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9.1

Especificação da Linguagem XConnector em XML Schema

```

<?xml version="1.0"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/XConnector"
xmlns="http://www.telemidia.puc-rio.br/specs/xml/XConnector"
elementFormDefault="qualified" attributeFormDefault="unqualified" >

<xsd:complexType name="HypermediaConnector" abstract="true">
  <xsd:sequence>
    <xsd:element name="param" type="ParameterType" minOccurs="0"
      maxOccurs="unbounded"/>
  </xsd:sequence>
  <xsd:attribute name="id" type="xsd:ID" use="required"/>
  <xsd:attribute name="name" type="xsd:string"/>
  <xsd:attribute name="description" type="xsd:string"/>
</xsd:complexType>

<xsd:complexType name="ParameterType" >
  <xsd:attribute name="name" type="xsd:string" use="required"/>
  <xsd:attribute name="type" type="xsd:string" use="required"/>
</xsd:complexType>

<xsd:complexType name="CausalHypermediaConnector">
  <xsd:complexContent>
    <xsd:extension base="HypermediaConnector">
      <xsd:sequence>
        <xsd:choice maxOccurs="unbounded">
          <xsd:element name="conditionRole" type="ConditionRole"/>
          <xsd:element name="propertyRole" type="PropertyRole" />
        </xsd:choice>
        <xsd:element name="actionRole" type="ActionRole"
          maxOccurs="unbounded"/>
        <xsd:element name="glue" type="CausalGlue"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="ConstraintHypermediaConnector">
  <xsd:complexContent>
    <xsd:extension base="HypermediaConnector">
      <xsd:sequence>
        <xsd:element name="propertyRole" type="PropertyRole"
          minOccurs="2" maxOccurs="unbounded"/>
        <xsd:element name="glue" type="ConstraintGlue"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

```

```

<xsd:complexType name="Role" abstract="true">
  <xsd:attribute name="id" type="xsd:string" use="required"/>
  <xsd:attribute name="eventType" type="EventType" use="required"/>
  <xsd:attributeGroup ref="Cardinality"/>
  <xsd:attribute name="attributeName" type="xsd:string" />
</xsd:complexType>

<xsd:complexType name="ActionRole">
  <xsd:complexContent>
    <xsd:extension base="Role">
      <xsd:attribute name="actionType" type="SimpleAction"
        use="required"/>
      <xsd:attribute name="show" type="ShowType" default="new"/>
      <xsd:attribute name="delay" type="unsignedLongParamUnion"
        default="0"/>
      <xsd:attribute name="repeat" type="repeatUnion" default="0"/>
      <xsd:attribute name="delayBetweenRep"
        type="unsignedLongParamUnion" default="0"/>
      <xsd:attribute name="initialValue" type="xsd:anySimpleType"/>
      <xsd:attribute name="finalValue" type="xsd:anySimpleType"/>
      <xsd:attribute name="duration" type="unsignedLongParamUnion"
        default="0"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:simpleType name="ShowType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="embed" />
    <xsd:enumeration value="replace" />
    <xsd:enumeration value="new" />
  </xsd:restriction>
</xsd:simpleType>

<xsd:attributeGroup name="Cardinality">
  <xsd:attribute name="min" type="xsd:positiveInteger" default="1"/>
  <xsd:attribute name="max" type="maxUnion" default="1"/>
</xsd:attributeGroup >

<xsd:simpleType name="unboundedString">
  <xsd:restriction base="xsd:string">
    <xsd:pattern value="unbounded"/>
  </xsd:restriction>
</xsd:simpleType>

<xsd:simpleType name="unsignedLongParamUnion">
  <xsd:union memberTypes="xsd:unsignedLong xsd:string"/>
</xsd:simpleType>

<xsd:simpleType name="maxUnion">
  <xsd:union memberTypes="xsd:positiveInteger unboundedString"/>
</xsd:simpleType>

<xsd:simpleType name="repeatUnion">
  <xsd:union memberTypes="xsd:nonNegativeInteger unboundedString
xsd:string"/>
</xsd:simpleType>

<xsd:simpleType name="EventType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="presentation" />
    <xsd:enumeration value="mouseClick" />
    <xsd:enumeration value="attribution" />
    <xsd:enumeration value="mouseOver" />
    <xsd:enumeration value="prefetch" />
    <xsd:enumeration value="focus" />
  </xsd:restriction>
</xsd:simpleType>

```

```

    </xsd:restriction>
  </xsd:simpleType>

  <xsd:simpleType name="SimpleAction">
    <xsd:restriction base="xsd:string">
      <xsd:enumeration value="start" />
      <xsd:enumeration value="stop" />
      <xsd:enumeration value="pause" />
      <xsd:enumeration value="resume" />
      <xsd:enumeration value="abort" />
    </xsd:restriction>
  </xsd:simpleType>

  <xsd:complexType name="ConditionRole">
    <xsd:complexContent>
      <xsd:extension base="Role">
        <xsd:sequence>
          <xsd:element name="condition" type="Condition"/>
        </xsd:sequence>
      </xsd:extension>
    </xsd:complexContent>
  </xsd:complexType>

  <xsd:complexType name="Condition" abstract="true">
    <xsd:attribute name="isNegated" type="xsd:boolean" default="false"/>
  </xsd:complexType>

  <xsd:complexType name="SimpleCondition" abstract="true">
    <xsd:complexContent>
      <xsd:extension base="Condition">
      </xsd:extension>
    </xsd:complexContent>
  </xsd:complexType>

  <xsd:complexType name="EventStateCondition">
    <xsd:complexContent>
      <xsd:extension base="SimpleCondition">
        <xsd:attribute name="comparator" type="ComparatorType"
          use="required"/>
        <xsd:attribute name="state" type="StateType" use="required"/>
      </xsd:extension>
    </xsd:complexContent>
  </xsd:complexType>

  <xsd:complexType name="EventTransitionCondition">
    <xsd:complexContent>
      <xsd:extension base="SimpleCondition">
        <xsd:attribute name="transition" type="TransitionType"
          use="required"/>
      </xsd:extension>
    </xsd:complexContent>
  </xsd:complexType>

  <xsd:complexType name="EventAttributeCondition">
    <xsd:complexContent>
      <xsd:extension base="SimpleCondition">
        <xsd:attribute name="comparator" type="ComparatorType"
          use="required"/>
        <xsd:attribute name="attributeType" type="AttributeType"
          use="required"/>
        <xsd:attribute name="value" type="xsd:anySimpleType"
          use="required"/>
      </xsd:extension>
    </xsd:complexContent>
  </xsd:complexType>

```

```

<xsd:complexType name="CompoundCondition" >
  <xsd:complexContent>
    <xsd:extension base="Condition">
      <xsd:sequence>
        <xsd:element name="firstCondition" type="Condition"/>
        <xsd:element name="secondCondition" type="Condition"/>
      </xsd:sequence>
      <xsd:attribute name="operator" type="LogicalOperatorType"
        use="required"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:simpleType name="LogicalOperatorType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="and" />
    <xsd:enumeration value="or" />
  </xsd:restriction>
</xsd:simpleType>

<xsd:simpleType name="ComparatorType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="eq" />
    <xsd:enumeration value="dif" />
    <xsd:enumeration value="gt" />
    <xsd:enumeration value="lt" />
    <xsd:enumeration value="gte" />
    <xsd:enumeration value="lte" />
  </xsd:restriction>
</xsd:simpleType>

<xsd:simpleType name="StateType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="prepared" />
    <xsd:enumeration value="occurring" />
    <xsd:enumeration value="paused" />
    <xsd:enumeration value="finished" />
  </xsd:restriction>
</xsd:simpleType>

<xsd:simpleType name="TransitionType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="starts" />
    <xsd:enumeration value="stops" />
    <xsd:enumeration value="pauses" />
    <xsd:enumeration value="resumes" />
    <xsd:enumeration value="aborts" />
    <xsd:enumeration value="abortsFromPaused" />
    <xsd:enumeration value="ends" />
  </xsd:restriction>
</xsd:simpleType>

<xsd:simpleType name="AttributeType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="repeat" />
    <xsd:enumeration value="occurences" />
    <xsd:enumeration value="attribute" />
  </xsd:restriction>
</xsd:simpleType>

<xsd:complexType name="PropertyRole">
  <xsd:complexContent>
    <xsd:extension base="Role">
      <xsd:sequence>
        <xsd:element name="property" type="Property"/>
      </xsd:sequence>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

```

```

        </xsd:extension>
      </xsd:complexContent>
    </xsd:complexType>

    <xsd:complexType name="Property" abstract="true">
    </xsd:complexType>

    <xsd:complexType name="EventStateProperty">
      <xsd:complexContent>
        <xsd:extension base="Property">
        </xsd:extension>
      </xsd:complexContent>
    </xsd:complexType>

    <xsd:complexType name="EventTransitionProperty">
      <xsd:complexContent>
        <xsd:extension base="Property">
          <xsd:attribute name="transition" type="TransitionType"
            use="required"/>
          <xsd:attribute name="offset" type="unsignedLongParamUnion"/>
        </xsd:extension>
      </xsd:complexContent>
    </xsd:complexType>

    <xsd:complexType name="EventAttributeProperty">
      <xsd:complexContent>
        <xsd:extension base="Property">
          <xsd:attribute name="attributeType" type="AttributeType"
            use="required"/>
          <xsd:attribute name="offset" type="xsd:anySimpleType"/>
        </xsd:extension>
      </xsd:complexContent>
    </xsd:complexType>

    <xsd:complexType name="CausalGlue">
      <xsd:sequence>
        <xsd:element name="triggerExpression" type="TriggerExpression"/>
        <xsd:element name="actionExpression" type="ActionExpression"/>
      </xsd:sequence>
    </xsd:complexType>

    <xsd:complexType name="ConstraintGlue">
      <xsd:sequence>
        <xsd:element name="propertyExpression" type="PropertyExpression"/>
      </xsd:sequence>
    </xsd:complexType>

    <xsd:complexType name="TriggerExpression" abstract="true">
      <xsd:attribute name="isNegated" type="xsd:boolean" default="false"/>
      <xsd:attribute name="minDelay" type="unsignedLongParamUnion"
        default="0"/>
      <xsd:attribute name="maxDelay" type="unsignedLongParamUnion"
        default="0"/>
    </xsd:complexType>

    <xsd:complexType name="SimpleTriggerExpression">
      <xsd:complexContent>
        <xsd:extension base="TriggerExpression">
          <xsd:attribute name="conditionRole" type="xsd:string"
            use="required"/>
          <xsd:attribute name="qualifier" type="ConditionQualifierType"/>
        </xsd:extension>
      </xsd:complexContent>
    </xsd:complexType>

    <xsd:complexType name="CompoundTriggerExpression" >

