;">Evidência: Existem réplicas para cada o agente comprador e para cada agente vendedor.</div> </div>	
Pós-condições: O protocolo do cenário de negociação foi executado e finalizado com sucesso.	







B1 Especificação XMLaw: SELIC

```

<Laws>
  <LawOrganization id="bc" name="Banco Central">
    <!-- Role definition -->
    <Role id="IF" />
    <Role id="comprador" />
    <Role id="vendedor" />
    <Role id="selic" />

    <CriticalityAnalysis>
      <Weight ref="message" value="0"/>
      <Weight ref="transition" value="0"/>
      <Weight ref="role" value="0"/>
      <Increases>
        <Increase event-id="norm_obligation_of_buying_again" event-
          type="norm_activation" value="0.1">
          <Assignee role-ref="vendedor" role-
            instance="$vendedor.instance"/>
        </Increase>
        <Increase event-id="clock_obligation_buy_again" event-
          type="clock_activation" value="0.1">
          <Assignee role-ref="vendedor" role-
            instance="$vendedor.instance"/>
        </Increase>

        <Increase event-id="norm_obligation_of_selling_again" event-
          type="norm_activation" value="0.1">
          <Assignee role-ref="comprador" role-
            instance="$comprador.instance"/>
        </Increase>
        <Increase event-id="clock_obligation_of_selling_again" event-
          type="clock_activation" value="0.1">
          <Assignee role-ref="comprador" role-
            instance="$comprador.instance"/>
        </Increase>
      </Increases>
      <Decreases>
        <Decrease event-id="norm_obligation_of_buying_again" event-
          type="norm_deactivation" value="0.1">
          <Assignee role-ref="vendedor" role-
            instance="$vendedor.instance"/>
        </Decrease>
        <Decrease event-id="clock_obligation_buy_again" event-
          type="clock_deactivation" value="0.1">
          <Assignee role-ref="vendedor" role-
            instance="$vendedor.instance"/>
        </Decrease>

        <Decrease event-id="norm_obligation_of_selling_again" event-
          type="norm_deactivation" value="0.1">
          <Assignee role-ref="comprador" role-

```

```

        instance="$comprador.instance"/>
    </Decrease>
    <Decrease event-id="clock_obligation_of_selling_again" event-
type="clock_deactivation" value="0.1">
        <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
    </Decrease>

    <Decrease event-id="norm_prohibition_of_buying_again" event-
type="norm_activation" value="0.1">
        <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
    </Decrease>
    <Decrease event-id="norm_prohibition_of_trading" event-
type="norm_activation" value="0.1">
        <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
    </Decrease>
</Decreases>
</CriticalityAnalysis>

<Scene id="OpCompPUAberto" time-to-live="infinity">
    <CriticalityAnalysis>
        <Weight ref="role" value="0.1"/>
        <Weight ref="message" value="0"/>
        <Increases>
            <Increase event-id="selic" event-type="role_activation"
value="0.45">
                <Assignee role-ref="selic" role-instance="$selic.instance"/>
            </Increase>
            <Increase event-id="comprador" event-type="role_activation"
value="0.2">
                <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
            </Increase>
            <Increase event-id="vendedor" event-type="role_activation"
value="0.2">
                <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
            </Increase>

            <Increase event-id="SEL1054tp4Compra" event-
type="transition_activation" value="0.2">
                <Assignee role-ref="selic" role-instance="$selic.instance"/>
                <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
            </Increase>
            <Increase event-id="SEL1054tp2Compra" event-
type="transition_activation" value="0.2">
                <Assignee role-ref="selic" role-instance="$selic.instance"/>
                <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
            </Increase>
            <Increase event-id="SEL1054tp4Venda" event-
type="transition_activation" value="0.2">
                <Assignee role-ref="selic" role-instance="$selic.instance"/>
                <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
            </Increase>
            <Increase event-id="SEL1054tp2Venda" event-

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type="transition_activation" value="0.2">
  <Assignee role-ref="selic" role-instance="$selic.instance"/>
  <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
  </Increase>
</Increases>
<Decreases>
  <Decrease event-id="selic" event-type="role_deactivation"
value="0.45">
    <Assignee role-ref="selic" role-instance="$selic.instance"/>
  </Decrease>
  <Decrease event-id="comprador" event-type="role_deactivation"
value="0.2">
    <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
  </Decrease>
  <Decrease event-id="vendedor" event-type="role_deactivation"
value="0.2">
    <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
  </Decrease>
  <Decrease event-id="SEL1054tp2CompraConfirmada" event-
type="transition_activation" value="0.2">
    <Assignee role-ref="selic" role-instance="$selic.instance"/>
    <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
    <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
  </Decrease>
  <Decrease event-id="SEL1054tp4CompraConfirmada" event-
type="transition_activation" value="0.2">
    <Assignee role-ref="selic" role-instance="$selic.instance"/>
    <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
    <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
  </Decrease>
  <Decrease event-id="SEL1054tp2VendaConfirmada" event-
type="transition_activation" value="0.2">
    <Assignee role-ref="selic" role-instance="$selic.instance"/>
    <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
    <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
  </Decrease>
  <Decrease event-id="SEL1054tp4VendaConfirmada" event-
type="transition_activation" value="0.2">
    <Assignee role-ref="selic" role-instance="$selic.instance"/>
    <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
    <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
  </Decrease>
</Decreases>
</CriticalityAnalysis>
<Creators>
  <Creator role_ref="selic"/>
</Creators>
<Protocol id="negotiation-protocol">
  <Messages>

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<Message id="startMsg" performative="inform">
  <Content>
    <Entry key="anuncio" value="Negociações
    abertas"/>
  </Content>
  <Sender role-ref="selic"/>
  <Receivers>
    <Receiver role-ref="comprador"/>
    <Receiver role-ref="vendedor"/>
  </Receivers>
</Message>
<Message id="SEL1054tp2CompraMsg" performative="request">
  <Content>
    <Entry key="CodMsg" value="SEL1054"/>
    <Entry key="TpCompr" value="02" />
    <Entry key="NOPRET" value=" "/>
  </Content>
  <Sender role-ref="comprador"/>
  <Receivers>
    <Receiver role-ref="selic"/>
  </Receivers>
</Message>
<Message id="SEL1054tp4CompraMsg" performative="request">
  <Content>
    <Entry key="CodMsg" value="SEL1054"/>
    <Entry key="TpCompr" value="04" />
    <Entry key="NOPRET" value=" "/>
  </Content>
  <Sender role-ref="comprador"/>
  <Receivers>
    <Receiver role-ref="selic"/>
  </Receivers>
</Message>
<Message id="SEL1054R1AguardandoVendaMsg"
performative="inform">
  <Content>
    <Entry key="CodMsg" value="SEL1054"/>
    <Entry key="NOPRET" value="\d+"/>
    <Entry key="SitOpSEL"
    value="negociacao_aguardando_venda"/>
  </Content>
  <Sender role-ref="selic"/>
  <Receivers>
    <Receiver role-ref="comprador"/>
  </Receivers>
</Message>
<Message id="SEL1054R1CompraMsg" performative="inform">
  <Content>
    <Entry key="CodMsg" value="SEL1054"/>
    <Entry key="NOPRET" value="\d+"/>
  </Content>
  <Sender role-ref="selic"/>
  <Receivers>
    <Receiver role-ref="comprador"/>
  </Receivers>
</Message>
<Message id="SEL1054tp2VendaMsg" performative="request">
  <Content>

