Programming for Ginga-NCL

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Programming in NCL Conceptual Model

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Basic Entities

what? nodes (media objects)

how? node's properties

where? node's properties

when? links and connectors

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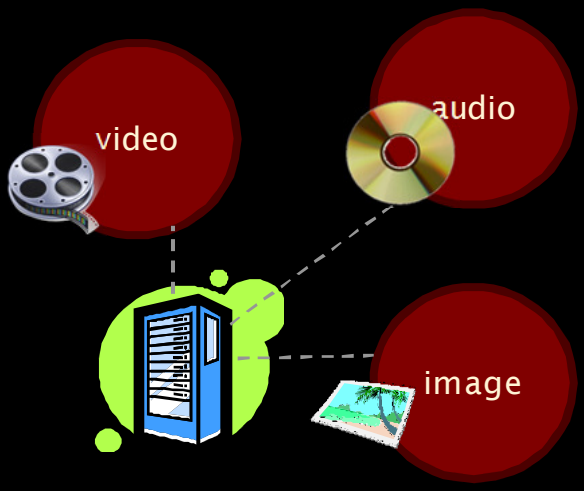
What? Media Objects



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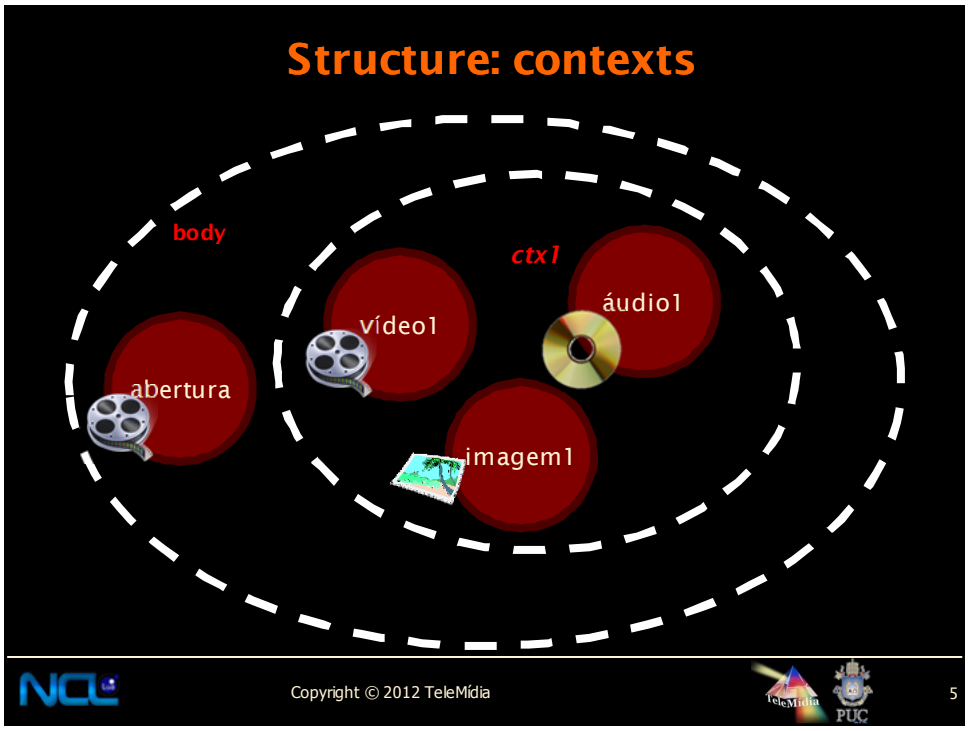

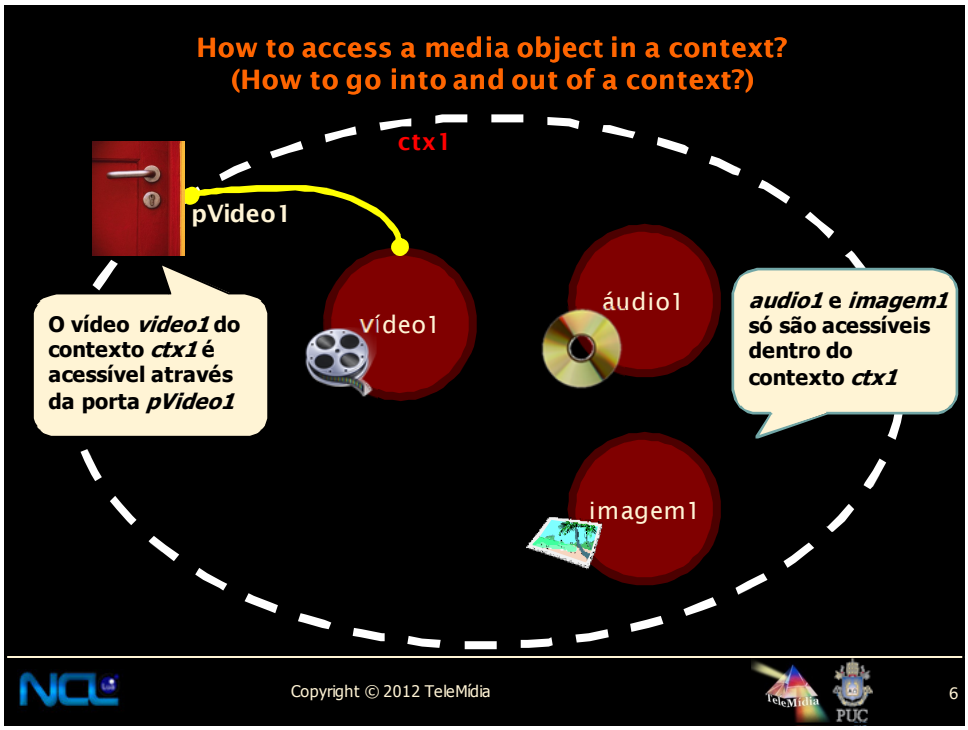

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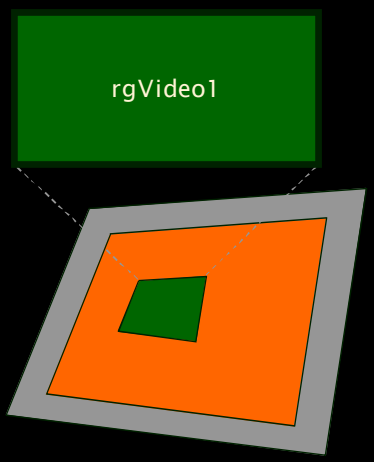
Where?

Regions

on a specific device



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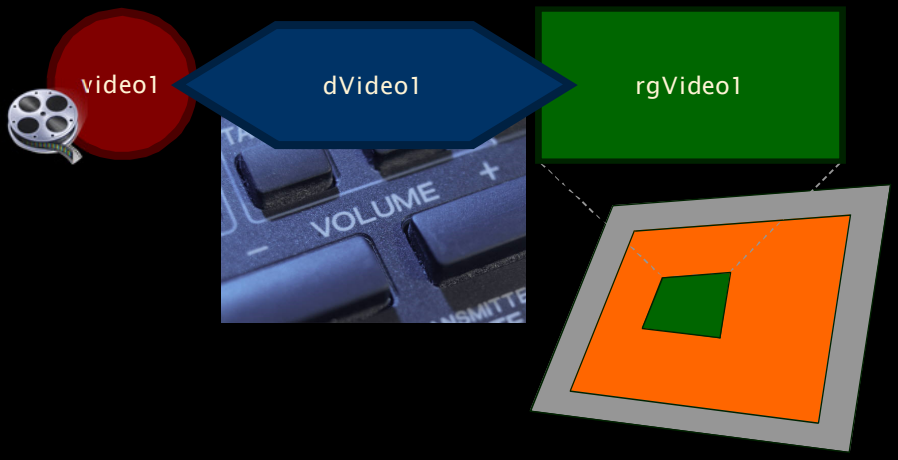
How?



