

Bibliografia

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A

A Lei do Aeroporto

```

<Laws>
  <LawOrganization id="airport" name="Toronto_Airport">
    <Scenes>
      <!-- ++++++ ----->
      <Scene id="announcement" time-to-live="10000">
        <!-- 10 sec. -->
        <Creators>
          <Creator agent="any" role="any"/>
        </Creators>
        <Entrance>
          <Participant agent="any" role="customer">
            <StatesRef>
              <StateRef ref="s0"/>
            </StatesRef>
          </Participant>
          <Participant agent="any" role="announcer">
            <StatesRef>
              <StateRef ref="s1"/>
            </StatesRef>
          </Participant>
        </Entrance>
        <Messages>
          <Message id="m1" template="message(request,sender(_,customer),
            receiver(_,announcer),content(hello))."/>
          <Message id="m2" template="message(inform,sender(_,announcer),
            receiver(CustomerAgent,customer),content(services([_|_]))."/>
        </Messages>
        <Protocol>
          <States>
            <State id="s0" type="initial" label="Initial_state"/>
            <State id="s1" type="execution" label="Message_sent"/>
            <State id="s2" type="success" label="Response_answered"/>
          </States>
          <Transitions>
            <Transition id="t1" from="s0" to="s1" message-ref="m1"/>
            <Transition id="t2" from="s1" to="s2" message-ref="m2"/>
          </Transitions>
        </Protocol>
        <Clocks>
          <Clock id="time-for-answering-hello" type="regular" tick-period="
            5000">
            <!-- 5 sec. -->
            <Activations>
              <Element ref="t1" event-type="transition_activation"/>
            </Activations>
            <Deactivations>

```

```

        <Element ref="t2" event-type="transition_activation"/>
    </Deactivations>
</Clock>
</Clocks>
<Actions>
    <Action id="announcer-is-down" class="br.pucrio.inf.les.law.app.
        airport.repairactions.HealAnnouncerAction">
        <Semantic>Semantic for this action </Semantic>
        <Element ref="time-for-answering-hello" event-type="clock_tick"
            />
    </Action>
</Actions>
</Scene>
<!-- ++++++ ----->
<Scene id="selection" time-to-live="60000">
    <!-- 1 min. -->
    <Creators>
        <Creator agent="any" role="any"/>
    </Creators>
    <Entrance>
        <Participant agent="any" role="customer">
            <StatesRef>
                <StateRef ref="s3"/>
            </StatesRef>
        </Participant>
        <Participant agent="any" role="announcer">
            <StatesRef>
                <StateRef ref="s4"/>
            </StatesRef>
        </Participant>
    </Entrance>
    <Messages>
        <Message id="m3" template="message(request,sender(_,customer),
            receiver(_,announcer),content(options(Service)))."/>
        <Message id="m4" template="message(inform,sender(_,announcer),
            receiver(_,customer),content(products(ListOfProducts)))."/>
        <Message id="m5" template="message(request,sender(_,customer),
            receiver(_,announcer),content(sellers-of(Product)))."/>
        <Message id="m6" template="message(inform,sender(_,announcer),
            receiver(Customer,customer),content(sellers([_]_)))."/>
    </Messages>
    <Protocol>
        <States>
            <State id="s3" type="initial" label="Ready_to_ask_for_options"/>
            <State id="s4" type="execution" label="List_of_products_
                requested"/>
            <State id="s5" type="execution" label="List_of_products_informed
                "/>
            <State id="s6" type="execution" label="List_of_sellers_requested
                "/>
            <State id="s7" type="success" label="List_of_sellers_informed"/>
        </States>
        <Transitions>
            <Transition id="t3" from="s3" to="s4" message-ref="m3"/>
            <Transition id="t4" from="s4" to="s5" message-ref="m4"/>
            <Transition id="t5" from="s5" to="s6" message-ref="m5"/>
            <Transition id="t6" from="s6" to="s7" message-ref="m6"/>
        </Transitions>
    </Protocol>