```

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        <Entry key="CodMsg"          value="SEL1054"/>
        <Entry key="TpCompr"        value="02" />

        <Entry key="NOPRET"        value=" " />
    </Content>
    <Sender role-ref="vendedor"/>
    <Receivers>
        <Receiver role-ref="selic"/>
    </Receivers>
</Message>
<Message id="SEL1054tp4VendaMsg" performative="request">
    <Content>
        <Entry key="CodMsg"          value="SEL1054"/>
        <Entry key="TpCompr"        value="04" />

        <Entry key="NOPRET"        value=" " />
    </Content>
    <Sender role-ref="vendedor"/>
    <Receivers>
        <Receiver role-ref="selic"/>
    </Receivers>
</Message>
<Message id="SEL1054R1AguardandoCompraMsg"
performative="inform">
    <Content>
        <Entry key="CodMsg"          value="SEL1054"/>
        <Entry key="NOPRET"        value="d+"/>
        <Entry key="SitOpSEL"
value="negociacao_aguardando_compra"/>
    </Content>
    <Sender role-ref="selic"/>
    <Receivers>
        <Receiver role-ref="vendedor"/>
    </Receivers>
</Message>
<Message id="SEL1054R1VendaMsg" performative="inform">
    <Content>
        <Entry key="CodMsg"          value="SEL1054"/>
        <Entry key="NOPRET"        value="d+"/>
    </Content>
    <Sender role-ref="selic"/>
    <Receivers>
        <Receiver role-ref="vendedor"/>
    </Receivers>
</Message>
</Messages>
<States>
    <State id="negociacaoFechada" type="initial" label="Estado
Inicial" />
    <State id="nenhumaSolicitacao" type="execution"
label="Negociação abertas" />
    <State id="compraSolicitada" type="execution" label="Pedido de
Compra Solicitado" />
    <State id="vendaSolicitada" type="execution" label="Pedido de
Venda Solicitado" />
    <State id="negociacaoExecutada" type="execution"
label="Negociação Executada (match de compra e venda)" />
    <State id="negociacaoFinalizada1" type="execution"
label="Negociacao Concluida (1/2)" />
    <State id="negociacaoFinalizada2" type="success"
/

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        label="Negociacao Concluida (2/2)" />
</States>
<Transitions>
  <Transition id="start" from="negociacaoFechada"
to="nenhumaSolicitacao" ref="startMsg" event-
type="message_arrival" />
  <Transition id="SEL1054tp4Compra"
from="nenhumaSolicitacao" to="compraSolicitada"
ref="SEL1054tp4CompraMsg" event-type="message_arrival">
  <Constraint class="br.pucrio.inf.les.law.application.selic.
constraint.ConditionNOPRET"
  semantics="NOPRETVazio" />
</Transition>
  <Transition id="SEL1054tp2Compra"
from="nenhumaSolicitacao" to="compraSolicitada"
ref="SEL1054tp2CompraMsg" event-type="message_arrival">
  <Constraint class="br.pucrio.inf.les.law.application.selic.
constraint.ConditionNOPRET"
  semantics="NOPRETVazio" />
</Transition>
  <Transition id="SEL1054tp4Venda" from="nenhumaSolicitacao"
to="vendaSolicitada" ref="SEL1054tp4VendaMsg" event-
type="message_arrival">
  <Constraint
  class="br.pucrio.inf.les.law.application.selic.constraint.
ConditionNOPRET" semantics="NOPRETVazio" />
</Transition>
  <Transition id="SEL1054tp2Venda" from="nenhumaSolicitacao"
to="vendaSolicitada" ref="SEL1054tp2VendaMsg" event-
type="message_arrival">
  <Constraint class="br.pucrio.inf.les.law.application.selic.
constraint.ConditionNOPRET" semantics="NOPRETVazio"
  />
</Transition>
  <Transition id="SEL1054R1AguardandoCompra1"
from="vendaSolicitada" to="vendaSolicitada"
ref="SEL1054R1AguardandoCompraMsg" event-
type="message_arrival" />
  <Transition id="SEL1054R1AguardandoVenda1"
from="compraSolicitada" to="compraSolicitada"
ref="SEL1054R1AguardandoVendaMsg" event-
type="message_arrival" />
  <Transition id="SEL1054tp2CompraConfirmada"
from="vendaSolicitada" to="negociacaoExecutada"
ref="SEL1054tp2CompraMsg" event-type="message_arrival" />
  <Transition id="SEL1054tp4CompraConfirmada"
from="vendaSolicitada" to="negociacaoExecutada"
ref="SEL1054tp4CompraMsg" event-type="message_arrival" />
  <Transition id="SEL1054tp2VendaConfirmada"
from="compraSolicitada" to="negociacaoExecutada"
ref="SEL1054tp2VendaMsg" event-type="message_arrival" />
  <Transition id="SEL1054tp4VendaConfirmada"
from="compraSolicitada" to="negociacaoExecutada"
ref="SEL1054tp4VendaMsg" event-type="message_arrival" />
  <Transition id="SEL1054R1AguardandoCompra2"
from="negociacaoExecutada" to="negociacaoExecutada"
ref="SEL1054R1AguardandoCompraMsg" event-
type="message_arrival" />
  <Transition id="SEL1054R1AguardandoVenda2"
from="negociacaoExecutada" to="negociacaoExecutada"

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ref="SEL1054R1AguardandoVendaMsg" event-
type="message_arrival" />
<Transition id="SEL1054R1CompraFinalizada"
from="negociacaoExecutada" to="negociacaoFinalizada1"
ref="SEL1054R1CompraMsg" event-type="message_arrival" />
<Transition id="SEL1054R1VendaFinalizada"
from="negociacaoFinalizada1" to="negociacaoFinalizada2"
ref="SEL1054R1VendaMsg" event-type="message_arrival" />
</Transitions>
</Protocol>

<Entrance>
  <Participant role_ref="selic" limit="1">
    <State ref="negociacaoFechada"/>
  </Participant>
  <Participant role_ref="comprador" limit="1">
    <State ref="nenhumaSolicitacao"/>
    <State ref="vendaSolicitada"/>
  </Participant>
  <Participant role_ref="vendedor" limit="1">
    <State ref="nenhumaSolicitacao"/>
    <State ref="compraSolicitada"/>
  </Participant>
</Entrance>