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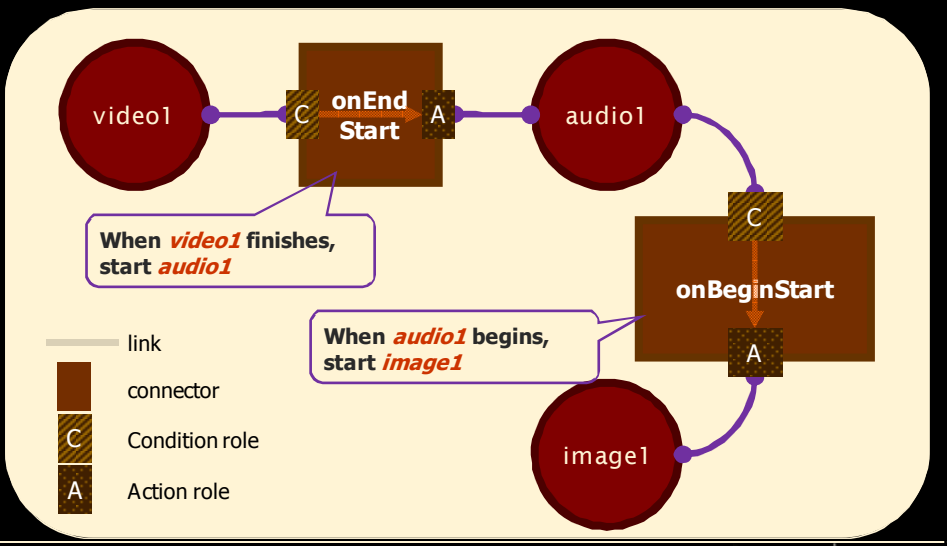
When? Links and conectors



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Programming in NCL

The Language

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Designing an NCL Document

- visions
  - spatial/temporal (storyboard)
  - structural
  - layout
  - temporal

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Example 1 – Storyboard

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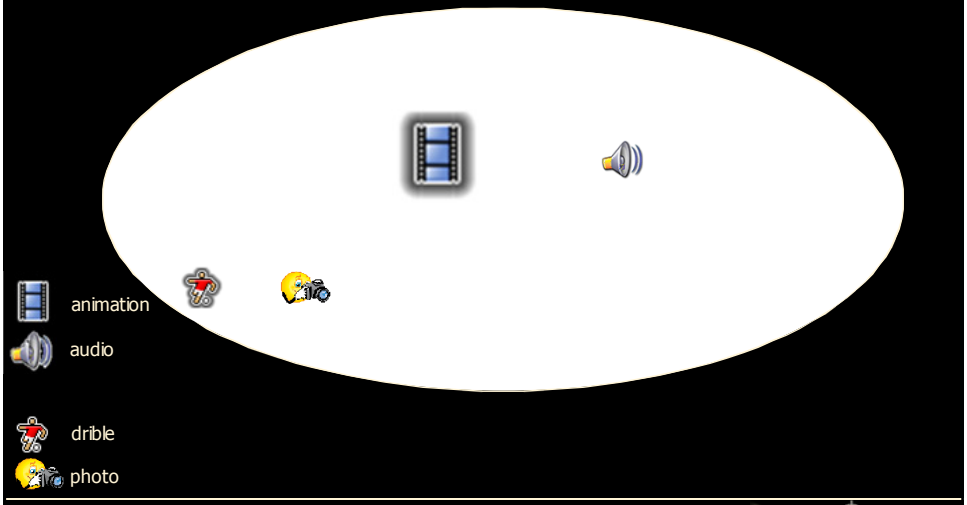
Example 1 – Structural View



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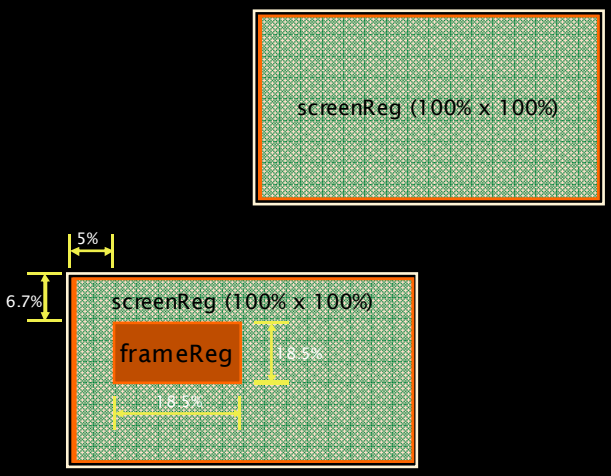
Example 1 – Layout View



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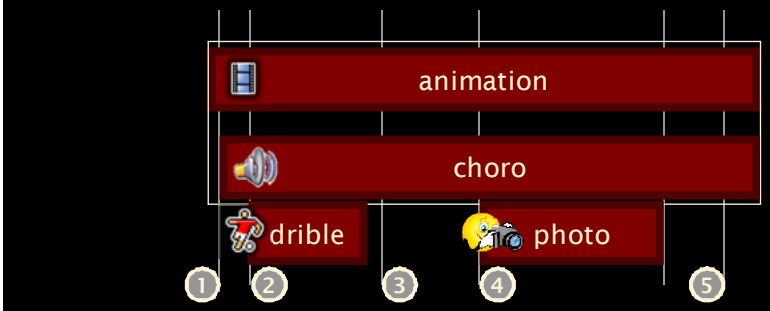
Example 1 – Temporal View



1	2	3	4	5
animation @ screenReg + choro	drible @ frameReg + animation @... + choro	animation @... + choro	photo @ frameReg + animation @...+ choro	animation @... + choro