```

```

<xsd:complexContent>
  <xsd:extension base="TriggerExpression">
    <xsd:choice>
      <xsd:sequence>
        <xsd:element name="firstTrigger"
          type="TriggerExpression"/>
        <xsd:element name="secondTrigger"
          type="TriggerExpression"/>
      </xsd:sequence>
      <xsd:sequence>
        <xsd:element name="trigger" type="TriggerExpression"/>
        <xsd:element name="property" type="PropertyExpression"/>
      </xsd:sequence>
    </xsd:choice>
    <xsd:attribute name="operator" type="LogicalOperatorType"
      use="required"/>
  </xsd:extension>
</xsd:complexContent>
</xsd:complexType>

<xsd:simpleType name="ConditionQualifierType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="all" />
    <xsd:enumeration value="any" />
  </xsd:restriction>
</xsd:simpleType>

<xsd:complexType name="PropertyExpression" abstract="true">
</xsd:complexType>

<xsd:complexType name="SimplePropertyExpression" abstract="true">
  <xsd:complexContent>
    <xsd:extension base="PropertyExpression">
      <xsd:attribute name="comparator" type="ComparatorType"
        use="required"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="PropertyToPropertyExpression">
  <xsd:complexContent>
    <xsd:extension base="SimplePropertyExpression">
      <xsd:attribute name="firstPropertyRole" type="xsd:string"
        use="required"/>
      <xsd:attribute name="firstQualifier"
        type="ConditionQualifierType"/>
      <xsd:attribute name="secondPropertyRole" type="xsd:string"
        use="required"/>
      <xsd:attribute name="secondQualifier"
        type="ConditionQualifierType"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="AttributeToValueExpression">
  <xsd:complexContent>
    <xsd:extension base="SimplePropertyExpression">
      <xsd:attribute name="propertyRole" type="xsd:string"
        use="required"/>
      <xsd:attribute name="qualifier" type="ConditionQualifierType"/>
      <xsd:attribute name="value" type="xsd:anySimpleType"
        use="required"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

```

```

<xsd:complexType name="EventStateToValueExpression">
  <xsd:complexContent>
    <xsd:extension base="SimplePropertyExpression">
      <xsd:attribute name="propertyRole" type="xsd:string"
        use="required"/>
      <xsd:attribute name="qualifier" type="ConditionQualifierType"/>
      <xsd:attribute name="state" type="StateType" use="required"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="CompoundPropertyExpression" >
  <xsd:complexContent>
    <xsd:extension base="PropertyExpression">
      <xsd:sequence>
        <xsd:element name="firstProperty" type="PropertyExpression"/>
        <xsd:element name="secondProperty"
          type="PropertyExpression"/>
      </xsd:sequence>
      <xsd:attribute name="operator" type="LogicalOperatorType"
        use="required"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:complexType name="ActionExpression" abstract="true">
  <xsd:attribute name="delay" type="unsignedLongParamUnion"
    default="0"/>
</xsd:complexType>

<xsd:complexType name="SimpleActionExpression">
  <xsd:complexContent>
    <xsd:extension base="ActionExpression">
      <xsd:attribute name="actionRole" type="xsd:string"
        use="required"/>
      <xsd:attribute name="qualifier" type="ActionQualifierType"/>
    </xsd:extension>
  </xsd:complexContent>
</xsd:complexType>

<xsd:simpleType name="CompoundActionOperatorType">
  <xsd:restriction base="xsd:string">
    <xsd:enumeration value="par" />
    <xsd:enumeration value="seq" />
    <xsd:enumeration value="excl" />
  </xsd:restriction>
</xsd:simpleType>

<xsd:simpleType name="ActionQualifierType">
  <xsd:restriction base="CompoundActionOperatorType">
    <xsd:enumeration value="par" />
    <xsd:enumeration value="excl" />
  </xsd:restriction>
</xsd:simpleType>

<xsd:complexType name="CompoundActionExpression" >
  <xsd:complexContent>
    <xsd:extension base="ActionExpression">
      <xsd:sequence>
        <xsd:element name="firstAction" type="ActionExpression"/>
        <xsd:element name="secondAction" type="ActionExpression"/>
      </xsd:sequence>
      <xsd:attribute name="operator" type="CompoundActionOperatorType"
        use="required"/>
    </xsd:extension>
  </xsd:complexContent>

```

```

</xsd:complexType>
<xsd:element name="xconnector" type="HypermediaConnector" >
  <xsd:key name="KeyConnectorRole">
    <xsd:selector xpath="./(conditionRole|propertyRole|actionRole)"/>
    <xsd:field xpath="@id"/>
  </xsd:key>

  <xsd:key name="keyConditionRole">
    <xsd:selector xpath="//conditionRole"/>
    <xsd:field xpath="@id"/>
  </xsd:key>

  <xsd:key name="keyPropertyRole">
    <xsd:selector xpath="//propertyRole"/>
    <xsd:field xpath="@id"/>
  </xsd:key>

  <xsd:key name="keyActionRole">
    <xsd:selector xpath="//actionRole"/>
    <xsd:field xpath="@id"/>
  </xsd:key>

  <xsd:keyref name="conditionRoleRef" refer="keyConditionRole">
    <xsd:selector xpath="//glue/*/"/>
    <xsd:field xpath="@conditionRole"/>
  </xsd:keyref>

  <xsd:keyref name="propertyRoleRef" refer="keyPropertyRole">
    <xsd:selector xpath="//glue/*/"/>
    <xsd:field xpath="@propertyRole"/>
  </xsd:keyref>

  <xsd:keyref name="firstPropertyRoleRef" refer="keyPropertyRole">
    <xsd:selector xpath="//glue/*/"/>
    <xsd:field xpath="@firstPropertyRole"/>
  </xsd:keyref>

  <xsd:keyref name="secondPropertyRoleRef" refer="keyPropertyRole">
    <xsd:selector xpath="//glue/*/"/>
    <xsd:field xpath="@secondPropertyRole"/>
  </xsd:keyref>

  <xsd:keyref name="actionRoleRef" refer="keyActionRole">
    <xsd:selector xpath="//glue/*/"/>
    <xsd:field xpath="@actionRole"/>
  </xsd:keyref>
</xsd:element>

<xsd:element name="connectorBase">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element ref="xconnector" maxOccurs="unbounded"/>
    </xsd:sequence>
    <xsd:attribute name="id" type="xsd:ID"/>
    <xsd:attribute name="name" type="xsd:string"/>
    <xsd:attribute name="description" type="xsd:string"/>
  </xsd:complexType>
</xsd:element>

</xsd:schema>

```

10

Apêndice B

10.1

Exemplo de Base de Conectores com Relações Temporais de Allen

```
<?xml version="1.0"?>
<connectorBase name="Allen's Temporal Relations"
  xmlns="http://www.telemidia.puc-rio.br/specs/xml/XConnector"
  xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
  xsi:schemaLocation="http://www.telemidia.puc-rio.br/specs/xml/XConnector
http://www.telemidia.puc-rio.br/specs/xml/XConnector.xsd">

  <xconnector id="meets-constraint"
    xsi:type="ConstraintHypermediaConnector" >
    <propertyRole id="x" eventType="presentation">
      <property xsi:type="EventTransitionProperty" transition="stops"/>
    </propertyRole>
    <propertyRole id="y" eventType="presentation">
      <property xsi:type="EventTransitionProperty" transition="starts"/>
    </propertyRole>
    <glue>
      <propertyExpression xsi:type="PropertyToPropertyExpression"
        comparator="eq" firstPropertyRole="x" secondPropertyRole="y"/>
    </glue>
  </xconnector>

  <xconnector id="meets-start" xsi:type="CausalHypermediaConnector" >
    <conditionRole id="x" eventType="presentation">
      <condition xsi:type="EventTransitionCondition" transition="stops"/>
    </conditionRole>
    <actionRole id="y" eventType="presentation" actionType="start"/>
    <glue>
      <triggerExpression xsi:type="SimpleTriggerExpression"
        conditionRole="x"/>
      <actionExpression xsi:type="SimpleActionExpression"
        actionRole="y"/>
    </glue>
  </xconnector>

  <xconnector id="meets-stop" xsi:type="CausalHypermediaConnector" >
    <conditionRole id="y" eventType="presentation">
      <condition xsi:type="EventTransitionCondition"
        transition="starts"/>
    </conditionRole>
    <actionRole id="x" eventType="presentation" actionType="stop"/>
    <glue>
      <triggerExpression xsi:type="SimpleTriggerExpression"
        conditionRole="y" />
      <actionExpression xsi:type="SimpleActionExpression"
        actionRole="x"/>
    </glue>
  </xconnector>
```

```

<xconnector id="starts-constraint"
xsi:type="ConstraintHypermediaConnector" >
  <propertyRole id="x" eventType="presentation">
    <property xsi:type="EventTransitionProperty" transition="starts"/>
  </propertyRole>
  <propertyRole id="y" eventType="presentation">
    <property xsi:type="EventTransitionProperty" transition="starts"/>
  </propertyRole>
  <glue>
    <propertyExpression xsi:type="PropertyToPropertyExpression"
comparator="eq"
    firstPropertyRole="x" secondPropertyRole="y"/>
  </glue>
</xconnector>

<xconnector id="starts" xsi:type="CausalHypermediaConnector" >
  <conditionRole id="x" eventType="presentation">
    <condition xsi:type="EventTransitionCondition"
transition="starts"/>
  </conditionRole>
  <actionRole id="y" eventType="presentation" actionType="start"/>
  <glue>
    <triggerExpression xsi:type="SimpleTriggerExpression"
conditionRole="x" />
    <actionExpression xsi:type="SimpleActionExpression"
actionRole="y"/>
  </glue>
</xconnector>

<xconnector id="finishes-constraint"
xsi:type="ConstraintHypermediaConnector" >
  <propertyRole id="x" eventType="presentation">
    <property xsi:type="EventTransitionProperty" transition="stops"/>
  </propertyRole>
  <propertyRole id="y" eventType="presentation">
    <property xsi:type="EventTransitionProperty" transition="stops"/>
  </propertyRole>
  <glue>
    <propertyExpression xsi:type="PropertyToPropertyExpression"
comparator="eq"
    firstPropertyRole="x" secondPropertyRole="y"/>
  </glue>
</xconnector>

<xconnector id="finishes" xsi:type="CausalHypermediaConnector" >
  <conditionRole id="x" eventType="presentation">
    <condition xsi:type="EventTransitionCondition"
transition="stops"/>
  </conditionRole>
  <actionRole id="y" eventType="presentation" actionType="stop"/>
  <glue>
    <triggerExpression xsi:type="SimpleTriggerExpression"
conditionRole="x" />
    <actionExpression xsi:type="SimpleActionExpression"
actionRole="y"/>
  </glue>
</xconnector>

<xconnector id="before" xsi:type="CausalHypermediaConnector" >
  <param name="delay" type="xsd:unsignedLong"/>
  <conditionRole id="x" eventType="presentation">
    <condition xsi:type="EventTransitionCondition"
transition="stops"/>
  </conditionRole>
  <actionRole id="y" eventType="presentation" actionType="start"/>
  <glue>