</Scene>

<Scene id="OpRecompPUAberto" time-to-live="infinity">
  <CriticalityAnalysis>
    <Weight ref="role" value="0.1"/>
    <Weight ref="message" value="0"/>
    <Increases>
      <Increase event-id="selic" event-type="role_activation"
value="0.45">
        <Assignee role-ref="selic" role-instance="$selic.instance"/>
      </Increase>
      <Increase event-id="comprador" event-type="role_activation"
value="0.2">
        <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
      </Increase>
      <Increase event-id="vendedor" event-type="role_activation"
value="0.2">
        <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
      </Increase>
      <Increase event-id="SEL1056tp1Recomp" event-
type="transition_activation" value="0.2">
        <Assignee role-ref="selic" role-instance="$selic.instance"/>
        <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
      </Increase>
      <Increase event-id="SEL1056tp3Recomp" event-
type="transition_activation" value="0.2">
        <Assignee role-ref="selic" role-instance="$selic.instance"/>
        <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
      </Increase>
      <Increase event-id="SEL1056tp1Revenda" event-
type="transition_activation" value="0.2">

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        <Assignee role-ref="selic" role-instance="$selic.instance"/>
        <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
    </Increase>
    <Increase event-id="SEL1056tp3Revenda" event-
type="transition_activation" value="0.2">
        <Assignee role-ref="selic" role-instance="$selic.instance"/>
        <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
    </Increase>
</Increases>
<Decreases>
    <Decrease event-id="selic" event-type="role_deactivation"
value="0.45">
        <Assignee role-ref="selic" role-instance="$selic.instance"/>
    </Decrease>
    <Decrease event-id="comprador" event-type="role_deactivation"
value="0.2">
        <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
    </Decrease>
    <Decrease event-id="vendedor" event-type="role_deactivation"
value="0.2">
        <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
    </Decrease>
    <Decrease event-id="SEL1056tp1RecompraConfirmada" event-
type="transition_activation" value="0.2">
        <Assignee role-ref="selic" role-instance="$selic.instance"/>
        <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
        <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
    </Decrease>
    <Decrease event-id="SEL1056tp3RecompraConfirmada" event-
type="transition_activation" value="0.2">
        <Assignee role-ref="selic" role-instance="$selic.instance"/>
        <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
        <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
    </Decrease>
    <Decrease event-id="SEL1056tp1RevendaConfirmada" event-
type="transition_activation" value="0.2">
        <Assignee role-ref="selic" role-instance="$selic.instance"/>
        <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
        <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
    </Decrease>
    <Decrease event-id="SEL1056tp3RevendaConfirmada" event-
type="transition_activation" value="0.2">
        <Assignee role-ref="selic" role-instance="$selic.instance"/>
        <Assignee role-ref="comprador" role-
instance="$comprador.instance"/>
        <Assignee role-ref="vendedor" role-
instance="$vendedor.instance"/>
    </Decrease>
</Decreases>
</CriticalityAnalysis>

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<Creators>
  <Creator role_ref="selic"/>
</Creators>

<Protocol id="renegotiation-protocol">
  <Messages>
    <Message id="SEL1056tp3RecompraMsg"
      performative="request">
      <Content>
        <Entry key="CodMsg" value="SEL1056"/>
        <Entry key="TpCompr" value="03" />
        <Entry key="NOPRET" value="\d+"/>
      </Content>
      <Sender role-ref="comprador"/>
      <Receivers>
        <Receiver role-ref="selic"/>
      </Receivers>
    </Message>
    <Message id="SEL1056tp1RecompraMsg"
      performative="request">
      <Content>
        <Entry key="CodMsg" value="SEL1056"/>
        <Entry key="TpCompr" value="01" />
        <Entry key="NOPRET" value="\d+"/>
      </Content>
      <Sender role-ref="comprador"/>
      <Receivers>
        <Receiver role-ref="selic"/>
      </Receivers>
    </Message>
    <Message id="SEL1056R1AguardandoRevendaMsg"
      performative="inform">
      <Content>
        <Entry key="CodMsg" value="SEL1056"/>
        <Entry key="NOPRET" value="\d+"/>
        <Entry key="SitOpSEL"
          value="negociacao_aguardando_revenda"/>
      </Content>
      <Sender role-ref="selic"/>
      <Receivers>
        <Receiver role-ref="comprador"/>
      </Receivers>
    </Message>
    <Message id="SEL1056R1RecompraMsg"
      performative="inform">
      <Content>
        <Entry key="CodMsg" value="SEL1056"/>
        <Entry key="NOPRET" value="\d+"/>
      </Content>
      <Sender role-ref="selic"/>
      <Receivers>
        <Receiver role-ref="comprador"/>
      </Receivers>
    </Message>
    <Message id="SEL1056tp1RevendaMsg"
      performative="request">

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        <Content>
          <Entry key="CodMsg"      value="SEL1056"/>
          <Entry key="TpCompr"     value="03" />

          <Entry key="NOPRET"     value="\d+"/>

        </Content>
        <Sender role-ref="vendedor"/>
        <Receivers>
          <Receiver role-ref="selic"/>
        </Receivers>
      </Message>
      <Message id="SEL1056tp3RevendaMsg"
        performative="request">
        <Content>
          <Entry key="CodMsg"      value="SEL1056"/>
          <Entry key="TpCompr"     value="01" />
          <Entry key="NOPRET"     value="\d+"/>

        </Content>
        <Sender role-ref="vendedor"/>
        <Receivers>
          <Receiver role-ref="selic"/>
        </Receivers>
      </Message>
      <Message id="SEL1056R1AguardandoRecompraMsg"
        performative="inform">
        <Content>
          <Entry key="CodMsg"      value="SEL1056"/>
          <Entry key="NOPRET"     value="\d+"/>
          <Entry key="SitOpSEL"   value="negociacao_aguardando_recompra"/>
        </Content>
        <Sender role-ref="selic"/>
        <Receivers>
          <Receiver role-ref="vendedor"/>
        </Receivers>
      </Message>
      <Message id="SEL1056R1RevendaMsg" performative="inform">
        <Content>
          <Entry key="CodMsg"      value="SEL1056"/>
          <Entry key="NOPRET"     value="\d+"/>

        </Content>
        <Sender role-ref="selic"/>
        <Receivers>
          <Receiver role-ref="vendedor"/>
        </Receivers>
      </Message>
    </Messages>
    <States>
      <State id="nenhumaResolicitacao" type="initial" label="Estado
        Inicial" />
      <State id="recompraSolicitada" type="execution" label="Pedido
        de Recompra Solicitado" />
      <State id="revendaSolicitada" type="execution" label="Pedido de
        Revenda Solicitada" />
      <State id="renegociacaoExecutada" type="execution"
        label="Renegociação Executada (match de recompra e revenda)"
        />
    </States>
  </State>