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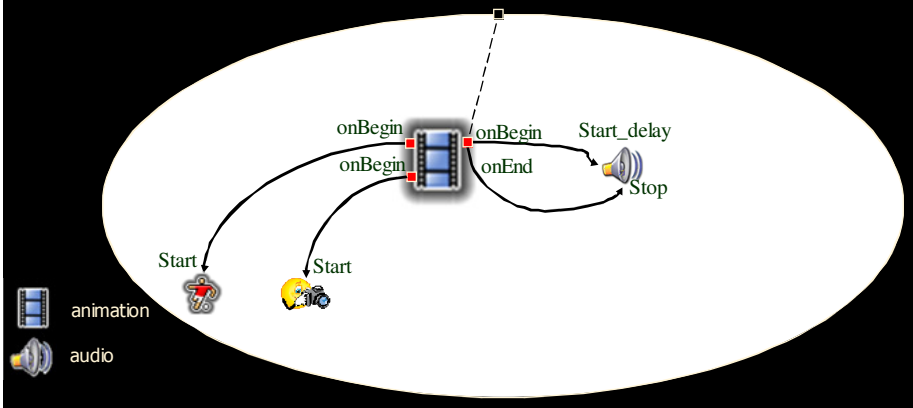
Example 1 – Structural View



animation
audio
drible
photo

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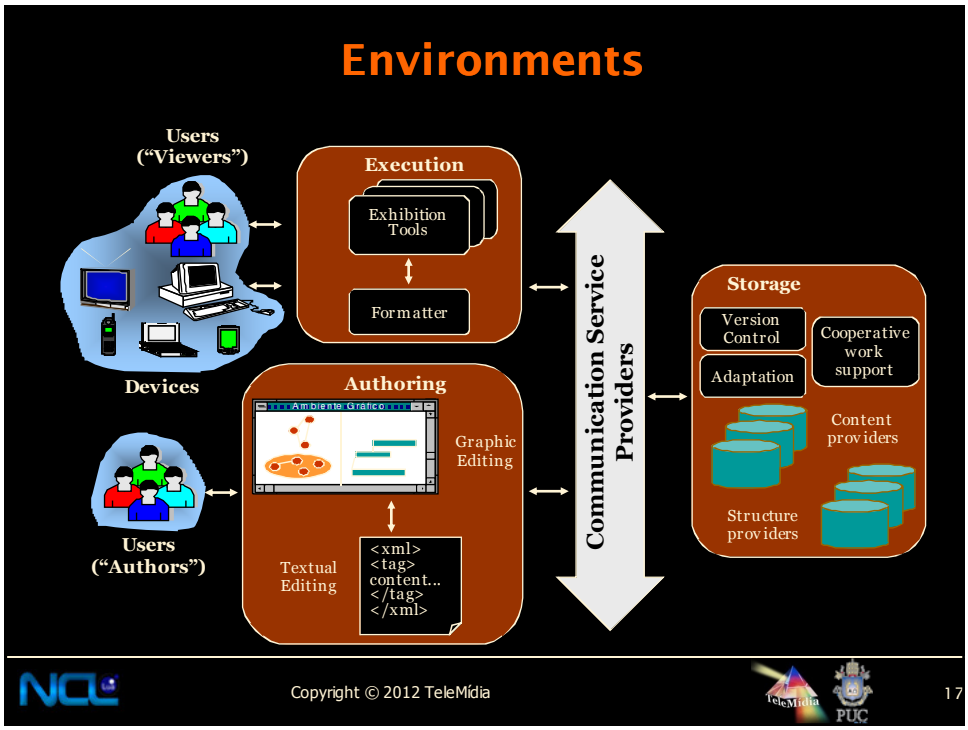
Environments
Users
("Viewers")
Devices
Execution
Exhibition
Tools
Formatter
Authoring
Graphic
Editing
Textual
Editing
<xml>
<tag>
content...
</tag>
</xml>
Users
("Authors")
Communication Service
Providers
Storage
Version
Control
Cooperative
work
support
Adaptation
Content
providers
Structure
providers
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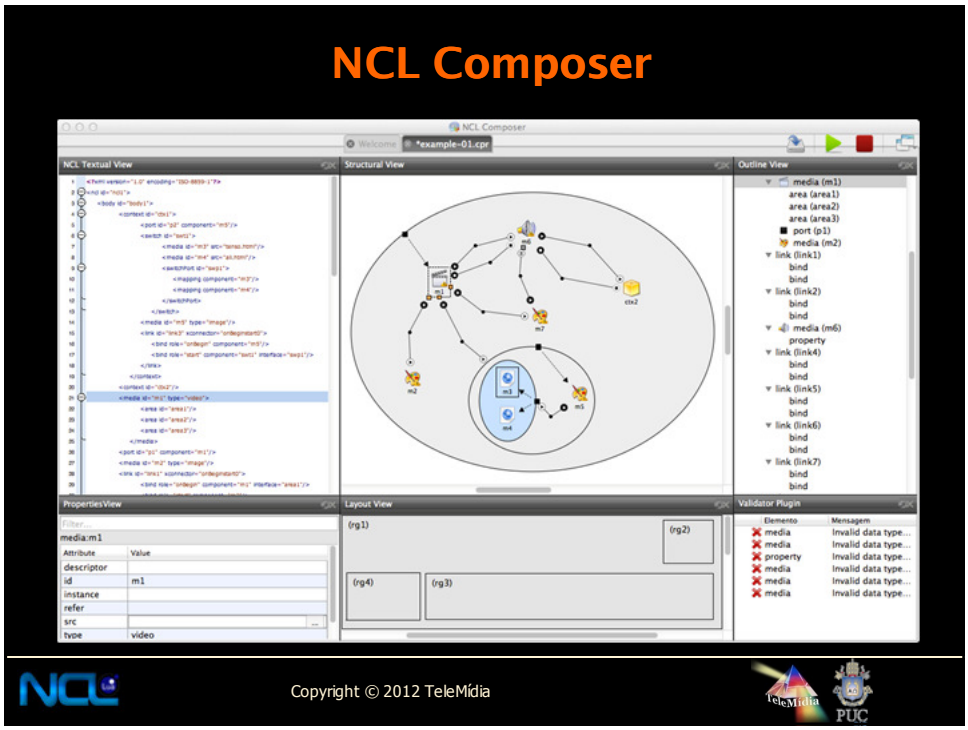
NCL Composer
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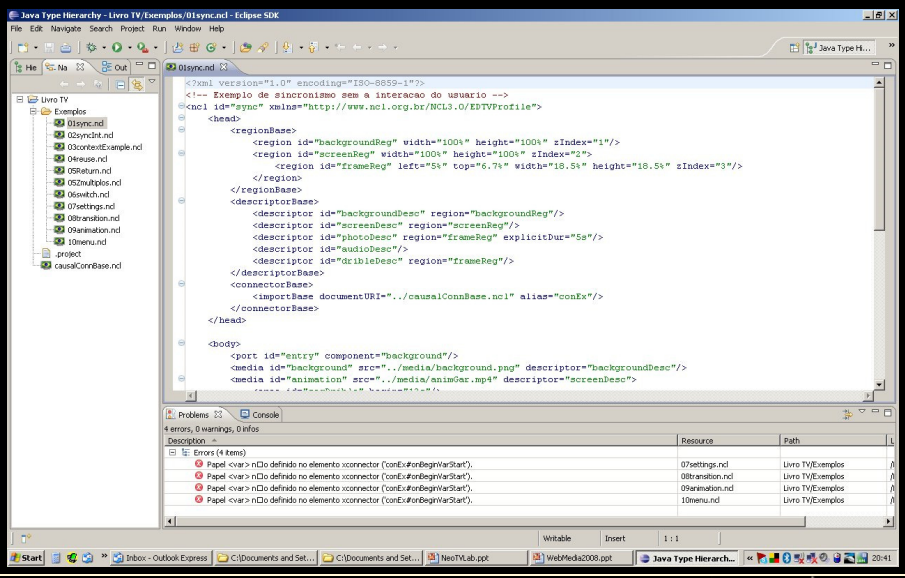
NCL Eclipse