```

```

</Scene>
<!-- ++++++----->
<Scene id="negotiation" time-to-live="infinity">
  <Creators>
    <Creator agent="any" role="any"/>
  </Creators>
  <Entrance>
    <Participant agent="any" role="customer">
      <StatesRef>
        <StateRef ref="s8"/>
      </StatesRef>
    </Participant>
    <Participant agent="any" role="seller">
      <StatesRef>
        <StateRef ref="s9"/>
      </StatesRef>
    </Participant>
  </Entrance>
  <Messages>
    <Message id="m7" template="message(cfp,sender(_,customer),receiver(
      _,seller),content(product-details(product(Product),maxprice(Price
      ),brand(Brand))))"/>
    <Message id="m8" template="message(propose,sender(SellerAgent,seller
      ),receiver(_,customer),content(product(name(Product),price(Price
      ),brand(Brand))))"/>
    <Message id="m9" template="message(accept-proposal,sender(_,customer
      ),receiver(_,seller),content(_))"/>
    <Message id="m10" template="message(inform,sender(_,seller),receiver
      (CustomerAgent,customer),content(payto(Bank)))"/>

    <Message id="m11" template="message(refuse,sender(_,seller),receiver
      (_,customer),content(Reason))"/>
    <Message id="m12" template="message(reject-proposal,sender(_,
      customer),receiver(_,seller),content(Reason))"/>

    <Message id="m13" template="message(cancel,sender(_,seller),receiver
      (_,customer),content(Reason))"/>
  </Messages>
  <Protocol>
    <States>
      <State id="s8" type="initial" label="Ready_for_starting_
        negotiations"/>
      <State id="s9" type="execution" label="Call_for_proposal_
        requested"/>
      <State id="s10" type="execution" label="Proposal_sent"/>
      <State id="s11" type="execution" label="Proposal_accepted"/>
      <State id="s12" type="success" label="Bank_informed"/>
      <State id="s13" type="failure" label="Refuse_sending_proposal"/>
      <State id="s14" type="failure" label="Proposal_rejected"/>
      <State id="s15" type="failure" label="Too_long_time_to_decide"/>
    </States>
    <Transitions>
      <Transition id="t7" from="s8" to="s9" message-ref="m7">
        <Constraints>
          <Constraint class="br.pucrio.inf.les.law.app.airport.
            repairactions.EnforceValue">
            <Semantic>Gets value on price</Semantic>
          </Constraint>
        </Constraints>
      </Transition>
    </Transitions>
  </Protocol>
</Scene>

```



```

        </StatesRef>
    </Participant>
</Entrance>
<Messages>
    <Message id="m14" template="message(request,sender(_ , initiator ),
        receiver(_ , participant ), content (pay (amount (Amount) , to ( Seller) )))
        ."/>
    <Message id="m15" template="message(inform,sender(_ , participant ),
        receiver(_ , initiator ), content (receipt (number (Number) ))) ."/>
</Messages>
<Protocol>
    <States>
        <State id="s16" type="initial" label="Ready_for_payment"/>
        <State id="s17" type="execution" label="Payment_order_emitted"/>
        <State id="s18" type="success" label="Receipt_sent"/>
    </States>
    <Transitions>
        <Transition id="t14" from="s16" to="s17" message-ref="m14"/>
        <Transition id="t15" from="s17" to="s18" message-ref="m15"/>
    </Transitions>
</Protocol>
</Scene>
</Scenes>
<Norms>
    <Permission id="permission-to-pay">
        <Owner>CustomerAgent </Owner>
        <Activations>
            <Element ref="negotiation" event-type="sucessful_scene_completion"/>
        </Activations>
        <Deactivations>
            <Element ref="payment" event-type="sucessful_scene_completion"/>
        </Deactivations>
    </Permission>
</Norms>
</LawOrganization>
</Laws>

```

Tabela A.1: Implementação das Leis do Aeroporto Utilizando o XMLaw

B

Gramática do XMLaw

Na Tabela B.1, apresenta-se a gramática da linguagem XMLaw utilizando-se o formato XML schema [80].