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<State id="renegociacaoFinalizada1" type="execution"
label="Renegociacao Concluida (1/2)" />
<State id="renegociacaoFinalizada2" type="success"
label="Renegociacao Concluida (2/2)" />
</States>
<Transitions>
  <Transition id="SEL1056tp1Recompra"
from="nenhumaResolicitacao" to="recompraSolicitada"
ref="SEL1056tp1RecompraMsg" event-type="message_arrival"/>
  <Transition id="SEL1056tp3Recompra"
from="nenhumaResolicitacao" to="recompraSolicitada"
ref="SEL1056tp3RecompraMsg" event-type="message_arrival" />
  <Transition id="SEL1056tp1Revenda"
from="nenhumaResolicitacao" to="revendaSolicitada"
ref="SEL1056tp1RevendaMsg" event-type="message_arrival" />
  <Transition id="SEL1056tp3Revenda"
from="nenhumaResolicitacao" to="revendaSolicitada"
ref="SEL1056tp3RevendaMsg" event-type="message_arrival" />

  <Transition id="SEL1056R1AguardandoRecompra1"
from="revendaSolicitada" to="revendaSolicitada"
ref="SEL1056R1AguardandoRecompraMsg" event-
type="message_arrival" />
  <Transition id="SEL1056R1AguardandoRevenda1"
from="recompraSolicitada" to="recompraSolicitada"
ref="SEL1056R1AguardandoRevendaMsg" event-
type="message_arrival" />

  <Transition id="SEL1056tp1RecompraConfirmada"
from="revendaSolicitada" to="renegociacaoExecutada"
ref="SEL1056tp1RecompraMsg" event-type="message_arrival" />
  <Transition id="SEL1056tp3RecompraConfirmada"
from="revendaSolicitada" to="renegociacaoExecutada"
ref="SEL1056tp3RecompraMsg" event-type="message_arrival" />
  <Transition id="SEL1056tp1RevendaConfirmada"
from="recompraSolicitada" to="renegociacaoExecutada"
ref="SEL1056tp1RevendaMsg" event-type="message_arrival" />
  <Transition id="SEL1056tp3RevendaConfirmada"
from="recompraSolicitada" to="renegociacaoExecutada"
ref="SEL1056tp3RevendaMsg" event-type="message_arrival" />
  <Transition id="SEL1056R1AguardandoRecompra2"
from="renegociacaoExecutada" to="renegociacaoExecutada"
ref="SEL1056R1AguardandoRecompraMsg" event-
type="message_arrival" />
  <Transition id="SEL1056R1AguardandoRevenda2"
from="renegociacaoExecutada" to="renegociacaoExecutada"
ref="SEL1056R1AguardandoRevendaMsg" event-
type="message_arrival" />
  <Transition id="SEL1056R1RecompraFinalizada"
from="renegociacaoExecutada" to="renegociacaoFinalizada1"
ref="SEL1056R1RecompraMsg" event-type="message_arrival" />
  <Transition id="SEL1056R1RevendaFinalizada"
from="renegociacaoFinalizada1" to="renegociacaoFinalizada2"
ref="SEL1056R1RevendaMsg" event-type="message_arrival" />
</Transitions>
</Protocol>
<Entrance>
  <Participant role_ref="selic" limit="1">
    <State ref="nenhumaResolicitacao"/>
    <State ref="revendaSolicitada"/>

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        <State ref="recompraSolicitada"/>
        <State ref="renegociacaoExecutada"/>
    </Participant>
    <Participant role_ref="comprador" limit="1">
        <State ref="nenhumaResolicitacao"/>
        <State ref="revendaSolicitada"/>
    </Participant>
    <Participant role_ref="vendedor" limit="1">
        <State ref="nenhumaResolicitacao"/>
        <State ref="recompraSolicitada"/>
    </Participant>
</Entrance>

</Scene>
<!-- Caso de Leis: Garantir recompra -->
<Action id="seller-has-been-fined" class="br.pucRio.inf.les.law.application.selic.action.
    FineAction">
    <Element ref="clock_obligation_buy_again" event-type="clock_tick"/>
</Action>

<!-- 1 dia = 24h * 60 min * 60 seg * 1000 mlseg = 86400000 -->
<Clock id="clock_obligation_buy_again" type="periodic" tick-period="86400000">
    <Activations>
        <Element ref="norm_obligation_of_buying_again" event-
            type="norm_activation" />
    </Activations>
    <Deactivations>
        <Element ref="SEL1056tp1Recompra" event-type="transition_activation" />
        <Element ref="SEL1056tp3Recompra" event-type="transition_activation" />
        <Element ref="SEL1056tp1Revenda" event-type="transition_activation" />
        <Element ref="SEL1056tp3Revenda" event-type="transition_activation" />
    </Deactivations>
</Clock>

<!-- 10 dias = 10 * 24h * 60 min * 60 seg * 1000 mlseg = 864000000 -->
<Clock id="clock_prohibition_of_buying_again" type="once" tick-period="864000000">
    <Activations>
        <Element ref="norm_obligation_of_buying_again" event-
            type="norm_activation" />
    </Activations>
    <Deactivations>
        <Element ref="SEL1056tp1Recompra" event-type="transition_activation" />
        <Element ref="SEL1056tp3Recompra" event-type="transition_activation" />
        <Element ref="SEL1056tp1Revenda" event-type="transition_activation" />
        <Element ref="SEL1056tp3Revenda" event-type="transition_activation" />
    </Deactivations>
</Clock>
<Norm type="obligation" id="norm_obligation_of_buying_again">
    <Assignee role-ref="vendedor" role-instance="$vendedor.instance"/>
    <Activations>
        <Element ref="SEL1054R1VendaFinalizada" event-
            type="transition_activation"/>
    </Activations>
    <Deactivations>
        <Element ref="SEL1056tp1Recompra" event-type="transition_activation" />
        <Element ref="SEL1056tp3Recompra" event-type="transition_activation" />
        <Element ref="SEL1056tp1RecompraConfirmada" event-
            type="transition_activation" />
        <Element ref="SEL1056tp3RecompraConfirmada" event-
            type="transition_activation" />
    </Deactivations>

```

```

    </Deactivations>
  </Norm>
  <Norm type="prohibition" id="norm_prohibition_of_buying_again">
    <Assignee role-ref="vendedor" role-instance="$vendedor.instance"/>
    <Activations>
      <Element ref="clock_prohibition_of_buying_again" event-
        type="clock_timeout"/>
    </Activations>
    <!-- Esta norma não contém elementos de desativação porque uma vez que o
      prazo de recompra tenha sido expirado, a instituição não poderá mais
      recomprar o título -->
  </Norm>