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XML Markup Language

- TAG or XML Element (<tag>...</tag> OR <tag />):
  - <media id="video1" descriptor="dVideoWholeScreen">
    ...
    </media>
  - <media id="video1" descriptor="dVideoWholeScreen"/>
- Atribute (format: atribute="value")
  - id
  - descriptor
- Atribute value (between "")
  - "video1"
  - "dVideoWhole Screen"

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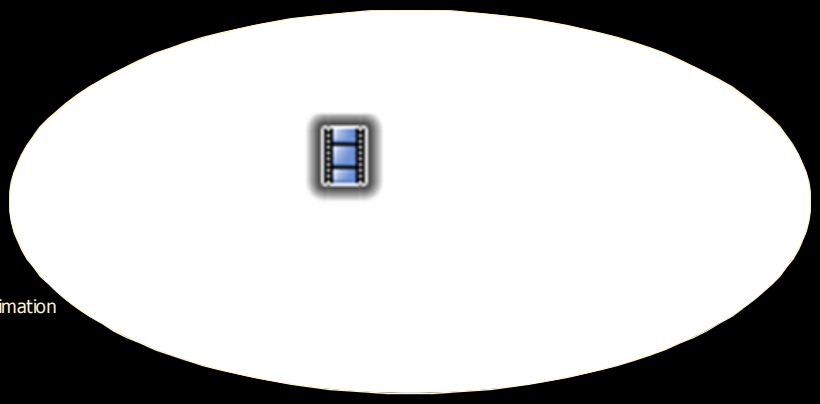
Designing an NCL Document

```
<?xml version="1.0" encoding="ISO-8859-1"?>

<ncl id="example01" xmlns="http://www.ncl.org.br/NCL3.0/
   EDTVProfile">

   <head>
      document header
   </head>

   <body>
      document body
   </body>
</ncl>
```

1

2

Example 1 – Structural View



animation

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Example 1

```
<body>

    <media id="animation" src="../media/animGar.mp4" >



    </media>
```

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Esquema	Parte específica do esquema	Uso
file:	///file_path/#fragment_identifier	Para arquivos locais
http:	//server_identifier/file_path/#fragment_identifier	Para arquivos remotos buscados pelo canal de interatividade usando o protocolo http
https:	//server_identifier/file_path/#fragment_identifier	Para arquivos remotos buscados pelo canal de interatividade usando o protocolo https
rtsp:	//server_identifier/file_path/#fragment_identifier	Para fluxos (*streams*) obtidos pelo canal de interatividade usando o protocolo rtsp
rtp:	//server_identifier/file_path/#fragment_identifier	Para fluxos (*streams*) obtidos pelo canal de interatividade usando o protocolo rtp
ncl-mirror:	//media_element_identifier	Para um fluxo de conteúdo idêntico a um que esteja em apresentação por um outro elemento de mídia
sbtvd-ts:	//program_number.component_tag	Para fluxos elementares recebidos pelo fluxo de transporte (TS)

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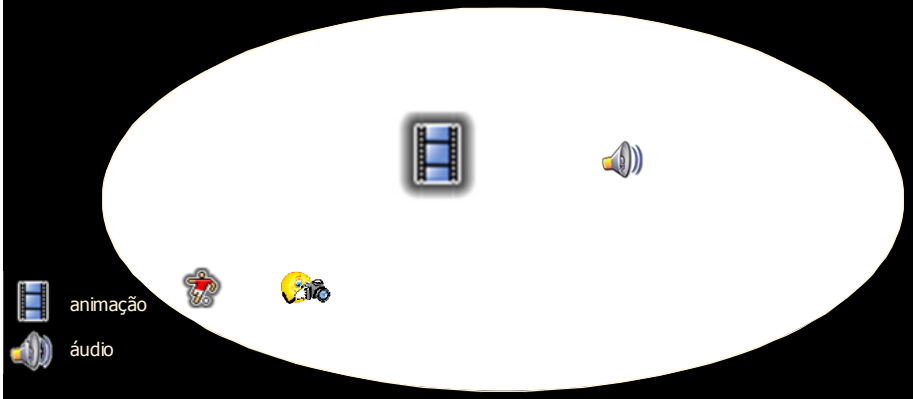
Example 1 – Structural View



animação

áudio

drible

foto

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Example 1

```
<body>

    <media id="animation" src="../media/animGar.mp4" >


        <property name="width" value="100%"/>
        <property name="heigth" value="100%"/>
        <property name="zIndex" value="2"/>
    </media>
    <media id="choro" src="../media/choro.mp3"/>
    <media id="drible" src="../media/drible.mp4">
        <property name="left" value="5%"/>
        <property name="top" value="6.7%"/>
        <property name="width" value="18.5%"/>
        <property name="heigth" value="18.5%"/>
        <property name="zIndex" value="3"/>
    </media>
```

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Example 1

```
<media id="photo" src="../media/photo.png">
      <property name="left" value="5%"/>
      <property name="top" value="6.7%"/>
      <property name="width" value="18.5%"/>
      <property name="heigth" value="18.5%"/>
      <property name="zIndex" value="3"/>
      <property name="explicitDur" value="5s"/>
</media>
```

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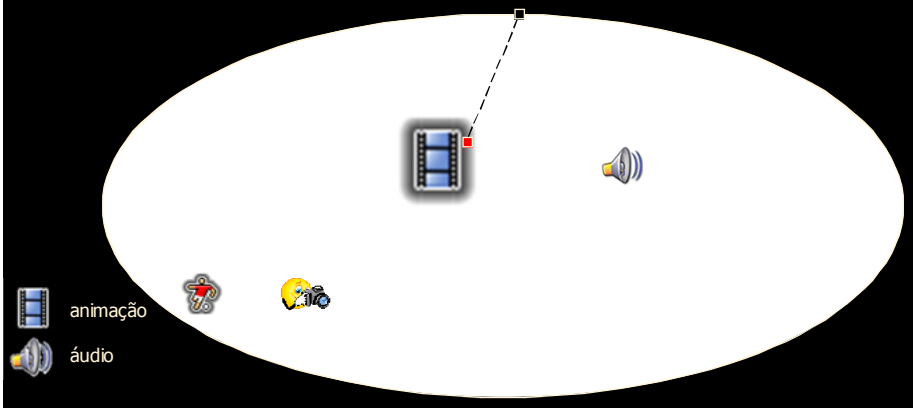
Example 1 – Structural View



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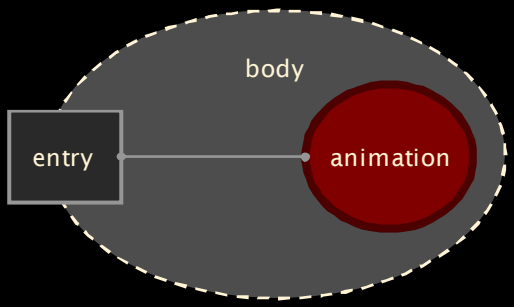
Example 1 – Context *body* and port

```
<body>
    <port id="entry" component="animation" />
  ...
</body>
```