```

```

        <triggerExpression xsi:type="SimpleTriggerExpression"
            conditionRole="x" minDelay="$delay" maxDelay="$delay" />
        <actionExpression xsi:type="SimpleActionExpression"
            actionRole="y"/>
    </glue>
</xconnector>

<xconnector id="before-constraint"
    xsi:type="ConstraintHypermediaConnector" >
    <propertyRole id="x" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="stops"/>
    </propertyRole>
    <propertyRole id="y" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="starts"/>
    </propertyRole>
    <glue>
        <propertyExpression xsi:type="PropertyToPropertyExpression"
            firstPropertyRole="x" secondPropertyRole="y" comparator="lt"/>
    </glue>
</xconnector>

<xconnector id="during" xsi:type="ConstraintHypermediaConnector" >
    <propertyRole id="xb" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="starts"/>
    </propertyRole>
    <propertyRole id="xe" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="stops"/>
    </propertyRole>
    <propertyRole id="yb" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="starts"/>
    </propertyRole>
    <propertyRole id="ye" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="stops"/>
    </propertyRole>
    <glue>
        <propertyExpression xsi:type="CompoundPropertyExpression"
            operator="and">
            <firstProperty xsi:type="PropertyToPropertyExpression"
                firstPropertyRole="yb" secondPropertyRole="xb"
            >
                <secondProperty xsi:type="PropertyToPropertyExpression"
                    firstPropertyRole="xe" secondPropertyRole="ye"
                >
                    <comparator="lt"/>
                </secondProperty>
            </firstProperty>
        </propertyExpression>
    </glue>
</xconnector>

<xconnector id="overlaps" xsi:type="ConstraintHypermediaConnector" >
    <propertyRole id="xb" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="starts"/>
    </propertyRole>
    <propertyRole id="xe" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="stops"/>
    </propertyRole>
    <propertyRole id="yb" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="starts"/>
    </propertyRole>
    <propertyRole id="ye" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="stops"/>
    </propertyRole>
    <glue>
        <propertyExpression xsi:type="CompoundPropertyExpression"
            operator="and">
            <firstProperty xsi:type="PropertyToPropertyExpression"
                firstPropertyRole="xb" secondPropertyRole="yb"
            >
                <comparator="lt"/>
            </firstProperty>
        </propertyExpression>
    </glue>
</xconnector>

```

```

        <secondProperty xsi:type="CompoundPropertyExpression"
operator="and">
        <firstProperty xsi:type="PropertyToPropertyExpression"
            firstPropertyRole="xe" secondPropertyRole="ye"
comparator="lt"/>
        <secondProperty xsi:type="PropertyToPropertyExpression"
            firstPropertyRole="yb" secondPropertyRole="xe"
comparator="lt"/>
        </secondProperty>
    </propertyExpression>
</glue>
</xconnector>

<xconnector id="equals" xsi:type="ConstraintHypermediaConnector" >
    <propertyRole id="xb" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="starts"/>
    </propertyRole>
    <propertyRole id="xe" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="stops"/>
    </propertyRole>
    <propertyRole id="yb" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="starts"/>
    </propertyRole>
    <propertyRole id="ye" eventType="presentation">
        <property xsi:type="EventTransitionProperty" transition="stops"/>
    </propertyRole>
    <glue>
        <propertyExpression xsi:type="CompoundPropertyExpression"
operator="and">
            <firstProperty xsi:type="PropertyToPropertyExpression"
                firstPropertyRole="xb" secondPropertyRole="yb"
comparator="eq"/>
            <secondProperty xsi:type="PropertyToPropertyExpression"
                firstPropertyRole="ye" secondPropertyRole="xe"
comparator="eq"/>
        </propertyExpression>
    </glue>
</xconnector>
</connectorBase>

```

11

Apêndice C

11.1

Especificação da Linguagem XTemplate em XML Schema

```
<?xml version="1.0"?>
<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/XTemplate"
xmlns="http://www.telemidia.puc-rio.br/specs/xml/XTemplate"
elementFormDefault="qualified" attributeFormDefault="unqualified" >

<xsd:complexType name="CompositeTemplateType">
  <xsd:sequence>
    <xsd:element name="extends" type="ExtendType" minOccurs="0"
maxOccurs="unbounded"/>
    <xsd:element name="vocabulary" type="VocabularyType" minOccurs="1"
maxOccurs="1"/>
    <xsd:element name="constraints" type="ConstraintSetType"
minOccurs="0" maxOccurs="1"/>
  </xsd:sequence>
  <xsd:attribute name="id" type="xsd:ID" use="required"/>
  <xsd:attribute name="name" type="xsd:string"/>
  <xsd:attribute name="description" type="xsd:string"/>
</xsd:complexType>

<xsd:complexType name="ExtendType">
  <xsd:attribute name="xtemplate" type="xsd:anyURI" use="required"/>
</xsd:complexType>

<xsd:complexType name="VocabularyType">
  <xsd:sequence>
    <xsd:element name="component" type="ComponentType" minOccurs="0"
maxOccurs="unbounded"/>
    <xsd:element name="connector" type="ConnectorType" minOccurs="0"
maxOccurs="unbounded"/>
  </xsd:sequence>
</xsd:complexType>

<xsd:complexType name="ConstraintSetType">
  <xsd:sequence>
    <xsd:element name="constraint" type="ConstraintType" minOccurs="0"
maxOccurs="unbounded"/>
    <xsd:element name="resource" type="ResourceType" minOccurs="0"
maxOccurs="unbounded"/>
    <xsd:element name="link" type="LinkType" minOccurs="0"
maxOccurs="unbounded"/>
    <xsd:element name="variable" type="VariableType" minOccurs="0"
maxOccurs="unbounded"/>
    <xsd:element name="for-each" type="InteractionType" minOccurs="0"
maxOccurs="unbounded"/>
  </xsd:sequence>
</xsd:complexType>

<xsd:complexType name="ComponentType">
```

```

    <xsd:sequence>
      <xsd:element name="port" type="PortType" minOccurs="0"
maxOccurs="unbounded"/>
    </xsd:sequence>
    <xsd:attribute name="label" type="xsd:NMTOKEN" use="required"/>
    <xsd:attribute name="type" type="CompTypes"/>
    <xsd:attribute name="minOccurs" type="xsd:positiveInteger"/>
    <xsd:attribute name="maxOccurs" type="maxUnion"/>
  </xsd:complexType>

  <xsd:simpleType name="CompTypes">
    <xsd:restriction base="xsd:string">
      <xsd:enumeration value="video" />
      <xsd:enumeration value="audio" />
      <xsd:enumeration value="text" />
      <xsd:enumeration value="img" />
      <xsd:enumeration value="animation" />
      <xsd:enumeration value="script" />
      <xsd:enumeration value="application" />
      <xsd:enumeration value="composite" />
    </xsd:restriction>
  </xsd:simpleType>

  <xsd:complexType name="ConnectorType">
    <xsd:attribute name="src" type="xsd:anyURI" use="required"/>
    <xsd:attribute name="label" type="xsd:NMTOKEN" use="required"/>
    <xsd:attribute name="minOccurs" type="xsd:positiveInteger"/>
    <xsd:attribute name="maxOccurs" type="maxUnion"/>
  </xsd:complexType>

  <xsd:simpleType name="unboundedString">
    <xsd:restriction base="xsd:string">
      <xsd:pattern value="unbounded"/>
    </xsd:restriction>
  </xsd:simpleType>

  <xsd:simpleType name="maxUnion">
    <xsd:union memberTypes="xsd:positiveInteger unboundedString"/>
  </xsd:simpleType>

  <xsd:complexType name="PortType">
    <xsd:attribute name="label" type="xsd:string" use="required"/>
    <xsd:attribute name="minOccurs" type="xsd:positiveInteger"/>
    <xsd:attribute name="maxOccurs" type="maxUnion"/>
  </xsd:complexType>

  <xsd:complexType name="ConstraintType">
    <xsd:attribute name="select" type="xsd:string" use="required"/>
    <xsd:attribute name="description" type="xsd:string"/>
  </xsd:complexType>

  <xsd:complexType name="ResourceType">
    <xsd:attribute name="src" type="xsd:anyURI" use="required"/>
    <xsd:attribute name="type" type="xsd:NMTOKEN" use="required"/>
    <xsd:attribute name="label" type="xsd:NMTOKEN" use="required"/>
  </xsd:complexType>

  <xsd:complexType name="LinkType">
    <xsd:sequence>
      <xsd:element name="bind" type="BindType" maxOccurs="unbounded"/>
    </xsd:sequence>
    <xsd:attribute name="type" type="xsd:NMTOKEN" use="required"/>
  </xsd:complexType>

  <xsd:complexType name="BindType">
    <xsd:attribute name="role" type="xsd:string" use="required"/>

```

```
<xsd:attribute name="select" type="xsd:string" use="required"/>
</xsd:complexType>

<xsd:complexType name="VariableType">
  <xsd:attribute name="name" type="xsd:string" use="required"/>
  <xsd:attribute name="select" type="xsd:string" use="required"/>
</xsd:complexType>

<xsd:complexType name="InteractionType" >
  <xsd:sequence>
    <xsd:element name="link" type="LinkType" maxOccurs="unbounded"/>
    <xsd:element name="variable" type="VariableType" minOccurs="0"
maxOccurs="unbounded"/>
  </xsd:sequence>
  <xsd:attribute name="select" type="xsd:string" use="required"/>
</xsd:complexType>

<xsd:element name="xtemplate" type="CompositeTemplateType" >
</xsd:element>

<xsd:element name="templateBase">
  <xsd:complexType>
    <xsd:sequence>
      <xsd:element ref="xtemplate" maxOccurs="unbounded"/>
    </xsd:sequence>
    <xsd:attribute name="id" type="xsd:ID" />
    <xsd:attribute name="name" type="xsd:string"/>
    <xsd:attribute name="description" type="xsd:string"/>
  </xsd:complexType>
</xsd:element>

</xsd:schema>
```