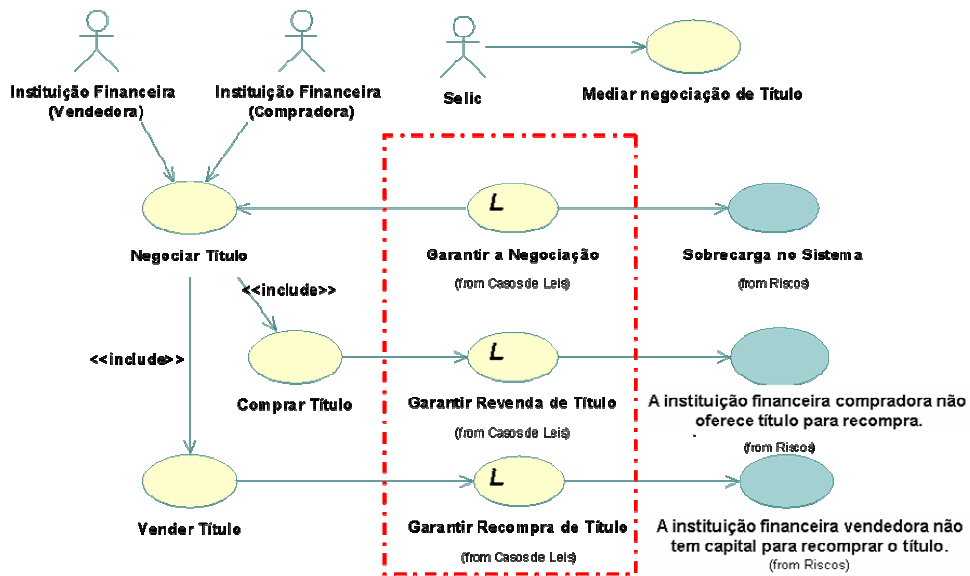
  <!-- Caso de Leis: Garantir revenda -->
  <Action id="buyer-has-been-fined" class="br.pucRio.inf.les.law.application.selic.
    action.FineAction">
    <Element ref="clock_obligation_of_selling_again" event-type="clock_tick"/>
  </Action>
  <!-- 1 dia = 24h * 60 min * 60 seg * 1000 mlseg = 86400000 -->
  <Clock id="clock_obligation_of_selling_again" type="periodic" tick-
    period="86400000">
    <Activations>
      <Element ref="norm_obligation_of_selling_again" event-
        type="norm_activation" />
    </Activations>
    <Deactivations>
      <Element ref="SEL1056tp1Recompra" event-type="transition_activation" />
      <Element ref="SEL1056tp3Recompra" event-type="transition_activation" />
      <Element ref="SEL1056tp1Revenda" event-type="transition_activation" />
      <Element ref="SEL1056tp3Revenda" event-type="transition_activation" />
    </Deactivations>
  </Clock>

  <!-- 10 dias = 10 * 24h * 60 min * 60 seg * 1000 mlseg = 864000000 -->
  <Clock id="clock_prohibition_of_trading" type="once" tick-period="864000000">
    <Activations>
      <Element ref="norm_prohibition_of_trading" event-type="norm_activation" />
    </Activations>
    <Deactivations>
      <Element ref="SEL1056tp1Recompra" event-type="transition_activation" />
      <Element ref="SEL1056tp3Recompra" event-type="transition_activation" />
      <Element ref="SEL1056tp1Revenda" event-type="transition_activation" />
      <Element ref="SEL1056tp3Revenda" event-type="transition_activation" />
    </Deactivations>
  </Clock>
  <Norm type="obligation" id="norm_obligation_of_selling_again">
    <Assignee role-ref="comprador" role-instance="$comprador.instance"/>
    <Activations>
      <Element ref="SEL1054R1VendaFinalizada" event-
        type="transition_activation"/>
    </Activations>
    <Deactivations>
      <Element ref="SEL1056tp1Recompra" event-type="transition_activation" />
      <Element ref="SEL1056tp3Recompra" event-type="transition_activation" />
      <Element ref="SEL1056tp1RecompraConfirmada" event-
        type="transition_activation" />
      <Element ref="SEL1056tp3RecompraConfirmada" event-
        type="transition_activation" />
    </Deactivations>
  </Norm>