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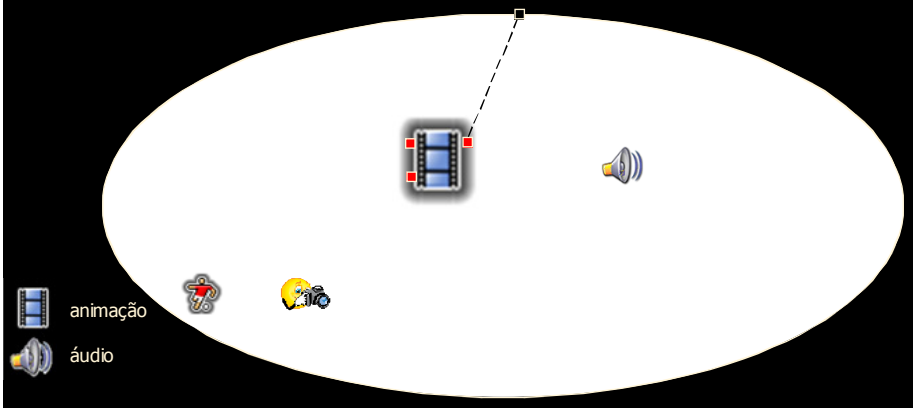
Example 1 – Structural View



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Example 1

```
<body>
    <port id="entry" component="animation"/>
    <media id="animation" src="../media/animGar.mp4" >
        <area id="segDrible" begin="12s"/>
        <area id="segPhoto" begin="41s"/>
        <property name="width" value="100%"/>
        <property name="heigth" value="100%"/>
        <property name="zIndex" value="2"/>
    </media>
    <media id="choro" src="../media/choro.mp3"/>
    <media id="drible" src="../media/drible.mp4">
        <property name="left" value="5%"/>
        <property name="top" value="6.7%"/>
        <property name="width" value="18.5%"/>
        <property name="heigth" value="18.5%"/>
        <property name="zIndex" value="3"/>
    </media>
```

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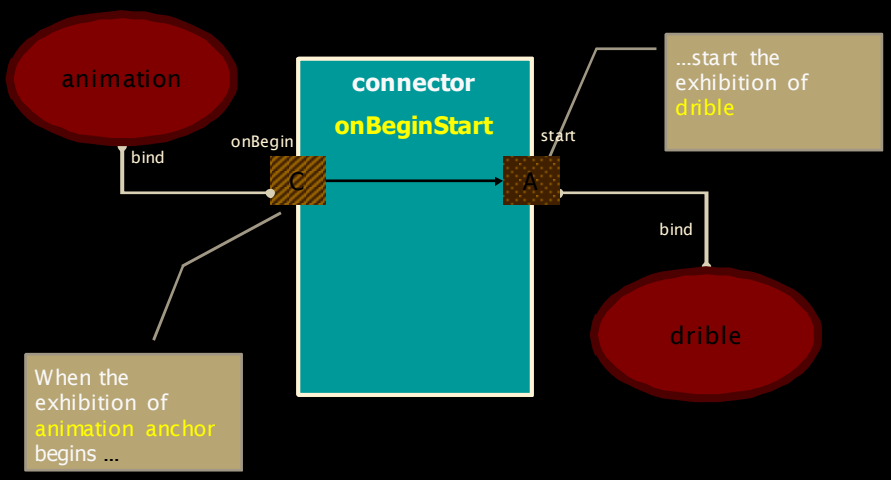
Connector *onBeginStart*



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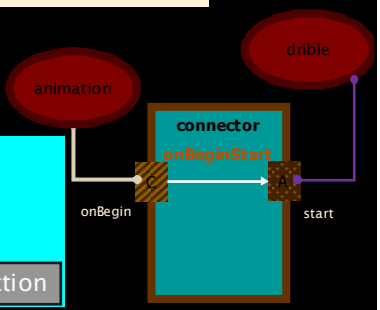
Connector *onBeginStart*

```
<causalConnector id="onBeginStart">
    <simpleCondition role="onBegin"/>
    <simpleAction role="start" max="unbounded" qualifier="seq"/>
</causalConnector>
```

Link using the *onBeginStart* connector:
Starting the drible video

```
<link xconnector="onBeginStart">
    bind role="onBegin" component="animation"
                                interface="segDrible/>
  <bind role="start" component="drible" />
</link>
```

In the **body** section



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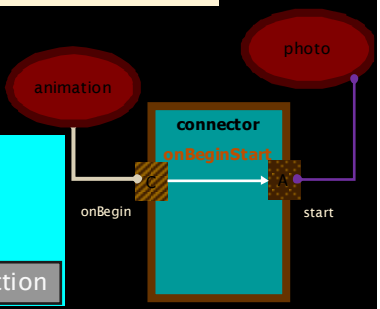
Connector *onBeginStart*

```
<causalConnector id="onBeginStart">
    <simpleCondition role="onBegin"/>
    <simpleAction role="start" max="unbounded" qualifier="seq" />
</causalConnector>
```

Link using the *onBeginStart* connector:
Starting the photo image

```
<link xconnector="onBeginStart">
    bind role="onBegin" component="animation"
                                interface="segPhoto/>
  <bind role="start" component="photo" />
</link>
```

In the **body** section



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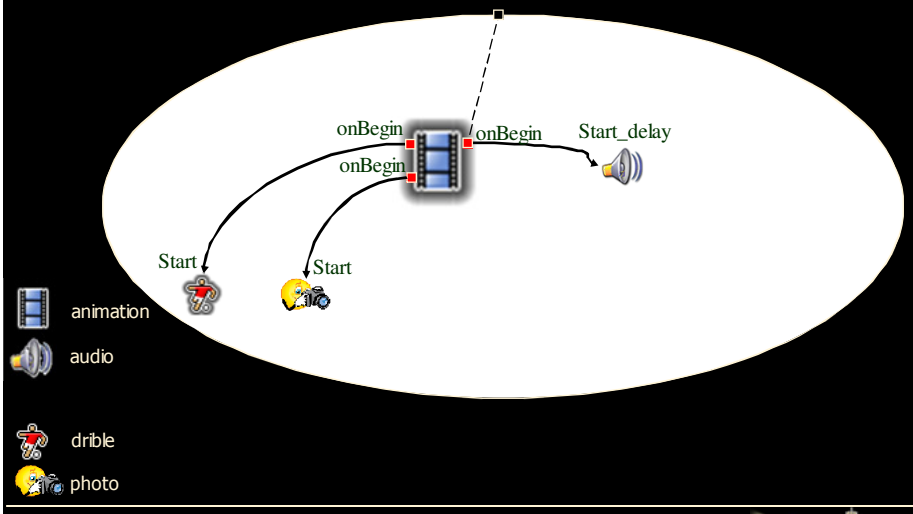
Example 1 – Structural View



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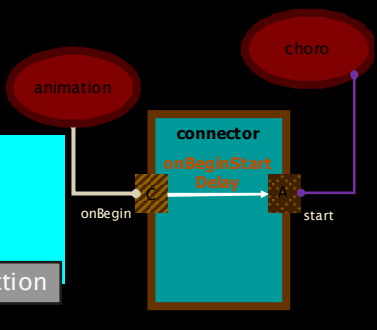
Connector *onBeginStart_delay*

```
<causalConnector id="onBeginStart_delay">
    <simpleCondition role="onBegin"/>
    <simpleAction role="start" delay="5s" max="unbounded" qualifier="seq"/>
</causalConnector>
```