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?> <!--W3C
Schema generated by XMLSpy v2005 sp1 U (http://www.xmlspy.com)-->
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
elementFormDefault="qualified">
  <xs:element name="Action">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="Semantic"/>
        <xs:element ref="Element"/>
      </xs:sequence>
      <xs:attribute name="id" use="required">
        <xs:simpleType>
          <xs:restriction base="xs:string"/>
        </xs:simpleType>
      </xs:attribute>
      <xs:attribute name="class" use="required">
        <xs:simpleType>
          <xs:restriction base="xs:string"/>
        </xs:simpleType>
      </xs:attribute>
    </xs:complexType>
  </xs:element>
  <xs:element name="Actions">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="Action" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="Activations">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="Element" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
  <xs:element name="ActiveNorms">
    <xs:complexType>
      <xs:sequence>
        <xs:element ref="Norm" maxOccurs="unbounded"/>
      </xs:sequence>
    </xs:complexType>
  </xs:element>
</xs:schema>
```

```

<xs:element name="Constraints">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="Constraint" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Clock">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="Activations"/>
      <xs:element ref="Deactivations"/>
    </xs:sequence>
    <xs:attribute name="id" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
    <xs:attribute name="type" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
    <xs:attribute name="tick-period" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
</xs:element>
<xs:element name="Clocks">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="Clock" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Constraint">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="Semantic"/>
    </xs:sequence>
    <xs:attribute name="class" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
</xs:element>
<xs:element name="Creator">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="ActiveNorms" minOccurs="0"/>
    </xs:sequence>
    <xs:attribute name="agent" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>

```

```

        <xs:attribute name="role" use="required">
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                <xs:restriction base="xs:string"/>
            </xs:simpleType>
        </xs:attribute>
    </xs:complexType>
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        <xs:sequence>
            <xs:element ref="Creator" maxOccurs="unbounded"/>
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="Deactivations">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="Element" maxOccurs="unbounded"/>
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="Element">
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            </xs:simpleType>
        </xs:attribute>
        <xs:attribute name="event-type" use="required">
            <xs:simpleType>
                <xs:restriction base="xs:string"/>
            </xs:simpleType>
        </xs:attribute>
    </xs:complexType>
</xs:element>
<xs:element name="StateRef">
    <xs:complexType>
        <xs:attribute name="ref" use="required">
            <xs:simpleType>
                <xs:restriction base="xs:string"/>
            </xs:simpleType>
        </xs:attribute>
    </xs:complexType>
</xs:element>
<xs:element name="Entrance">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="Participant" maxOccurs="unbounded"/>
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="LawOrganization">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="Scenes"/>
            <xs:element ref="Norms"/>
        </xs:sequence>
        <xs:attribute name="id" use="required">
            <xs:simpleType>

```

```

        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
    <xs:attribute name="name" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
</xs:element>
<xs:element name="Laws">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="LawOrganization"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Message">
  <xs:complexType>
    <xs:attribute name="id" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
    <xs:attribute name="template" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
</xs:element>
<xs:element name="Messages">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="Message" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Norm">
  <xs:complexType>
    <xs:attribute name="ref" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
</xs:element>
<xs:element name="Norms">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="Permission" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element ref="Obligation" minOccurs="0" maxOccurs="unbounded"/>
      <xs:element ref="Forbidden" minOccurs="0" maxOccurs="unbounded"/>
    </xs:sequence>
  </xs:complexType>
</xs:element>
<xs:element name="Owner">
  <xs:simpleType>
    <xs:restriction base="xs:string"/>

```

```

    </xs:simpleType>
</xs:element>
<xs:element name="Participant">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="StatesRef" maxOccurs="unbounded"/>
    </xs:sequence>
    <xs:attribute name="agent" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
    <xs:attribute name="role" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
</xs:element>
<xs:element name="Permission">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="Owner"/>
      <xs:element ref="Activations"/>
      <xs:element ref="Deactivations" minOccurs="0"/>
    </xs:sequence>
    <xs:attribute name="id" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
</xs:element>
<xs:element name="Obligation">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="Owner"/>
      <xs:element ref="Activations"/>
      <xs:element ref="Deactivations" minOccurs="0"/>
    </xs:sequence>
    <xs:attribute name="id" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
</xs:element>
<xs:element name="Forbidden">
  <xs:complexType>
    <xs:sequence>
      <xs:element ref="Owner"/>
      <xs:element ref="Activations"/>
      <xs:element ref="Deactivations" minOccurs="0"/>
    </xs:sequence>
    <xs:attribute name="id" use="required">
      <xs:simpleType>
        <xs:restriction base="xs:string"/>
      </xs:simpleType>
    </xs:attribute>
  </xs:complexType>
</xs:element>

```