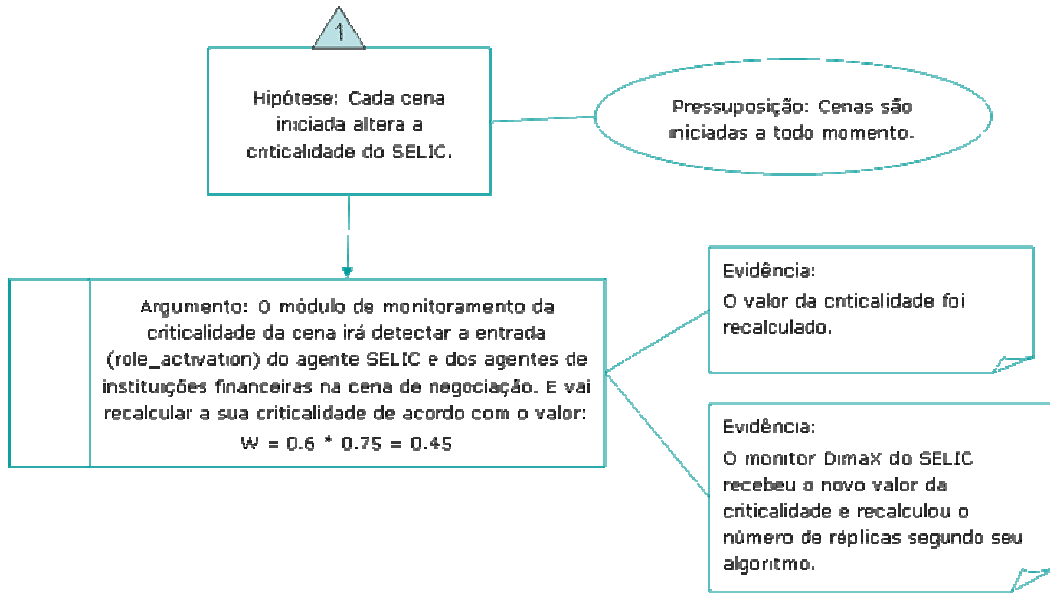
```

```
<Norm type="prohibition" id="norm_prohibition_of_trading">
  <Assignee role-ref="comprador" role-instance="$comprador.instance"/>
  <Activations>
    <Element ref="clock_prohibition_of_trading" event-type="clock_timeout"/>
  </Activations>
  <Deactivations>
    <Element ref="SEL1056tp1Revenda" event-type="transition_activation" />
    <Element ref="SEL1056tp3Revenda" event-type="transition_activation" />
    <Element ref="SEL1056tp1RevendaConfirmada" event-
      type="transition_activation" />
    <Element ref="SEL1056tp3RevendaConfirmada" event-
      type="transition_activation" />
  </Deactivations>
</Norm>
</LawOrganization>
</Laws>
```

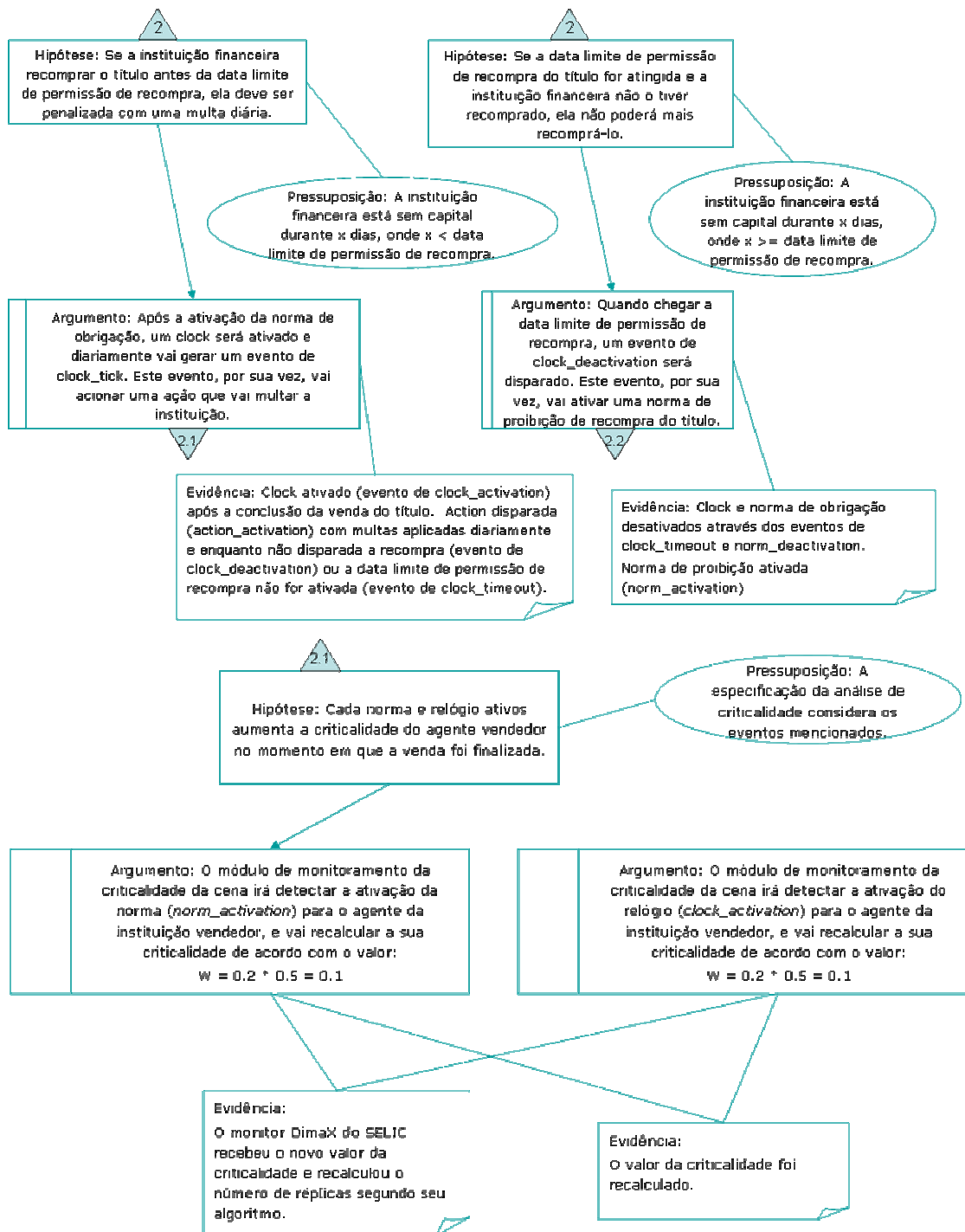
B2 Casos de Leis: SELIC

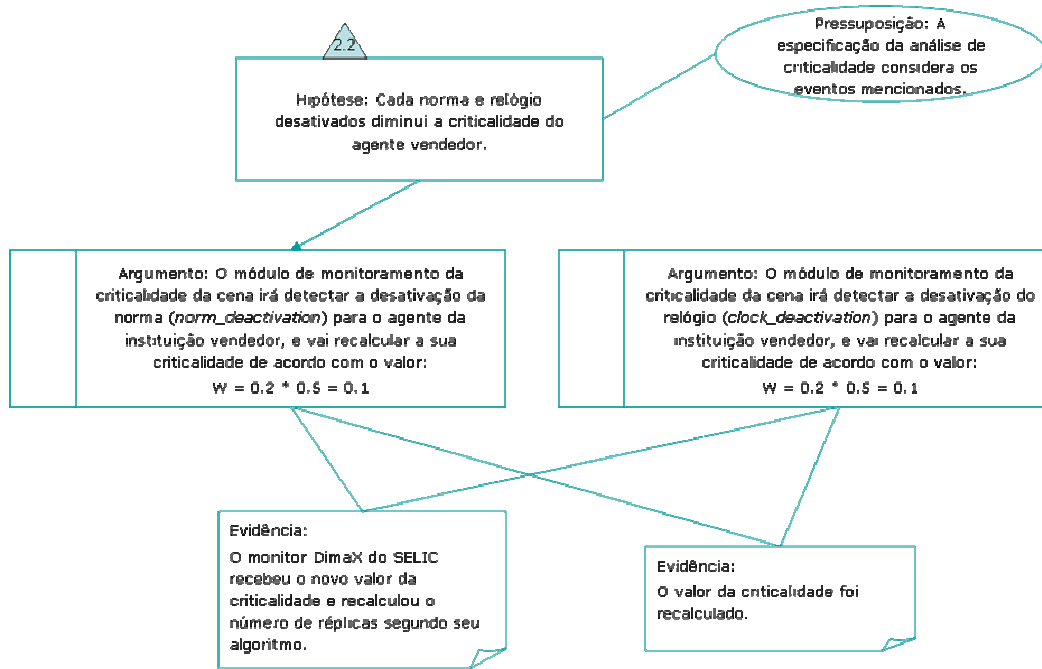


Caso de Leis Garantir a Negociação	
Caso de Uso: Negociar Título	
Risco: SELIC estar sobrecarregado com volume de mensagens	
Probabilidade: 60%	Impacto: 0,75
Pré-condições: Existir interessados na negociação (comprador e vendedor para título).	
<div style="border: 1px solid black; padding: 10px;"> <p>Contexto: Existe Comprador e vendedor para Título</p> <p>Hipótese: O agente SELIC não pode falhar.</p> <p>Pressuposição: Volume de negociações ocorrendo em paralelo pode crescer exponencialmente.</p> <p>Argumento: O módulo de monitoramento da criticidade do SELIC irá detectar o aumento da importância do agente (quantidade de negociações em paralelo) e vai aumentar a criticidade do agente SELIC a cada vez que uma cena for iniciada. O que irá recalcular o número de réplicas.</p> <p>Evidência: Uma réplica do agente SELIC substituiu o agente e ele não falhou.</p> <p style="text-align: center;">1</p> </div>	
Pós-condições: A negociação foi efetivada segundo as condições válidas e determinadas pelas IFs	

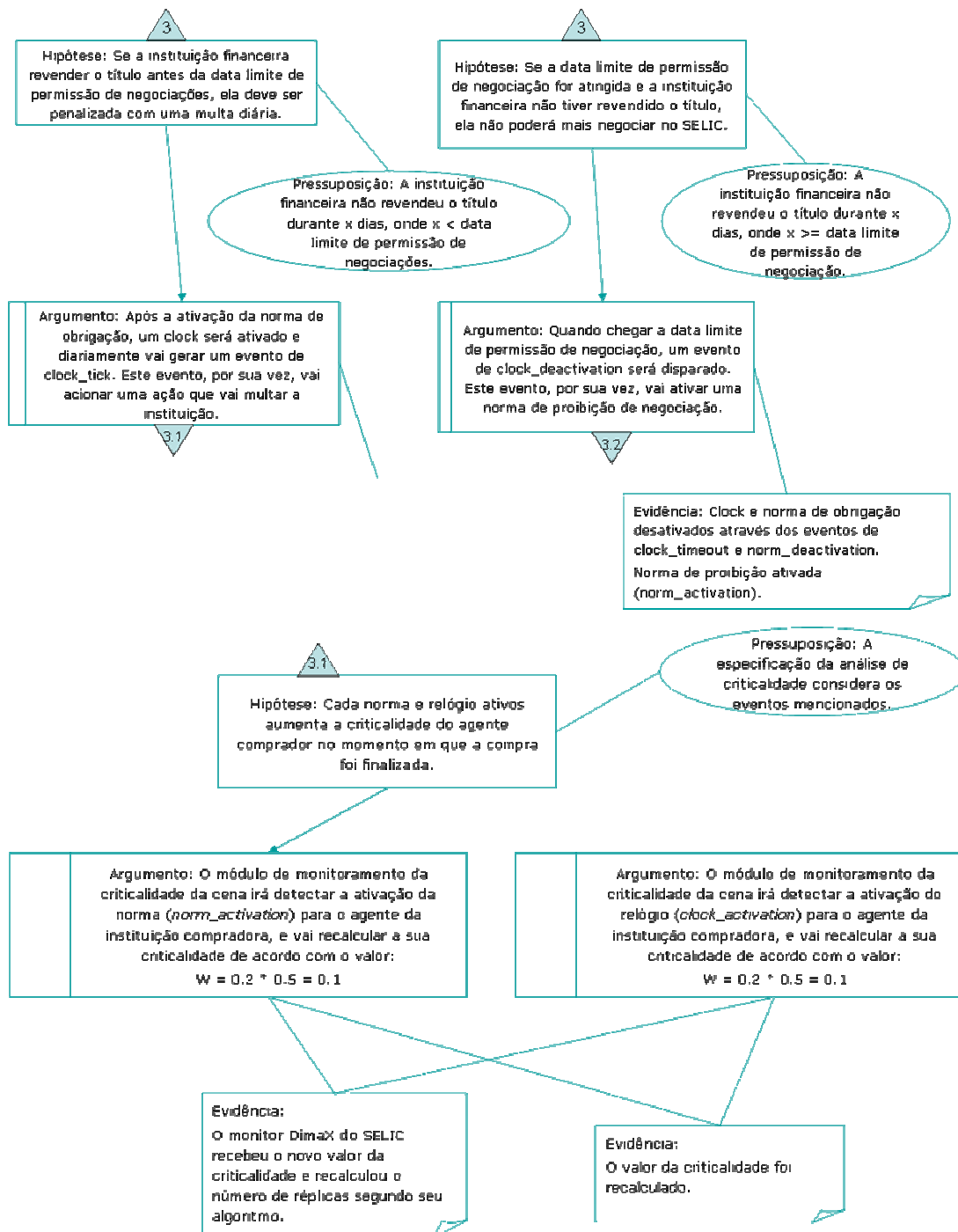


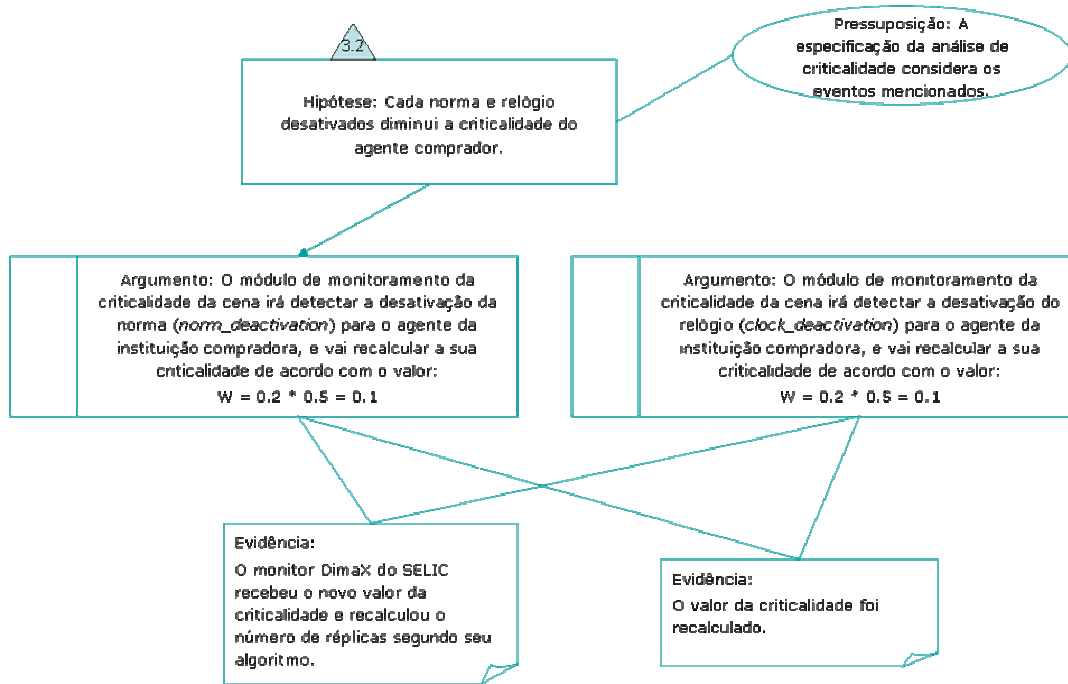
Caso de Leis Garantir a Recompra de Títulos	
Caso de Uso: Vender Título	
Risco: A instituição financeira vendedora não tem capital para recomprar o título.	
Probabilidade: 20%	Impacto: 0, 5
Pré-condições: Ter havido a venda do título a ser garantida a recompra (operação compromissada). Todos os campos obrigatórios de mensagem devem estar preenchidos.	