12

Apêndice D

12.1

Especificação das Áreas Funcionais de NCL 2.0 em XML Schema

12.1.1

Áreas Funcionais e Módulos NCL 2.0

```
<!--  
XML Schema for the NCL Language  
  
This is NCL  
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.  
See http://www.telemidia.puc-rio.br  
  
Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL.xsd  
Author: Debora Christina Muchaluat Saade  
Revision: 2003/03/10  
  
-->  
<schema xmlns="http://www.w3.org/2001/XMLSchema"  
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl"  
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"  
  elementFormDefault="qualified" attributeFormDefault="unqualified"  
>  
  
  <!-- include the schema files for the building block types -->  
  
  <include schemaLocation="NCL-struct.xsd"/>  
  <include schemaLocation="NCL-component.xsd"/>  
  <include schemaLocation="NCL-interface.xsd"/>  
  <include schemaLocation="NCL-link.xsd"/>  
  <include schemaLocation="NCL-connector.xsd"/>  
  <include schemaLocation="NCL-compositeTemplate.xsd"/>  
  <include schemaLocation="NCL-timing.xsd"/>  
  <include schemaLocation="NCL-layout.xsd"/>  
  <include schemaLocation="NCL-presentation.xsd"/>  
  <include schemaLocation="NCL-control.xsd"/>  
  
  <!-- import the NCL 2.0 language namespace -->  
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/Language" schemaLocation="NCL-language.xsd"/>  
  
  <!-- import the definitions in the modules namespaces -->  
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/Structure" schemaLocation="NCL-Structure.xsd"/>  
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/BasicMedia" schemaLocation="NCL-BasicMedia.xsd"/>
```

```

    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicComposite" schemaLocation="NCL-
BasicComposite.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/MediaInterface" schemaLocation="NCL-
MediaInterface.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/CompositeInterface" schemaLocation="NCL-
CompositeInterface.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/AttributeInterface" schemaLocation="NCL-
AttributeInterface.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/SwitchInterface" schemaLocation="NCL-
SwitchInterface.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Linking" schemaLocation="NCL-Linking.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/XConnector" schemaLocation="http://www.telemidia.puc-
rio.br/specs/xml/XConnector.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/CompositeConnector" schemaLocation="NCL-
CompositeConnector.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/XTemplate" schemaLocation="http://www.telemidia.puc-
rio.br/specs/xml/XTemplate.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/XTemplateUse" schemaLocation="NCL-
XTemplateUse.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicTiming" schemaLocation="NCL-BasicTiming.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicLayout" schemaLocation="NCL-BasicLayout.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicDescriptor" schemaLocation="NCL-
BasicDescriptor.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/CompositeDescriptor" schemaLocation="NCL-
CompositeDescriptor.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/TestAttributes" schemaLocation="NCL-
TestAttributes.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/ContentControl" schemaLocation="NCL-
ContentControl.xsd"/>
    <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/DescriptorControl" schemaLocation="NCL-
DescriptorControl.xsd"/>

</schema>

```

12.1.2

Área Funcional *Structure*

```

<!--
XML Schema for the NCL Structure functionality.

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-struct.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

```

```

-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  elementFormDefault="qualified" attributeFormDefault="unqualified"
>

  <!-- define the structure module attribute group -->
  <attributeGroup name="structureModuleAttrs">
  </attributeGroup>

  <!-- define the ncl element prototype -->
  <complexType name="nclPrototype">
  </complexType>

  <!-- define the head element prototype -->
  <complexType name="headPrototype">
  </complexType>

  <!-- define the body element prototype -->
  <complexType name="bodyPrototype">
  </complexType>

  <!-- declare global elements -->
  <element name="ncl" type="ncllang:nclType"
substitutionGroup="ncllang:ncl"/>
  <element name="head" type="ncllang:headType"
substitutionGroup="ncllang:head"/>
  <element name="body" type="ncllang:bodyType"
substitutionGroup="ncllang:body"/>

</schema>

```

12.1.3

Área Funcional *Components*

```

<!--
XML Schema for the NCL Component functionality

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
component.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the local and global NCL component attributes.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  elementFormDefault="qualified" attributeFormDefault="unqualified"
>

  <!-- define the media src attributes-->
  <attribute name="type" type="string"/>
  <attribute name="src" type="anyURI"/>

  <!-- define the media src attribute group -->

```

```

<attributeGroup name="mediaSrcAttrs">
  <attribute name="type" type="string" use="optional"/>
  <attribute name="src" type="anyURI" use="optional"/>
</attributeGroup>

<!--
  define the media object element prototype
  ref, animation, audio, img, text, textstream, video
  are all identical and use this prototype
-->
<complexType name="mediaPrototype">
  <attributeGroup ref="ncl:mediaSrcAttrs" />
</complexType>

<!--
  define the composite element prototype
-->
<complexType name="compositePrototype">
</complexType>

<!-- define the global media elements -->
<element name="text" type="ncllang:mediaType"
substitutionGroup="ncllang:text"/>
  <element name="img" type="ncllang:mediaType"
substitutionGroup="ncllang:img"/>
  <element name="audio" type="ncllang:mediaType"
substitutionGroup="ncllang:audio"/>
  <element name="animation" type="ncllang:mediaType"
substitutionGroup="ncllang:animation"/>
  <element name="video" type="ncllang:mediaType"
substitutionGroup="ncllang:video"/>
  <element name="textstream" type="ncllang:mediaType"
substitutionGroup="ncllang:textstream"/>
  <element name="ref" type="ncllang:mediaType"
substitutionGroup="ncllang:ref"/>

<!-- define the global composite element -->
<element name="composite" type="ncllang:compositeType"
substitutionGroup="ncllang:composite"/>

</schema>

```

12.1.4

Área Funcional Interfaces

```

<!--
XML Schema for the NCL Component Interface Functionality

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
interface.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL interface point types and attributes.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
Language"
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"

```

```

        elementFormDefault="qualified" attributeFormDefault="unqualified"
    >

        <!-- define the coords attribute -->
        <attribute name="coords" type="string"/>

        <!-- define the begin, end, dur attributes -->
        <attribute name="begin" type="unsignedLong"/>
        <attribute name="end" type="unsignedLong"/>
        <attribute name="dur" type="unsignedLong"/>

        <!-- define the text, position attributes -->
        <attribute name="text" type="string"/>
        <attribute name="position" type="unsignedLong"/>

        <!-- define the first, last attributes -->
        <attribute name="first" type="unsignedLong"/>
        <attribute name="last" type="unsignedLong"/>

        <!-- define the component, anchor attributes -->
        <attribute name="component" type="string"/>
        <attribute name="anchor" type="string"/>

        <!-- define the component list attribute -->
        <attribute name="componentList" type="IDREFs"/>

        <!-- define the attribute name attribute -->
        <attribute name="name" type="string"/>

        <!-- define the TemporalAnchorAttrs attribute group -->
        <attributeGroup name="TemporalAnchorAttrs">
            <attribute name="begin" type="unsignedLong"/>
            <attribute name="end" type="unsignedLong"/>
            <attribute name="dur" type="unsignedLong"/>
        </attributeGroup>

        <!-- define the TextAnchorAttrs attribute group -->
        <attributeGroup name="TextAnchorAttrs">
            <attribute name="text" type="string"/>
            <attribute name="position" type="unsignedLong"/>
        </attributeGroup>

        <!-- define the SampleAnchorAttrs attribute group -->
        <attributeGroup name="SampleAnchorAttrs">
            <attribute name="first" type="unsignedLong"/>
            <attribute name="last" type="unsignedLong"/>
        </attributeGroup>

        <!-- define the CompositePortAttrs attribute group -->
        <attributeGroup name="CompositePortAttrs">
            <attribute name="component" type="IDREF"/>
            <attribute name="port" type="string"/>
        </attributeGroup>

        <complexType name="anchorPrototype">
        </complexType>

        <complexType name="imgAnchorPrototype">
            <complexContent>
                <extension base="anchorPrototype">
                    <attribute name="coords" type="string"/>
                </extension>
            </complexContent>
        </complexType>

        <complexType name="audioAnchorPrototype">

```

```

        <complexContent>
          <extension base="anchorPrototype">
            <attributeGroup ref="ncl:TemporalAnchorAttrs" />
            <attributeGroup ref="ncl:SampleAnchorAttrs" />
          </extension>
        </complexContent>
      </complexType>

      <complexType name="videoAnchorPrototype">
        <complexContent>
          <extension base="anchorPrototype">
            <attributeGroup ref="ncl:TemporalAnchorAttrs" />
            <attribute name="coords" type="string"/>
            <attributeGroup ref="ncl:SampleAnchorAttrs" />
          </extension>
        </complexContent>
      </complexType>

      <complexType name="textAnchorPrototype">
        <complexContent>
          <extension base="anchorPrototype">
            <attributeGroup ref="ncl:TextAnchorAttrs" />
          </extension>
        </complexContent>
      </complexType>

      <complexType name="compositeAnchorPrototype">
        <complexContent>
          <extension base="anchorPrototype">
            <attribute name="componentList" type="string"/>
          </extension>
        </complexContent>
      </complexType>

      <complexType name="compositePortPrototype">
        <complexContent>
          <extension base="anchorPrototype">
            <attributeGroup ref="ncl:CompositePortAttrs" />
          </extension>
        </complexContent>
      </complexType>

      <complexType name="componentAnchorPrototype">
        <complexContent>
          <extension base="anchorPrototype">
            <attribute name="coords" type="string"/>
            <attributeGroup ref="ncl:TemporalAnchorAttrs" />
            <attributeGroup ref="ncl:TextAnchorAttrs" />
            <attributeGroup ref="ncl:SampleAnchorAttrs" />
          </extension>
        </complexContent>
      </complexType>

      <complexType name="attributeInterfacePrototype">
        <attribute name="name" type="string"/>
      </complexType>

      <complexType name="portSwitchPrototype">
      </complexType>

      <!-- declare global elements in this module -->
      <element name="area" type="ncllang:componentAnchorType"
        substitutionGroup="ncllang:area"/>

      <element name="compositeArea" type="ncllang:compositeAnchorType"
        substitutionGroup="ncllang:compositeArea"/>

```

```

    <element name="port" type="ncllang:compositePortType"
substitutionGroup="ncllang:port"/>

    <element name="attribute" type="ncllang:attributeInterfaceType"
substitutionGroup="ncllang:attribute"/>

    <element name="portSwitch" type="ncllang:portSwitchType"
substitutionGroup="ncllang:portSwitch"/>

</schema>

```

12.1.5

Área Funcional *Linking*

```

<!--
XML Schema for the NCL Linking Functionality

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-link.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL link type and attributes.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-rio.br/specs/xml/ncl/Language"
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  elementFormDefault="qualified" attributeFormDefault="unqualified"
>

  <attribute name="xconnector" type="anyURI"/>
  <attribute name="name" type="string" />
  <attribute name="value" type="anySimpleType"/>
  <attribute name="role" type="string" />
  <attribute name="component" type="anyURI" />
  <attribute name="port" type="string" />
  <attribute name="src" type="anyURI" />

  <complexType name="linkPrototype">
    <attribute name="xconnector" type="anyURI" use="required"/>
  </complexType>

  <complexType name="paramPrototype">
    <attribute name="name" type="string" use="required"/>
    <attribute name="value" type="anySimpleType" use="required"/>
  </complexType>

  <complexType name="bindPrototype">
    <attribute name="role" type="string" use="required"/>
    <attribute name="component" type="anyURI" use="required"/>
    <attribute name="port" type="string" />
  </complexType>

  <complexType name="lrefPrototype">
    <attribute name="src" type="anyURI" use="required"/>
  </complexType>

  <complexType name="linkBasePrototype">
  </complexType>

```

```

    <element name="param" type="ncl:paramPrototype"
substitutionGroup="ncllang:param"/>
    <element name="bind" type="ncllang:bindType"
substitutionGroup="ncllang:bind"/>

    <element name="link" type="ncllang:linkType"
substitutionGroup="ncllang:link"/>
    <element name="linkBase" type="ncllang:linkBaseType"
substitutionGroup="ncllang:linkBase"/>
    <element name="lref" type="ncl:lrefPrototype"
substitutionGroup="ncllang:lref"/>

</schema>