Link using the *onBeginStartDelay* connector: Starting the choro audio

```
<link xconnector="onBeginStart_delay">
   <bind role="onBegin" component="animation"/>
   <bind role="start" component="choro" />
</link>
```

In the **body** section



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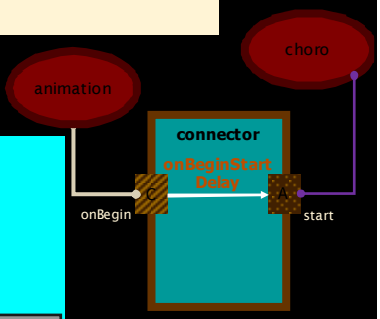
Connector *onBeginStart_delay*

```
<causalConnector id="onBeginStart_delay">
   <connectorParam name="xyz"/>
   <simpleCondition role="onBegin"/>
   <simpleAction role="start" delay="$xyz" max="unbounded" qualifier="seq"/>
</causalConnector>
```

Link using the *onBeginStartDelay* connector: Starting the choro audio

```
<link xconnector="onBeginStart_delay">
   <bind role="onBegin" component="animation"/>
   <bind role="start" component="choro">
        <bindParam name="xyz" value="5s"/>
   </bind>
</link>
```

In the **body** section



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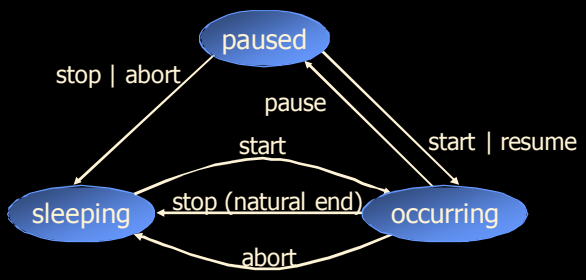
Event State Machine



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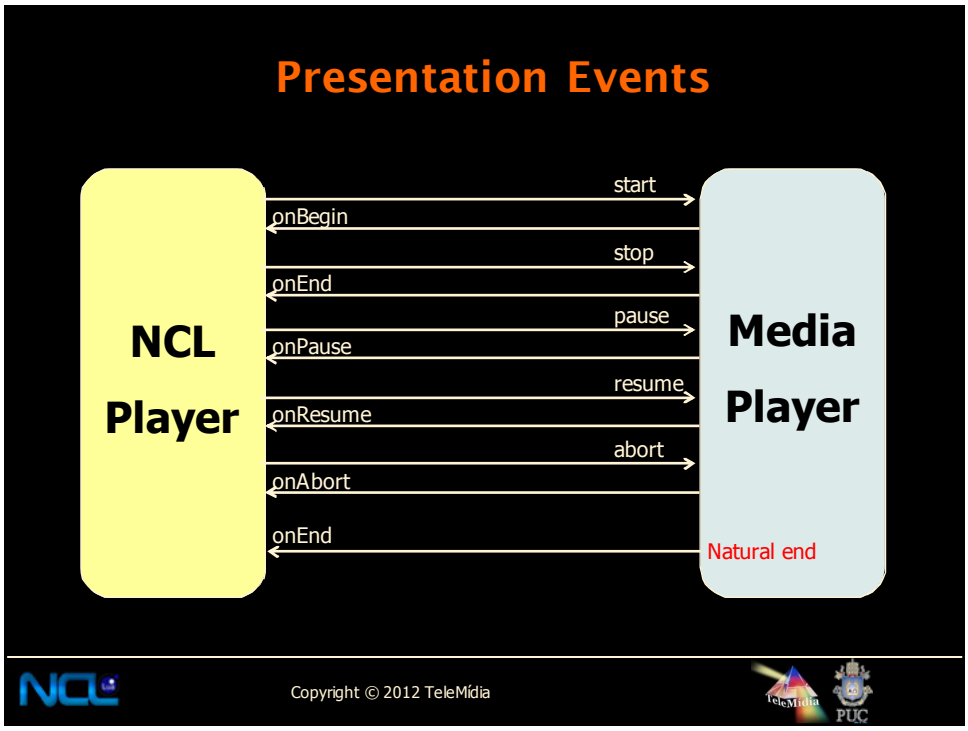