<div style="border: 1px solid black; padding: 10px;"> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; border-radius: 10px; padding: 5px; width: 15%;"> <p>Contexto: O Título foi vendido</p> </div> <div style="border: 1px solid black; padding: 5px; width: 30%;"> <p>Hipótese: Se uma instituição financeira que vendeu o título não recomprá-lo, ela será penalizada.</p> </div> </div> <div style="border: 1px solid black; padding: 10px; margin-top: 20px; width: 60%;"> <p>Argumento: Quando uma instituição financeira concluir a venda, o sistema vai associar uma norma de obrigação de recompra para a instituição financeira vendedora e vai penalizá-la se a mesma não recomprar o título. A pena varia de acordo com o tempo que a instituição leva para recomprar o título.</p> </div> <div style="border: 1px solid black; padding: 5px; margin-top: 20px; width: 20%;"> <p>Evidência: Norma de obrigação de recompra está ativada para a instituição financeira vendedora.</p> </div> </div>	
Pós-condições: Processo de Recompra deve ser disparado antes do tempo limite, ou agente desobedecedor receberá multas sucessivas.	





Caso de Leis Garantir a Revenda de Títulos	
Caso de Uso: Comprar Título	
Risco: A instituição financeira compradora não oferece título para recompra.	
Probabilidade: 20%	Impacto: 0, 5
Pré-condições: Ter havido a compra do título a ser garantida a revenda (operação compromissada). Todos os campos obrigatórios de mensagem devem estar preenchidos.	
<p>Contexto: O Título foi comprado</p> <p>Hipótese: Se uma instituição financeira que comprou o título não revendê-lo, ela será penalizada.</p> <p>Argumento: Quando uma instituição financeira concluir a compra, o sistema vai associar uma norma de obrigação de revenda para a instituição financeira compradora e associar para a instituição financeira vendedora. Se a mesma não revender o título, o sistema vai penalizá-la. A pena varia de acordo com o tempo que a instituição leva para revender o título.</p> <p>Evidência: Norma de obrigação de revenda está ativada para a instituição financeira compradora.</p> <p>3</p>	
Pós-condições: Processo de Recompra deve ser disparado antes do tempo limite, ou agente desobedeedor receberá multas sucessivas.	





B3 SELIC: Planilhas da Avaliação de Resultados

IF A iniciou a negociação

Estado (Contexto)	Peso			Criticalidade			Num. de Replicas		
	Selic	IFA	IFB	Selic	IFA	IFB	Selic	IFA	IFB
negociacaoFechada (role_activation)	0,00	0,00	0,00	0,000	0,000	0,000	0	0	0
nenhumaSolicitacao (transition_activation)	0,45	0,20	0,20	0,045	0,020	0,020	2	1	1
compraSolicitada (transition_activation)	0,20	0,20	0,00	0,055	0,030	0,020	2	1	1