```

12.1.6 Área Funcional *Connectors*

```

<!--
XML Schema for the NCL Connector Functionality

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
connector.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL connector funcionalty.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  elementFormDefault="qualified" attributeFormDefault="unqualified"
>

  <!-- import the definitions in the XConnector namespace -->
  <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/XConnector" schemaLocation="http://www.telemidia.puc-
rio.br/specs/xml/XConnector.xsd"/>

  <!--
    define the composite connector element prototype
  -->
  <complexType name="compositeConnectorPrototype">
</complexType>

  <complexType name="compositeRolePrototype">
    <attribute name="id" type="string" use="required"/>
    <attribute name="partialLink" type="IDREF" use="required"/>
    <attribute name="role" type="string" use="required"/>
  </complexType>

  <complexType name="compositeGluePrototype">
</complexType>

  <complexType name="partialLinkBasePrototype">
</complexType>

  <!-- define the global composite element -->

```

```

    <element name="compositeConnector"
type="ncllang:compositeConnectorType"
substitutionGroup="ncllang:compositeConnector"/>
    <element name="partialLinkBase" type="ncllang:partialLinkBaseType"
substitutionGroup="ncllang:partialLinkBase"/>
    <element name="role" type="ncllang:compositeRoleType"
substitutionGroup="ncllang:role"/>
    <element name="glue" type="ncllang:compositeGlueType"
substitutionGroup="ncllang:glue"/>
</schema>

```

12.1.7

Área Funcional *Composite Templates*

```

<!--
XML Schema for the NCL Template functionality

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
compositeTemplate.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL composite template types and attributes.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  elementFormDefault="qualified" attributeFormDefault="unqualified"
>

  <!-- import the definitions in the XTemplate namespace -->
  <import namespace="http://www.telemidia.puc-
rio.br/specs/xml/XTemplate" schemaLocation="http://www.telemidia.puc-
rio.br/specs/xml/XTemplate.xsd"/>

  <!-- declare global elements in this module -->
  <!-- (none) -->

  <!-- declare global attributes in this module -->
  <attribute name="xtemplate" type="anyURI"/>
  <attribute name="label" type="string"/>

  <!-- define the CompositeTemplateUseAttrs attribute group -->
  <attributeGroup name="CompositeTemplateUseAttrs">
    <attribute name="xtemplate" type="anyURI"/>
    <attribute name="label" type="string"/>
  </attributeGroup>

  <!-- define the TemplateComponentAttrs attribute group -->
  <attributeGroup name="TemplateComponentAttrs">
    <attribute name="label" type="string"/>
  </attributeGroup>

</schema>

```

12.1.8

Área Funcional *Timing*

```
<!--
XML Schema for the NCL Timing functionality

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-timing.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the ncl timing attributes.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
        xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
        xmlns:ncllang="http://www.telemidia.puc-rio.br/specs/xml/ncl/Language"
        targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
        elementFormDefault="qualified" attributeFormDefault="unqualified"
>

    <!-- define the dur, min, max timing attributes -->
    <attribute name="dur" type="string"/>
    <attribute name="min" type="string"/>
    <attribute name="max" type="string"/>

    <!-- define the TimingAttrs attribute group -->
    <attributeGroup name="TimingAttrs">
        <attribute name="dur" type="string" use="optional"/>
        <attribute name="min" type="string" use="optional"/>
        <attribute name="max" type="string" use="optional"/>
    </attributeGroup>

</schema>
```

12.1.9

Área Funcional *Layout*

```
<!--
XML Schema for the NCL Layout functionality

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-layout.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the Layout functionality
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
        xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
        xmlns:ncllang="http://www.telemidia.puc-rio.br/specs/xml/ncl/Language"
        targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
        elementFormDefault="qualified" attributeFormDefault="unqualified"
>
```

```

<!-- utility type for fit attribute values -->
<simpleType name="fitAttributeType">
  <restriction base="string">
    <enumeration value="fill"/>
    <enumeration value="hidden"/>
    <enumeration value="meet"/>
    <enumeration value="scroll"/>
    <enumeration value="slice"/>
  </restriction>
</simpleType>

<!-- define the layout element prototype -->
<complexType name="layoutPrototype">
  <attribute name="type" type="string" use="optional"
default="text/ncl-layout"/>
  <attribute name="src" type="anyURI" use="optional" />
</complexType>

<!-- define the Layout Component element prototype -->
<complexType name="LayoutComponentPrototype">
  <attribute name="title" type="string" use="optional" />
  <attribute name="backgroundColor" type="string" use="optional" />
  <attribute name="height" type="string" use="optional" />
  <attribute name="left" type="string" use="optional" />
  <attribute name="top" type="string" use="optional" />
  <attribute name="width" type="string" use="optional" />
  <attribute name="zIndex" type="integer" use="optional" />
  <attribute name="visible" type="boolean" use="optional" />

  <attribute name="close" use="optional" default="onRequest">
    <simpleType>
      <restriction base="string">
        <enumeration value="onRequest"/>
        <enumeration value="whenNotActive"/>
      </restriction>
    </simpleType>
  </attribute>

  <attribute name="open" use="optional" default="onStart">
    <simpleType>
      <restriction base="string">
        <enumeration value="onStart"/>
        <enumeration value="whenActive"/>
      </restriction>
    </simpleType>
  </attribute>
</complexType>

<!-- define the topLayout element prototype -->
<complexType name="topLayoutPrototype">
  <complexContent>
    <extension base="LayoutComponentPrototype">
      <attribute name="movable" type="boolean" use="optional"
/>
      <attribute name="resizable" type="boolean" use="optional"
/>
    </extension>
  </complexContent>
</complexType>

<!-- define the region element prototype -->
<complexType name="regionPrototype">
  <complexContent>
    <extension base="LayoutComponentPrototype">

```

```

        <attribute name="fit" use="optional" default="hidden"
type="ncl:fitAttributeType"/>
        <attribute name="showBackground" use="optional"
default="always">
            <simpleType>
                <restriction base="string">
                    <enumeration value="always"/>
                    <enumeration value="whenActive"/>
                </restriction>
            </simpleType>
        </attribute>
    </extension>
</complexContent>
</complexType>

<!-- define the global region attribute -->
<attribute name="region" type="IDREF"/>

<!-- define the region attributeGroup -->
<attributeGroup name="regionAttrs">
    <attribute name="region" type="IDREF" use="optional"/>
</attributeGroup>

<!-- define the global layout elements -->
<element name="layout" type="ncllang:layoutType"
substitutionGroup="ncllang:layout"/>
<element name="topLayout" type="ncllang:topLayoutType"
substitutionGroup="ncllang:topLayout"/>
<element name="region" type="ncllang:regionType"
substitutionGroup="ncllang:region"/>

</schema>

```

12.1.10

Área Funcional *Presentation Specification*

```

<!--
XML Schema for the NCL Presentation Functionality

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
presentation.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL Presentation Functionality.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
    xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
    xmlns:ncllang="http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
Language"
    targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
    elementFormDefault="qualified" attributeFormDefault="unqualified"
>

    <!-- define the descriptor global attribute -->
    <attribute name="descriptor" type="IDREF"/>

    <!-- define the descriptor attributeGroup -->
    <attributeGroup name="descriptorAttrs">

```

```

    <attribute name="descriptor" type="IDREF" use="optional"/>
  </attributeGroup>

  <!-- define the audio descriptor attribute -->
  <attribute name="soundLevel" type="string"/>
  <attribute name="balanceLevel" type="string"/>
  <attribute name="trebleLevel" type="string"/>
  <attribute name="bassLevel" type="string"/>

  <!-- define the soundLevel attributeGroup -->
  <attributeGroup name="AudioDescriptorAttrs">
    <attribute name="soundLevel" type="string" use="optional"/>
    <attribute name="balanceLevel" type="string" use="optional"/>
    <attribute name="trebleLevel" type="string" use="optional"/>
    <attribute name="bassLevel" type="string" use="optional"/>
  </attributeGroup>

  <complexType name="descriptorPrototype">
    <attribute name="player" type="string" use="optional"/>
    <attribute name="enableTimeBar" type="boolean" use="optional"/>
    <attribute name="style" type="anyURI" use="optional"/>
    <attributeGroup ref="ncl:AudioDescriptorAttrs" />
  </complexType>

  <complexType name="descriptorBasePrototype">
  </complexType>

  <complexType name="componentPresentationPrototype">
    <attribute name="component" type="IDREF" use="required"/>
    <attribute name="descriptor" type="IDREF" use="required"/>
  </complexType>

  <!-- declare global elements in this module -->
  <element name="descriptor" type="ncllang:descriptorType"
substitutionGroup="ncllang:descriptor"/>
  <element name="descriptorBase" type="ncllang:descriptorBaseType"
substitutionGroup="ncllang:descriptorBase"/>

  <element name="componentPresentation"
type="ncllang:componentPresentationType"
substitutionGroup="ncllang:componentPresentation"/>

</schema>

```

12.1.11

Área Funcional *Presentation Control*

```

<!--
XML Schema for the NCL Presentation Control functionality.

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-struct.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/02/15

Defines both the local and global NCL Presentation Control element and
attributes.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"

```

```

    xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
    targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
    elementFormDefault="qualified" attributeFormDefault="unqualified"
>

<!-- utility type for test attribute values -->
<simpleType name="onOrOffType">
  <restriction base="string">
    <enumeration value="on"/>
    <enumeration value="off"/>
  </restriction>
</simpleType>

<simpleType name="overdubOrSubtitleType">
  <restriction base="string">
    <enumeration value="overdub"/>
    <enumeration value="subtitle"/>
  </restriction>
</simpleType>

<!-- global system test attributes-->
<attribute name="systemAudioDesc" type="ncl:onOrOffType"/>
<attribute name="systemBitrate" type="string"/>
<attribute name="systemCaptions" type="ncl:onOrOffType"/>
<attribute name="systemComponent" type="string"/>
<attribute name="systemCPU" type="NMTOKEN"/>
<attribute name="systemLanguage" type="string"/>
<attribute name="systemOperatingSystem" type="NMTOKEN"/>
<attribute name="systemOverdubOrSubtitle"
type="ncl:overdubOrSubtitleType"/>
<attribute name="systemRequired" type="string"/>
<attribute name="systemScreenDepth" type="positiveInteger"/>
<attribute name="systemScreenSize" type="string"/>

<!-- system test attribute group -->
<attributeGroup name="systemTestAttrs">
  <attribute name="systemAudioDesc" type="ncl:onOrOffType"
use="optional"/>
  <attribute name="systemBitrate" type="string" use="optional"/>
  <attribute name="systemCaptions" type="ncl:onOrOffType"
use="optional"/>
  <attribute name="systemComponent" type="string" use="optional"/>
  <attribute name="systemCPU" type="NMTOKEN" use="optional"/>
  <attribute name="systemLanguage" type="string" use="optional"/>
  <attribute name="systemOperatingSystem" type="NMTOKEN"
use="optional"/>
  <attribute name="systemOverdubOrSubtitle"
type="ncl:overdubOrSubtitleType" use="optional"/>
  <attribute name="systemRequired" type="string" use="optional"/>
  <attribute name="systemScreenDepth" type="positiveInteger"
use="optional"/>
  <attribute name="systemScreenSize" type="string" use="optional"/>
</attributeGroup>

<!-- define the switch element prototype -->
<complexType name="switchPrototype">
</complexType>

<!-- define the descriptor switch element prototype -->
<complexType name="descriptorSwitchPrototype">
</complexType>

<!-- define the global content control elements -->
<element name="switch" type="ncllang:switchType"
substitutionGroup="ncllang:switch"/>