```

        </xs:complexType>
    </xs:element>
    <xs:element name="Protocol">
        <xs:complexType>
            <xs:sequence>
                <xs:element ref="States"/>
                <xs:element ref="Transitions"/>
            </xs:sequence>
        </xs:complexType>
    </xs:element>
    <xs:element name="Scene">
        <xs:complexType>
            <xs:sequence>
                <xs:element ref="Creators"/>
                <xs:element ref="Entrance"/>
                <xs:element ref="Messages"/>
                <xs:element ref="Protocol"/>
                <xs:element ref="Clocks" minOccurs="0"/>
                <xs:element ref="Actions" minOccurs="0"/>
                <xs:element ref="Norms" minOccurs="0"/>
            </xs:sequence>
            <xs:attribute name="id" use="required">
                <xs:simpleType>
                    <xs:restriction base="xs:string"/>
                </xs:simpleType>
            </xs:attribute>
            <xs:attribute name="time-to-live" use="required">
                <xs:simpleType>
                    <xs:restriction base="xs:string"/>
                </xs:simpleType>
            </xs:attribute>
        </xs:complexType>
    </xs:element>
    <xs:element name="Scenes">
        <xs:complexType>
            <xs:sequence>
                <xs:element ref="Scene" maxOccurs="unbounded"/>
            </xs:sequence>
        </xs:complexType>
    </xs:element>
    <xs:element name="Semantic">
        <xs:simpleType>
            <xs:restriction base="xs:string"/>
        </xs:simpleType>
    </xs:element>
    <xs:element name="State">
        <xs:complexType>
            <xs:attribute name="ref">
                <xs:simpleType>
                    <xs:restriction base="xs:string"/>
                </xs:simpleType>
            </xs:attribute>
            <xs:attribute name="id">
                <xs:simpleType>
                    <xs:restriction base="xs:string"/>
                </xs:simpleType>
            </xs:attribute>
            <xs:attribute name="type">
                <xs:simpleType>

```

```

        <xs:restriction base="xs:string">
            <xs:enumeration value="execution"/>
            <xs:enumeration value="failure"/>
            <xs:enumeration value="initial"/>
            <xs:enumeration value="success"/>
        </xs:restriction>
    </xs:simpleType>
</xs:attribute>
<xs:attribute name="label">
    <xs:simpleType>
        <xs:restriction base="xs:string"/>
    </xs:simpleType>
</xs:attribute>
</xs:complexType>
</xs:element>
<xs:element name="States">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="State" maxOccurs="unbounded"/>
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="StatesRef">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="StateRef" maxOccurs="unbounded"/>
        </xs:sequence>
    </xs:complexType>
</xs:element>
<xs:element name="Transition">
    <xs:complexType>
        <xs:sequence>
            <xs:element ref="Constraints" minOccurs="0"/>
            <xs:element ref="ActiveNorms" minOccurs="0"/>
        </xs:sequence>
        <xs:attribute name="id" use="required">
            <xs:simpleType>
                <xs:restriction base="xs:string"/>
            </xs:simpleType>
        </xs:attribute>
        <xs:attribute name="from" use="required">
            <xs:simpleType>
                <xs:restriction base="xs:string"/>
            </xs:simpleType>
        </xs:attribute>
        <xs:attribute name="to" use="required">
            <xs:simpleType>
                <xs:restriction base="xs:string"/>
            </xs:simpleType>
        </xs:attribute>
        <xs:attribute name="message-ref" use="required">
            <xs:simpleType>
                <xs:restriction base="xs:string"/>
            </xs:simpleType>
        </xs:attribute>
    </xs:complexType>
</xs:element>
<xs:element name="Transitions">
    <xs:complexType>

```

```
<xs:sequence>
  <xs:element ref="Transition" maxOccurs="unbounded"/>
</xs:sequence>
</xs:complexType>
</xs:element>
</xs:schema>
```

Tabela B.1: XML Schema do XMLaw