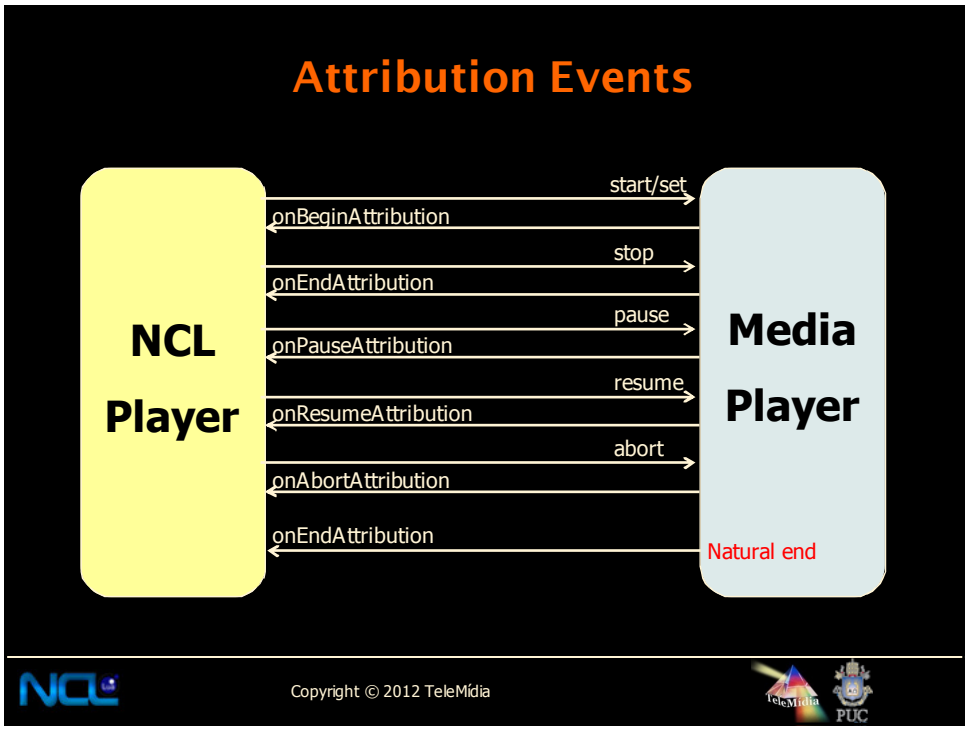

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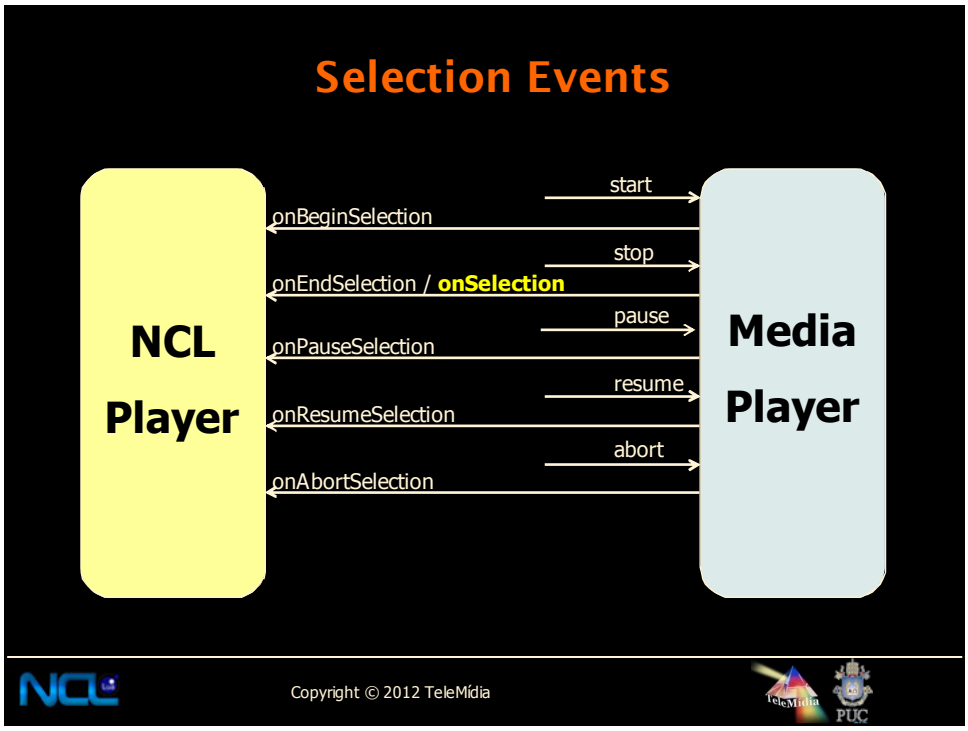

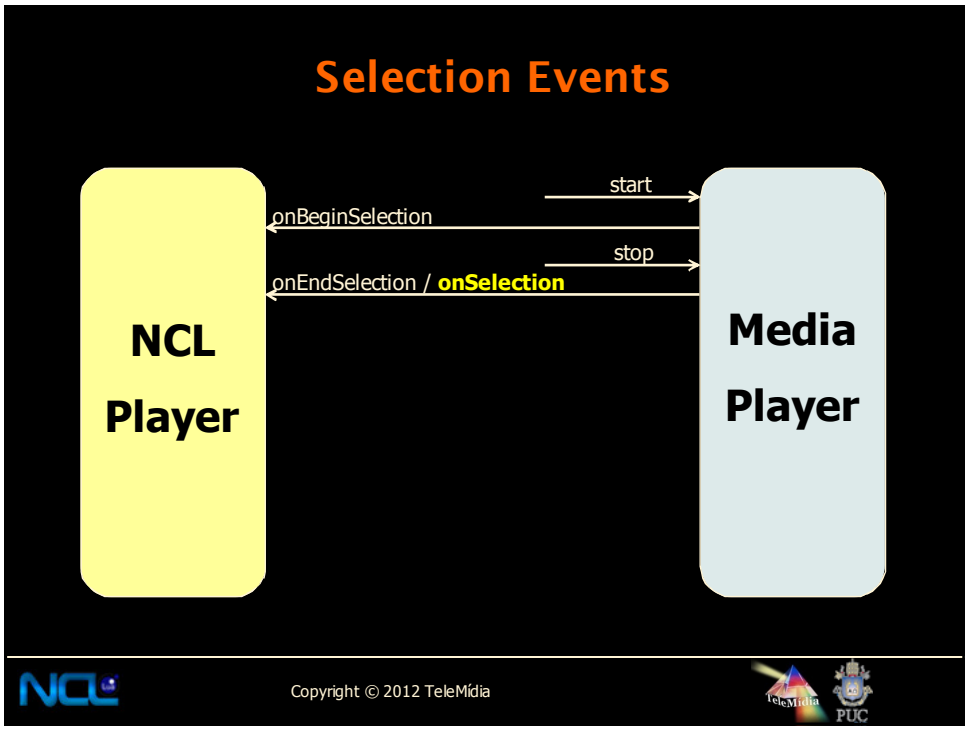

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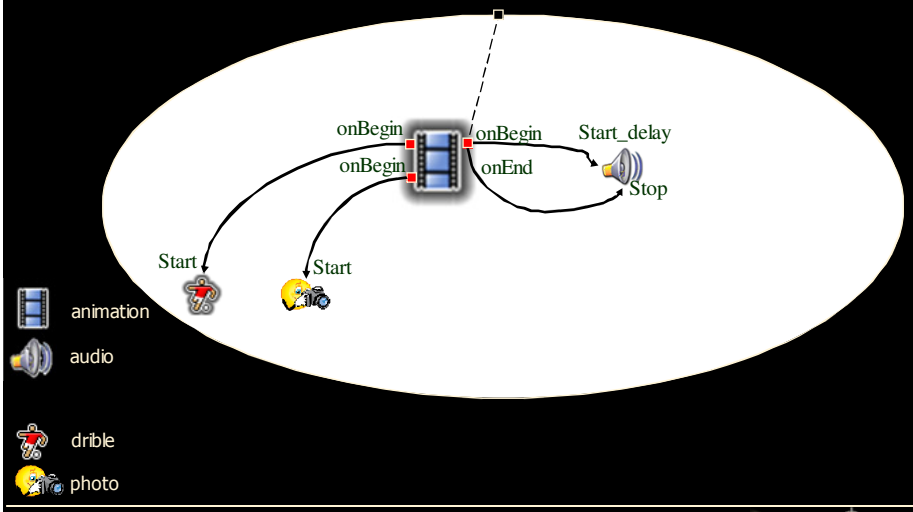
Example 1 – Structural View



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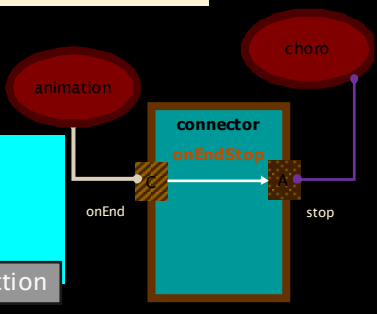
Connector *onEndStop*

```
<causalConnector id="onEndStop">
    <simpleCondition role="onEnd"/>
    <simpleAction role="stop" max="unbounded" qualifier="seq" />
</causalConnector>
```

Link using the *onEndStop* connector: Stoping the audio

```
<link xconnector="onEndStop">
    bind role="onEnd" component="animation"/>
  <bind role="stop" component="choro" />
</link>
```

In the **body** section



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Example 1

```
<link  id="lMusic"  xconnector="onBeginStart_delay">
       <bind role="onBegin" component="animation" />
       <bind role="start" component="choro">
            <bindParam  name="xyz" value="5s"/>
       </bind>
</link>

<link  id="lDrible"  xconnector="onBeginStart">
       <bind role="onBegin" component="animation"  interface="segDrible"/>
       <bind role="start" component="drible"/>
</link>

<link  id="lPhoto" xconnector="onBeginStart">
       <bind role="onBegin" component="animation"  interface="segPhoto"/>
       <bind role="start" component="photo"/>
</link>

<link  id="lEnd"  xconnector="onEndStop">
       <bind role="onEnd" component="animation"/>
       <bind role="stop" component="choro"/>
</link>

    </body>
</ncl>
```