```

```

    <element name="descriptorSwitch" type="ncllang:descriptorSwitchType"
substitutionGroup="ncllang:descriptorSwitch"/>

</schema>

```

12.2

Perfil NCL 2.0 Language Profile

```

<!--
XML Schema for the NCL 2.0 Language

This is NCL
Copyright: 1999-2003 TELEMIDIA/PUC-Rio, All Rights Reserved.
See http://www.telemidia.puc-rio.br/

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
language.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  elementFormDefault="qualified">

  <!-- import the ncl namespaces -->
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
schemaLocation="NCL.xsd"/>

  <!--
===== -->
  <!-- CoreAttrs attribute group used on all NCL profile elements
-->
  <!--
===== -->
  <attributeGroup name="CoreAttrs">
    <attribute name="id" type="ID" />
  </attributeGroup>

  <!--
===== -->
  <!-- Structure Functionality
-->
  <!--
===== -->

  <!--
===== -->
  <!-- define the top down structure of an NCL language document.
-->
  <!--
===== -->

  <!-- top level ncl element and content model -->
  <element name="ncl" type="ncllang:nclType"/>
  <complexType name="nclType">
    <complexContent>
      <extension base="ncl:nclPrototype">
        <sequence>

```

```

        <element ref="ncllang:head" minOccurs="0"
maxOccurs="1"/>
        <element ref="ncllang:body" minOccurs="1"
maxOccurs="1"/>
        </sequence>
        <attributeGroup ref="ncllang:CoreAttrs"/>
    </extension>
</complexContent>
</complexType>

<!-- head element and content model -->
<element name="head" type="ncllang:headType"/>
<complexType name="headType">
    <complexContent>
        <extension base="ncl:headPrototype">
            <sequence>
                <element ref="ncllang:layout" minOccurs="0"
maxOccurs="1"/>
                <element ref="ncllang:descriptorBase" minOccurs="0"
maxOccurs="1"/>
            </sequence>
        </extension>
    </complexContent>
</complexType>

<!-- body element and content model -->
<element name="body" type="ncllang:bodyType"/>
<complexType name="bodyType">
    <complexContent>
        <extension base="ncl:bodyPrototype">
            <choice minOccurs="0" maxOccurs="unbounded">
                <group ref="ncllang:mediaContentGroup"/>
                <group ref="ncllang:compositeContentGroup"/>
                <group ref="ncllang:linkbaseElementGroup"/>
                <group ref="ncllang:ContentControlGroup"/>
            </choice>
        </extension>
    </complexContent>
</complexType>

<!--
===== -->
<!-- Layout Functionality
-->
<!--
===== -->

<!-- layout element and content model -->
<element name="layout" type="ncllang:layoutType"/>

<complexType name="layoutType">
    <complexContent>
        <extension base="ncl:layoutPrototype">
            <sequence>
                <element name="topLayout"
type="ncllang:topLayoutType" minOccurs="0" maxOccurs="unbounded"/>
            </sequence>
        </extension>
    </complexContent>
</complexType>

<!-- topLayout element and content model -->
<element name="topLayout" type="ncllang:topLayoutType"/>

<complexType name="topLayoutType">
    <complexContent>

```

```

        <extension base="ncl:topLayoutPrototype">
            <sequence>
                <element name="region" type="ncllang:regionType"
minOccurs="0" maxOccurs="unbounded"/>
            </sequence>
            <attributeGroup ref="ncllang:CoreAttrs"/>
        </extension>
    </complexContent>
</complexType>

<!-- region element and content model -->
<element name="region" type="ncllang:regionType"/>

<complexType name="regionType">
    <complexContent>
        <extension base="ncl:regionPrototype">
            <sequence>
                <element name="region" type="ncllang:regionType"
minOccurs="0" maxOccurs="unbounded"/>
            </sequence>
            <attributeGroup ref="ncllang:CoreAttrs"/>
        </extension>
    </complexContent>
</complexType>

<!--
===== -->
<!-- Presentation Specification Functionality
-->
<!--
===== -->

<!-- descriptor element and content model -->
<element name="descriptor" type="ncllang:descriptorType"/>

<complexType name="descriptorType">
    <complexContent>
        <extension base="ncl:descriptorPrototype">
            <attributeGroup ref="ncllang:CoreAttrs"/>
            <attributeGroup ref="ncl:regionAttrs"/>
            <attributeGroup ref="ncl:TimingAttrs"/>
            <attributeGroup ref="ncl:systemTestAttrs"/>
        </extension>
    </complexContent>
</complexType>

<!-- descriptor groups -->
<group name="descriptorGroup">
    <choice>
        <element ref="ncllang:descriptor"/>
        <element ref="ncllang:descriptorSwitch"/>
    </choice>
</group>

<!-- descriptorBase element and content model -->
<element name="descriptorBase" type="ncllang:descriptorBaseType"/>
<complexType name="descriptorBaseType">
    <complexContent>
        <extension base="ncl:descriptorBasePrototype">
            <choice maxOccurs="unbounded">
                <group ref="ncllang:descriptorGroup"/>
            </choice>
        </extension>
    </complexContent>
</complexType>

```

```

<!-- descriptorBase groups -->
<group name="descriptorBaseGroup">
  <choice>
    <element ref="ncllang:descriptorBase"/>
  </choice>
</group>

<!-- componentPresentation element and content model -->
<element name="componentPresentation"
type="ncllang:componentPresentationType"/>
<complexType name="componentPresentationType">
  <complexContent>
    <extension base="ncl:componentPresentationPrototype">
    </extension>
  </complexContent>
</complexType>

<!-- descriptorBase groups -->
<group name="componentPresentationGroup">
  <choice>
    <element ref="ncllang:componentPresentation"/>
  </choice>
</group>

<!--
===== -->
<!-- Component Functionality
-->
<!--
===== -->

<!-- media elements and content model -->
<element name="text" type="ncllang:mediaType"/>
<element name="img" type="ncllang:mediaType"/>
<element name="audio" type="ncllang:mediaType"/>
<element name="animation" type="ncllang:mediaType"/>
<element name="video" type="ncllang:mediaType"/>
<element name="textstream" type="ncllang:mediaType"/>
<element name="ref" type="ncllang:mediaType"/>

<complexType name="mediaType">
  <complexContent>
    <extension base="ncl:mediaPrototype">
      <choice minOccurs="0" maxOccurs="unbounded">
        <group ref="ncllang:mediaInterfaceElementGroup"/>
      </choice>
      <attributeGroup ref="ncllang:CoreAttrs"/>
      <attributeGroup ref="ncl:mediaSrcAttrs"/>
      <attributeGroup ref="ncl:descriptorAttrs"/>
      <attributeGroup ref="ncl:TemplateComponentAttrs"/>
      <attributeGroup ref="ncl:systemTestAttrs"/>
    </extension>
  </complexContent>
</complexType>

<!-- media groups -->
<group name="mediaContentGroup">
  <choice>
    <element ref="ncllang:text"/>
    <element ref="ncllang:img"/>
    <element ref="ncllang:audio"/>
    <element ref="ncllang:animation"/>
    <element ref="ncllang:video"/>
    <element ref="ncllang:textstream"/>
    <element ref="ncllang:ref"/>
  </choice>

```

```

</group>

<!--
===== -->
<!-- composite element -->
<!--
===== -->

<!-- composite elements and content model -->
<element name="composite" type="ncllang:compositeType"/>

<complexType name="compositeType">
  <complexContent>
    <extension base="ncl:compositePrototype">
      <choice minOccurs="0" maxOccurs="unbounded">
        <group ref="ncllang:compositeInterfaceElementGroup"/>
        <group ref="ncllang:componentPresentationGroup"/>
        <group ref="ncllang:mediaContentGroup"/>
        <group ref="ncllang:compositeContentGroup"/>
        <group ref="ncllang:linkBaseElementGroup"/>
      </choice>
      <attributeGroup ref="ncllang:CoreAttrs"/>
      <attributeGroup ref="ncl:descriptorAttrs"/>
      <attributeGroup ref="ncl:systemTestAttrs"/>
      <attributeGroup ref="ncl:CompositeTemplateUseAttrs"/>
    </extension>
  </complexContent>
</complexType>

<!-- composite component groups -->
<group name="compositeContentGroup">
  <choice>
    <element ref="ncllang:composite"/>
  </choice>
</group>

<!--
===== -->
<!-- Interface Functionality
-->
<!--
===== -->

<!-- area elements and content model -->
<element name="area" type="ncllang:anchorType"/>

<complexType name="anchorType">
  <complexContent>
    <extension base="ncl:componentAnchorPrototype">
      <attributeGroup ref="ncllang:CoreAttrs"/>
      <attributeGroup ref="ncl:TemplateComponentAttrs"/>
    </extension>
  </complexContent>
</complexType>

<!-- attribute elements and content model -->
<element name="attribute" type="ncllang:attributeInterfaceType"/>

<complexType name="attributeInterfaceType">
  <complexContent>
    <extension base="ncl:attributeInterfacePrototype">
      <attributeGroup ref="ncllang:CoreAttrs"/>
      <attributeGroup ref="ncl:TemplateComponentAttrs"/>
    </extension>
  </complexContent>

```

```

</complexType>

<!-- media interface element groups -->
<group name="mediaInterfaceElementGroup">
  <choice>
    <element ref="ncllang:area"/>
    <element ref="ncllang:attribute"/>
  </choice>
</group>

<!-- compositeArea elements and content model -->
<element name="compositeArea" type="ncllang:compositeAnchorType"/>

<complexType name="compositeAnchorType">
  <complexContent>
    <extension base="ncl:compositeAnchorPrototype">
      <attributeGroup ref="ncllang:CoreAttrs"/>
      <attributeGroup ref="ncl:TemplateComponentAttrs"/>
    </extension>
  </complexContent>
</complexType>

<!-- port elements and content model -->
<element name="port" type="ncllang:compositePortType"/>

<complexType name="compositePortType">
  <complexContent>
    <extension base="ncl:compositePortPrototype">
      <attributeGroup ref="ncllang:CoreAttrs"/>
      <attributeGroup ref="ncl:TemplateComponentAttrs"/>
    </extension>
  </complexContent>
</complexType>

<!-- composite interface element groups -->
<group name="compositeInterfaceElementGroup">
  <choice>
    <element ref="ncllang:compositeArea"/>
    <element ref="ncllang:port"/>
  </choice>
</group>

<!-- portSwitch elements and content model -->
<element name="portSwitch" type="ncllang:portSwitchType"/>

<complexType name="portSwitchType">
  <complexContent>
    <extension base="ncl:portSwitchPrototype">
      <attributeGroup ref="ncllang:CoreAttrs"/>
    </extension>
  </complexContent>
</complexType>

<!-- switch interface element groups -->
<group name="switchInterfaceElementGroup">
  <choice>

    <element ref="ncllang:portSwitch"/>
  </choice>
</group>

<!--
===== -->
<!-- Linking Functionality
-->