negociacaoExecutada (transition_activation)	-0,20	-0,20	-0,20	0,045	0,020	0,010	2	1	0
negociacaoExecutada (nenhumaResolicitacao: role_activation)	0,45	0,00	0,00	0,090	0,020	0,010	4	1	0
negociacaoFinalizada1 (transition_activation)	0,00	0,00	0,00	0,090	0,020	0,010	4	1	0
negociacaoFinalizada2 (norm_activation)	0,00	0,00	0,10	0,090	0,020	0,050	4	1	2
negociacaoFinalizada2 (clock_activation)	0,00	0,00	0,10	0,090	0,020	0,090	4	1	4
negociacaoFinalizada2 (role_deactivation)	-0,45	-0,20	-0,20	0,045	0,000	0,070	2	0	3
nenhumaResolicitacao (role_activation)	0,00	0,20	0,20	0,045	0,020	0,090	2	1	4
revendaSolicitada (transition_activation)	0,20	0,00	0,20	0,055	0,030	0,090	4	1	4
revendaSolicitada (clock_deactivation)	0,00	0,00	-0,10	0,055	0,030	0,050	4	1	2
renegociacaoExecutada (transition_activation)	-0,20	-0,20	-0,20	0,045	0,020	0,050	4	1	2
renegociacaoFinalizada1 (transition_activation)	0,00	0,00	0,00	0,045	0,020	0,050	4	1	2
renegociacaoFinalizada2 (role_deactivation)	-0,45	-0,20	-0,20	0,000	0,000	0,020	0	0	1

IF B iniciou a negociação

Estado (Contexto)	Peso			Criticalidade			Num. de Replicas		
	Selic	IFA	IFB	Selic	IFA	IFB	Selic	IFA	IFB
negociacaoFechada (role_activation)	0,00	0,00	0,00	0,000	0,000	0,000	0	0	0
nenhumaSolicitacao (transition_activation)	0,00	0,00	0,00	0,045	0,020	0,020	2	1	1
vendaSolicitada (transition_activation)	0,20	0,00	0,20	0,055	0,020	0,030	2	1	1
negociacaoExecutada (transition_activation)	-0,20	-0,20	-0,20	0,045	0,010	0,020	2	0	1
negociacaoExecutada (nenhumaResolicitacao: role_activation)	0,45	0,00	0,00	0,090	0,010	0,020	4	0	1
negociacaoFinalizada1 (transition_activation)	0,00	0,00	0,00	0,090	0,010	0,020	4	0	1
negociacaoFinalizada2 (norm_activation)	0,00	0,00	0,10	0,090	0,010	0,060	4	0	3
negociacaoFinalizada2 (clock_activation)	0,00	0,00	0,10	0,090	0,010	0,100	4	0	5
negociacaoFinalizada2 (role_deactivation)	-0,45	-0,20	-0,20	0,045	-0,010	0,080	2	0	4
nenhumaResolicitacao (role_activation)	0,00	0,20	0,20	0,045	0,010	0,100	2	0	5
revendaSolicitada (transition_activation)	0,20	0,20	0,20	0,055	0,020	0,100	2	1	5
revendaSolicitada (clock_deactivation)	0,00	0,00	-0,10	0,055	0,020	0,060	2	1	3
renegociacaoExecutada (transition_activation)	-0,20	-0,20	-0,20	0,045	0,010	0,050	2	0	2
renegociacaoFinalizada1 (transition_activation)	0,00	0,00	0,00	0,045	0,010	0,050	2	0	2
renegociacaoFinalizada2 (role_deactivation)	-0,45	-0,20	-0,20	0,000	-0,010	0,030	0	0	1