```

```

<!--
===== -->

<!-- link element and content model -->
<element name="link" type="ncllang:linkType"/>
<complexType name="linkType">
  <complexContent>
    <extension base="ncl:linkPrototype">
      <sequence>
        <element name="param" type="ncl:paramPrototype"
minOccurs="0" maxOccurs="unbounded"/>
        <element name="bind" type="ncllang:bindType"
minOccurs="2" maxOccurs="unbounded"/>
      </sequence>
      <attributeGroup ref="ncllang:CoreAttrs"/>
    </extension>
  </complexContent>
</complexType>

<!-- bind element and content model -->
<element name="bind" type="ncllang:bindType"/>
<complexType name="bindType">
  <complexContent>
    <extension base="ncl:bindPrototype">
      <attributeGroup ref="ncl:descriptorAttrs"/>
    </extension>
  </complexContent>
</complexType>

<!-- lref element and content model -->
<element name="lref" type="ncllang:lrefType"/>
<complexType name="lrefType">
  <complexContent>
    <extension base="ncl:lrefPrototype">
      <attributeGroup ref="ncllang:CoreAttrs"/>
    </extension>
  </complexContent>
</complexType>

<!-- linkbase element and content model -->
<element name="linkBase" type="ncllang:linkBaseType"/>
<complexType name="linkBaseType">
  <complexContent>
    <extension base="ncl:linkBasePrototype">
      <choice minOccurs="1" maxOccurs="unbounded">
        <group ref="ncllang:linkGroup"/>
      </choice>
      <attributeGroup ref="ncllang:CoreAttrs"/>
    </extension>
  </complexContent>
</complexType>

<!-- linking groups -->
<group name="linkGroup">
  <choice>
    <element ref="ncllang:link"/>
    <element ref="ncllang:lref"/>
  </choice>
</group>

<!-- linkbase element groups -->
<group name="linkbaseElementGroup">
  <choice>
    <element ref="ncllang:linkBase"/>
  </choice>
</group>

```

```

<!--
===== -->
<!-- Connector Functionality
-->
<!--
===== -->

<element name="compositeConnector"
type="ncllang:compositeConnectorType"/>
<complexType name="compositeConnectorType">
  <complexContent>
    <extension base="ncl:compositeConnectorPrototype">
      <sequence>
        <element ref="ncllang:role" minOccurs="2"
maxOccurs="unbounded" />
        <element ref="ncllang:glue" maxOccurs="1" />
      </sequence>
      <attributeGroup ref="ncllang:CoreAttrs"/>
    </extension>
  </complexContent>
</complexType>

<!-- role element and content model (for composite connectors) -->
<element name="role" type="ncllang:compositeRoleType"/>
<complexType name="compositeRoleType">
  <complexContent>
    <extension base="ncl:compositeRolePrototype">
      </extension>
    </complexContent>
  </complexType>

<!-- glue element and content model (for composite connectors) -->
<element name="glue" type="ncllang:compositeGlueType"/>
<complexType name="compositeGlueType">
  <complexContent>
    <extension base="ncl:compositeGluePrototype">
      <choice minOccurs="0" maxOccurs="unbounded">
        <group ref="ncllang:mediaContentGroup"/>
        <group ref="ncllang:compositeContentGroup"/>
        <group ref="ncllang:linkBaseElementGroup"/>
        <element ref="ncllang:partialLinkBase"/>
      </choice>
    </extension>
  </complexContent>
</complexType>

<element name="partialLinkBase" type="ncllang:partialLinkBaseType"
substitutionGroup="ncllang:partialLinkBase"/>
<complexType name="partialLinkBaseType">
  <complexContent>
    <extension base="ncl:partialLinkBasePrototype">
      <sequence>
        <element ref="ncllang:link" maxOccurs="unbounded" />
      </sequence>
    </extension>
  </complexContent>
</complexType>

<!--
===== -->
<!-- Presentation Control Functionality
-->
<!--
===== -->

<!-- switch element and content model -->

```

```

<element name="switch" type="ncllang:switchType"/>
<complexType name="switchType">
  <complexContent>
    <extension base="ncl:switchPrototype">
      <choice maxOccurs="unbounded">
        <group ref="ncllang:switchInterfaceElementGroup"/>
        <group ref="ncllang:componentPresentationGroup"/>
        <group ref="ncllang:mediaContentGroup"/>
        <group ref="ncllang:compositeContentGroup"/>
        <group ref="ncllang:switchGroup"/>
      </choice>
      <attributeGroup ref="ncllang:CoreAttrs"/>
      <attributeGroup ref="ncl:systemTestAttrs"/>
    </extension>
  </complexContent>
</complexType>

<group name="switchGroup">
  <choice>
    <element ref="ncllang:switch"/>
  </choice>
</group>

<!-- descriptorSwitch element and content model -->
<element name="descriptorSwitch"
type="ncllang:descriptorSwitchType"/>
<complexType name="descriptorSwitchType">
  <complexContent>
    <extension base="ncl:descriptorSwitchProtoType">
      <sequence>
        <element ref="ncllang:descriptor"
maxOccurs="unbounded"/>
      </sequence>
      <attributeGroup ref="ncllang:CoreAttrs"/>
    </extension>
  </complexContent>
</complexType>

</schema>

```

12.3

Especificação dos módulos de NCL 2.0 em XML Schema

12.3.1

Structure Module

```

<!--
XML Schema for the NCL modules

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
Structure.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the Structure module namespace,
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"

```

```

        xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
        xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
        xmlns:Structure="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Structure"
        targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Structure"
        elementFormDefault="qualified" attributeFormDefault="unqualified"
    >

        <!-- these URL's will have to be expanded to their full and proper
locations -->

        <!-- import the definitions in the ncl namespace -->
        <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
schemaLocation="NCL.xsd"/>

        <!-- declare global elements in this module -->
        <element name="ncl" type="ncllang:nclType"
substitutionGroup="ncllang:ncl"/>
        <element name="head" type="ncllang:headType"
substitutionGroup="ncllang:head"/>
        <element name="body" type="ncllang:bodyType"
substitutionGroup="ncllang:body"/>

        <!-- declare global attributes in this module -->
        <!-- (none) -->

</schema>

```

12.3.2

BasicMedia Module

```

<!--
XML Schema for the NCL modules

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
BasicMedia.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL BasicMedia module namespace.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
        xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
        xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
        xmlns:BasicMedia="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicMedia"
        targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicMedia"
        elementFormDefault="qualified">

        <!-- these URL's will have to be expanded to their full and proper
locations -->

        <!-- import the definitions in the ncl namespace -->
        <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
schemaLocation="NCL.xsd"/>

```

```

    <!-- declare global elements in this module -->
    <element name="text" type="ncllang:mediaType"
substitutionGroup="ncllang:text"/>
    <element name="img" type="ncllang:mediaType"
substitutionGroup="ncllang:img"/>
    <element name="audio" type="ncllang:mediaType"
substitutionGroup="ncllang:audio"/>
    <element name="animation" type="ncllang:mediaType"
substitutionGroup="ncllang:animation"/>
    <element name="video" type="ncllang:mediaType"
substitutionGroup="ncllang:video"/>
    <element name="textstream" type="ncllang:mediaType"
substitutionGroup="ncllang:textstream"/>
    <element name="ref" type="ncllang:mediaType"
substitutionGroup="ncllang:ref"/>

    <!-- declare global attributes in this module -->
    <attribute name="type" type="string"/>
    <attribute name="src" type="anyURI"/>

</schema>

```

12.3.3 *BasicComposite Module*

```

<!--
XML Schema for the NCL modules - Basic Composite

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
Composite.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL Basic Composite module namespace.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  xmlns:BasicComposite="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicComposite"
  targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicComposite"
  elementFormDefault="qualified">

    <!-- these URL's will have to be expanded to their full and proper
locations -->

    <!-- import the definitions in the ncl namespace -->
    <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
schemaLocation="NCL.xsd"/>

    <!-- declare global elements in this module -->
    <element name="composite" type="ncllang:compositeType"
substitutionGroup="ncllang:composite"/>

    <!-- declare global attributes in this module -->

</schema>

```

12.3.4

MediaInterface Module

```

<!--
XML Schema for the NCL modules - MediaInterface

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
MediaInterface.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL Media Interface module namespace.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
        xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
        xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
        xmlns:MediaInterface="http://www.telemidia.puc-
rio.br/specs/xml/ncl/MediaInterface"
        targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/MediaInterface"
        elementFormDefault="qualified">

    <!-- these URL's will have to be expanded to their full and proper
    locations -->

    <!-- import the definitions in the ncl namespace -->
    <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
    schemaLocation="NCL.xsd"/>

    <!-- declare global elements in this module -->
    <element name="area" type="ncllang:componentAnchorType"
    substitutionGroup="ncllang:area"/>

    <!-- declare global attributes in this module -->
    <attribute name="coords" type="string"/>
    <attribute name="begin" type="unsignedLong"/>
    <attribute name="end" type="unsignedLong"/>
    <attribute name="dur" type="unsignedLong"/>
    <attribute name="text" type="string"/>
    <attribute name="position" type="unsignedLong"/>
    <attribute name="first" type="unsignedLong"/>
    <attribute name="last" type="unsignedLong"/>

</schema>

```

12.3.5

CompositeInterface Module

```

<!--
XML Schema for the NCL modules - CompositeInterface

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
CompositeInterface.xsd

```

Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL Composite Interface module namespace.

```
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-rio.br/specs/xml/ncl/Language"
  xmlns:CompositeInterface="http://www.telemidia.puc-rio.br/specs/xml/ncl/CompositeInterface"
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/CompositeInterface"
  elementFormDefault="qualified">

  <!-- these URL's will have to be expanded to their full and proper
  locations -->

  <!-- import the definitions in the ncl namespace -->
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  schemaLocation="NCL.xsd"/>

  <!-- declare global elements in this module -->
  <element name="compositeArea" type="ncllang:compositeAnchorType"
  substitutionGroup="ncllang:compositeArea"/>
  <element name="port" type="ncllang:compositePortType"
  substitutionGroup="ncllang:port"/>

</schema>
```

12.3.6

AttributeInterface Module

```
<!--
XML Schema for the NCL modules - AttributeInterface

This is NCL
Copyright: 2000-2002 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br
```

```
Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
AttributeInterface.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10
```

Schema for the NCL Attribute Interface module namespace.

```
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-rio.br/specs/xml/ncl/Language"
  xmlns:AttributeInterface="http://www.telemidia.puc-rio.br/specs/xml/ncl/AttributeInterface"
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/AttributeInterface"
  elementFormDefault="qualified">

  <!-- these URL's will have to be expanded to their full and proper
  locations -->

  <!-- import the definitions in the ncl namespace -->
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  schemaLocation="NCL.xsd"/>
```

```

    <!-- declare global elements in this module -->
    <element name="attribute" type="ncllang:attributeInterfaceType"
substitutionGroup="ncllang:attribute"/>

    <!-- declare global attributes in this module -->

</schema>

```

12.3.7

SwitchInterface Module

```

<!--
XML Schema for the NCL modules - SwitchInterface

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
CompositeInterface.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL Switch Interface module namespace.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
        xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
        xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
        xmlns:SwitchInterface="http://www.telemidia.puc-
rio.br/specs/xml/ncl/SwitchInterface"
        targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/SwitchInterface"
        elementFormDefault="qualified">

    <!-- these URL's will have to be expanded to their full and proper
locations -->

    <!-- import the definitions in the ncl namespace -->
    <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
schemaLocation="NCL.xsd"/>

    <!-- declare global elements in this module -->
    <element name="portSwitch" type="ncllang:portSwitchType"
substitutionGroup="ncllang:portSwitch"/>

    <!-- declare global attributes in this module -->

</schema>

```

12.3.8

Linking Module

```

<!--
XML Schema for the NCL modules - Linking

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-Linking.xsd

```

```

Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL Linking module namespace.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-rio.br/specs/xml/ncl/Language"
  xmlns:Linking="http://www.telemidia.puc-rio.br/specs/xml/ncl/Linking"
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/Linking"
  elementFormDefault="qualified">

  <!-- these URL's will have to be expanded to their full and proper
  locations -->

  <!-- import the definitions in the ncl namespace -->
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  schemaLocation="NCL.xsd"/>

  <!-- declare global elements in this module -->

  <element name="param" type="ncl:paramPrototype"
  substitutionGroup="ncllang:param"/>
  <element name="bind" type="ncllang:bindType"
  substitutionGroup="ncllang:bind"/>

  <element name="link" type="ncllang:linkType"
  substitutionGroup="ncllang:link"/>
  <element name="linkBase" type="ncllang:linkBaseType"
  substitutionGroup="ncllang:linkBase"/>
  <element name="lref" type="ncl:lrefPrototype"
  substitutionGroup="ncllang:lref"/>

  <!-- declare global attributes in this module -->
  <attribute name="xconnector" type="anyURI"/>
  <attribute name="name" type="string" />
  <attribute name="value" type="anySimpleType"/>
  <attribute name="role" type="string" />
  <attribute name="component" type="anyURI" />
  <attribute name="port" type="string" />
  <attribute name="src" type="anyURI" />

</schema>

```

12.3.9

CompositeConnector Module

```

<!--
XML Schema for the NCL modules - Composite Connector

This is NCL
Copyright: 2000-2002 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
CompositeConnector.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2002/07/15

Schema for the NCL Composite Connector module namespace.
-->

```

```

<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-rio.br/specs/xml/ncl/Language"
  xmlns:CompositeConnector="http://www.telemidia.puc-rio.br/specs/xml/ncl/CompositeConnector"
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/CompositeConnector"
  elementFormDefault="qualified">

  <!-- these URL's will have to be expanded to their full and proper
  locations -->

  <!-- import the definitions in the ncl namespace -->
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  schemaLocation="NCL.xsd"/>

  <!-- declare global elements in this module -->
  <element name="compositeConnector"
  type="ncllang:compositeConnectorType"
  substitutionGroup="ncllang:compositeConnector"/>
  <element name="partialLinkBase" type="ncllang:partialLinkBaseType"
  substitutionGroup="ncllang:partialLinkBase"/>

  <!-- declare global attributes in this module -->

</schema>

```

12.3.10

XTemplateUse Module

```

<!--
XML Schema for the NCL modules

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
TemplateUse.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL Template Use module namespace.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-rio.br/specs/xml/ncl/Language"
  xmlns:TemplateUse="http://www.telemidia.puc-rio.br/specs/xml/ncl/TemplateUse"
  targetNamespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/TemplateUse"
  elementFormDefault="qualified">

  <!-- these URL's will have to be expanded to their full and proper
  locations -->

  <!-- import the definitions in the ncl namespace -->
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  schemaLocation="NCL.xsd"/>

  <!-- declare global elements in this module -->
  <!-- (none) -->

```

```

<!-- declare global attributes in this module -->
<attribute name="xtemplate" type="anyURI"/>
<attribute name="label" type="string"/>

</schema>

```

12.3.11

BasicTiming Module

```

<!--
XML Schema for the NCL modules - Basic Timing

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
InlineTiming.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL Basic Timing module namespace.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  xmlns:BasicTiming="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicTiming"
  targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicTiming"
  elementFormDefault="qualified">

  <!-- these URL's will have to be expanded to their full and proper
locations -->

  <!-- import the definitions in the ncl namespace -->
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
schemaLocation="NCL.xsd"/>

  <!-- declare global elements in this module -->
  <!-- (none) -->

  <!-- declare global attributes in this module -->
  <attribute name="dur" type="string"/>
  <attribute name="min" type="string"/>
  <attribute name="max" type="string"/>

</schema>

```

12.3.12

BasicLayout Module

```

<!--
XML Schema for the NCL modules

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

```

```

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
BasicLayout.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2002/07/15

Schema for the NCL BasicMedia module namespace.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
        xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
        xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
        xmlns:BasicLayout="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicLayout"
        targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicLayout"
        elementFormDefault="qualified">

    <!-- these URL's will have to be expanded to their full and proper
locations -->

    <!-- import the definitions in the ncl namespace -->
    <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
schemaLocation="NCL.xsd"/>

    <!-- declare global elements in this module -->
    <element name="layout" type="ncllang:layoutType"
substitutionGroup="ncllang:layout"/>
    <element name="topLayout" type="ncllang:topLayoutType"
substitutionGroup="ncllang:topLayout"/>
    <element name="region" type="ncllang:regionType"
substitutionGroup="ncllang:region"/>

    <!-- declare global attributes in this module -->
    <attribute name="region" type="IDREF"/>

</schema>

```

12.3.13

BasicDescriptor Module

```

<!--
XML Schema for the NCL modules

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
BasicDescriptor.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the NCL BasicDescriptor module namespace.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
        xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
        xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
        xmlns:BasicDescriptor="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicDescriptor"
        targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/BasicDescriptor"
        elementFormDefault="qualified">

```

```

    <!-- these URL's will have to be expanded to their full and proper
    locations -->

    <!-- import the definitions in the ncl namespace -->
    <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
    schemaLocation="NCL.xsd"/>

    <!-- declare global attributes in this module -->
    <attribute name="descriptor" type="IDREF"/>

    <!-- declare global elements in this module -->
    <element name="descriptor" type="ncllang:descriptorType"
    substitutionGroup="ncllang:descriptor"/>
    <element name="descriptorBase" type="ncllang:descriptorBaseType"
    substitutionGroup="ncllang:descriptorBase"/>

</schema>

```

12.3.14

CompositeDescriptor Module

```

<!--
XML Schema for the NCL modules

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
CompositeDescriptor.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2002/07/15

Schema for the NCL CompositeDescriptor module namespace.
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  xmlns:CompositeDescriptor="http://www.telemidia.puc-
rio.br/specs/xml/ncl/CompositeDescriptor"
  targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/CompositeDescriptor"
  elementFormDefault="qualified">

    <!-- these URL's will have to be expanded to their full and proper
    locations -->

    <!-- import the definitions in the ncl namespace -->
    <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
    schemaLocation="NCL.xsd"/>

    <!-- declare global elements in this module -->
    <element name="componentPresentation"
    type="ncllang:componentPresentationType"
    substitutionGroup="ncllang:componentPresentation"/>

</schema>

```

12.3.15***TestAttributes Module***

```

<!--
XML Schema for the NCL modules - TestAttributes

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
TestAttributes.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the TestAttributes module namespace
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncLang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:TestAttributes="http://www.telemidia.puc-
rio.br/specs/xml/ncl/TestAttributes"
  targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/TestAttributes"
  elementFormDefault="qualified" attributeFormDefault="unqualified"
>

  <!-- these URL's may have to be expanded to their full and proper
locations -->

  <!-- import the definitions in the NCL namespace -->
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
schemaLocation="NCL.xsd"/>

  <!-- declare global elements in this module -->

  <!-- declare global attributes in this module -->
  <attribute name="systemAudioDesc" type="ncl:onOrOffType"/>
  <attribute name="systemBitrate" type="string"/>
  <attribute name="systemCaptions" type="ncl:onOrOffType"/>
  <attribute name="systemComponent" type="string"/>
  <attribute name="systemCPU" type="NMTOKEN"/>
  <attribute name="systemLanguage" type="string"/>
  <attribute name="systemOperatingSystem" type="NMTOKEN"/>
  <attribute name="systemOverdubOrSubtitle"
type="ncl:overdubOrSubtitleType"/>
  <attribute name="systemRequired" type="string"/>
  <attribute name="systemScreenDepth" type="positiveInteger"/>
  <attribute name="systemScreenSize" type="string"/>

</schema>

```

12.3.16***ContentControl Module***

```

<!--
XML Schema for the NCL modules - Content Control

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

```

```

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
ContentControl.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the Content Control module namespace
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:ContentControl="http://www.telemidia.puc-
rio.br/specs/xml/ncl/ContentControl"
  targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/ContentControl"
  elementFormDefault="qualified" attributeFormDefault="unqualified"
>

  <!-- these URL's may have to be expanded to their full and proper
locations -->

  <!-- import the definitions in the NCL namespace -->
  <import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
schemaLocation="NCL.xsd"/>

  <!-- declare global elements in this module -->
  <element name="switch" type="ncllang:switchType"
substitutionGroup="ncllang:switch"/>

  <!-- declare global attributes in this module -->

</schema>

```

12.3.17

DescriptorControl Module

```

<!--
XML Schema for the NCL modules - Descriptor Control

This is NCL
Copyright: 2000-2003 LABORATORIO TELEMIDIA, All Rights Reserved.
See http://www.telemidia.puc-rio.br

Public URI: http://www.telemidia.puc-rio.br/specs/xml/ncl/NCL-
DescriptorControl.xsd
Author: Debora Christina Muchaluat Saade
Revision: 2003/03/10

Schema for the Descriptor Control module namespace
-->
<schema xmlns="http://www.w3.org/2001/XMLSchema"
  xmlns:ncllang="http://www.telemidia.puc-
rio.br/specs/xml/ncl/Language"
  xmlns:ncl="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
  xmlns:DescriptorControl="http://www.telemidia.puc-
rio.br/specs/xml/ncl/DescriptorControl"
  targetNamespace="http://www.telemidia.puc-
rio.br/specs/xml/ncl/DescriptorControl"
  elementFormDefault="qualified" attributeFormDefault="unqualified"
>

  <!-- these URL's may have to be expanded to their full and proper
locations -->

```

```
<!-- import the definitions in the NCL namespace -->
<import namespace="http://www.telemidia.puc-rio.br/specs/xml/ncl/"
schemaLocation="NCL.xsd"/>

<!-- declare global elements in this module -->
<element name="descriptorSwitch" type="ncllang:descriptorSwitchType"
substitutionGroup="ncllang:descriptorSwitch"/>

<!-- declare global attributes in this module -->

</schema>
```