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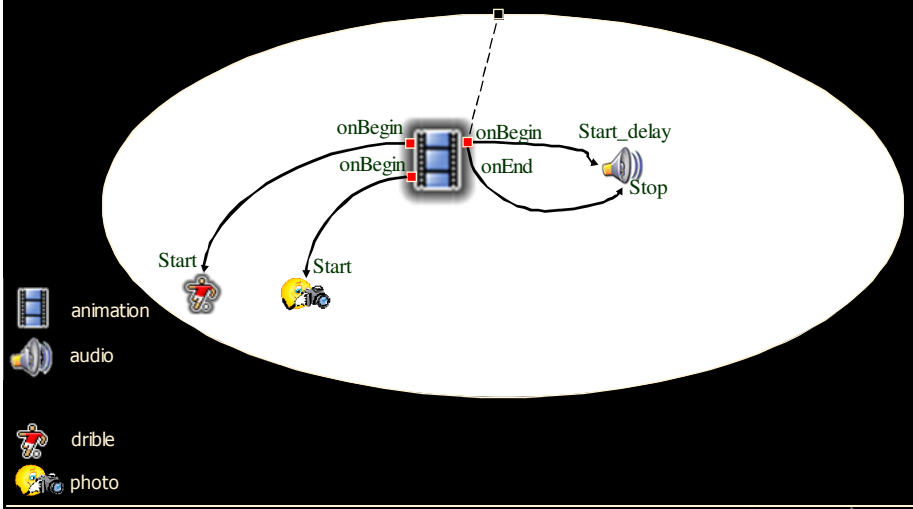
Example 2 – Structural View



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Basic Entities

what? nodes (media objects)

how? node's properties or descriptors

where? node's properties or regions

when? links and connectors

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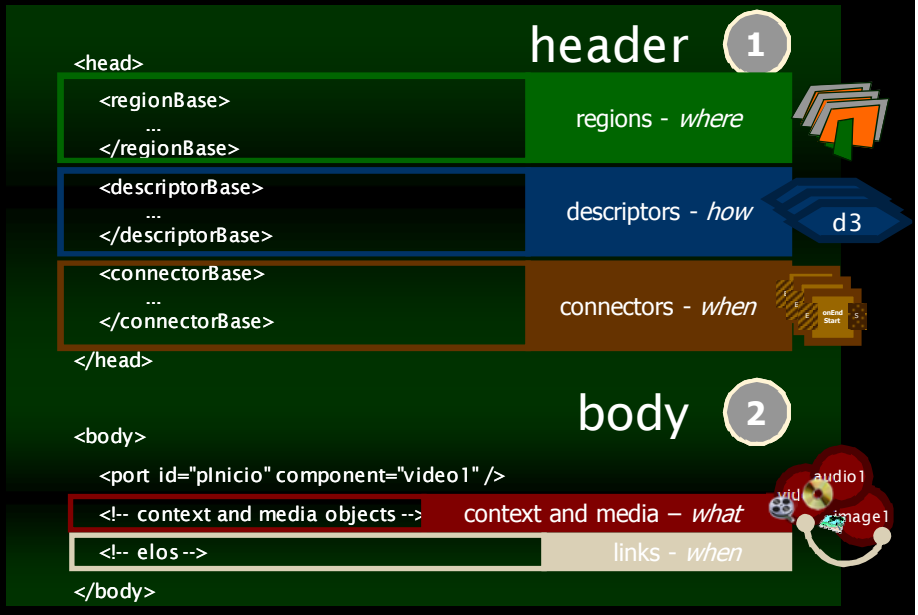

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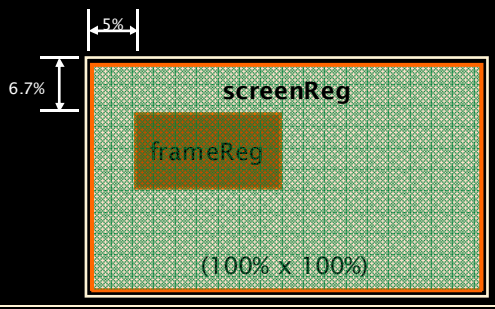
Regions

```
<regionBase>
  <region id="screenReg" height="100%" width="100%" zIndex="2">
    <region id="frameReg" left="5%" top="6.7%" height="18.5%" width="160"
                                                              zIndex="3"/>
  </region>
</regionBase>
```



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Example 2 – Descriptors

```
<descriptorBase>
  <descriptor id="screenDesc" region="screenReg"/>
  <descriptor id="photoDesc" region="frameReg" explicitDur="5s"/>
  <descriptor id="audioDesc"/>
  <descriptor id="dribleDesc" region="frameReg"/>
</descriptorBase>
```

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Example 2

```
<body>
    <port id="entry" component="animation"/>

    <media id="animation" src="../media/animGar.mp4" descriptor="screenDesc">
        <area id="segDrible" begin="12s"/>
        <area id="segPhoto" begin="41s"/>
    </media>
    <media id="choro" src="../media/choro.mp3" descriptor="audioDesc"/>
    <media id="drible" src="../media/drible.mp4" descriptor="dribleDesc"/>
    <media id="photo" src="../media/photo.png" descriptor="photoDesc"/>
```

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```
<?xml version="1.0" encoding="ISO-8859-1"?>
<!-- Exemplo de sincronismo sem a interacao do usuario -->
<ncl id="sync" xmlns="http://www.ncl.org.br/NCL3.0/EDTVProfile">
    <head>
        <regionBase>
            <region id="screenReg" height="100%" width="100%" zIndex="1">
                <region id="frameReg" left="5%" top="6.7%" height="18.5%" width="18.5%"
                                                                    zIndex="3"/>
            </region>
        </regionBase>
        <descriptorBase>
            <descriptor id="screenDesc" region="screenReg"/>
            <descriptor id="photoDesc" region="frameReg" explicitDur="5s"/>
            <descriptor id="audioDesc"/>
            <descriptor id="dribleDesc" region="frameReg"/>
        </descriptorBase>
        <connectorBase>
            <importBase documentURI="causalConnBase.ncl" alias="conEx"/>
        </connectorBase>
    </head>
```

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Example 2

```
<link  id="lMusic"  xconnector="conEx#onBeginStart_delay">
       <bind  role="onBegin" component="animation" />
       <bind  role="start" component="choro">
            <bindParam  name="xyz" value="5s"/>
       </bind>
</link>

<link  id="lDrible"  xconnector="conEx#onBeginStart">
       <bind  role="onBegin" component="animation"  interface="segDrible"/>
       <bind  role="start" component="drible"/>
</link>

<link  id="lPhoto" xconnector="conEx#onBeginStart">
       <bind  role="onBegin" component="animation"  interface="segPhoto"/>
       <bind  role="start" component="photo"/>
</link>

<link  id="lEnd"  xconnector="conEx#onEndStop">
       <bind  role="onEnd" component="animation"/>
       <bind  role="stop" component="choro"/>
</link>

    </body>
</ncl>
```

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Example 3 – Storyboard

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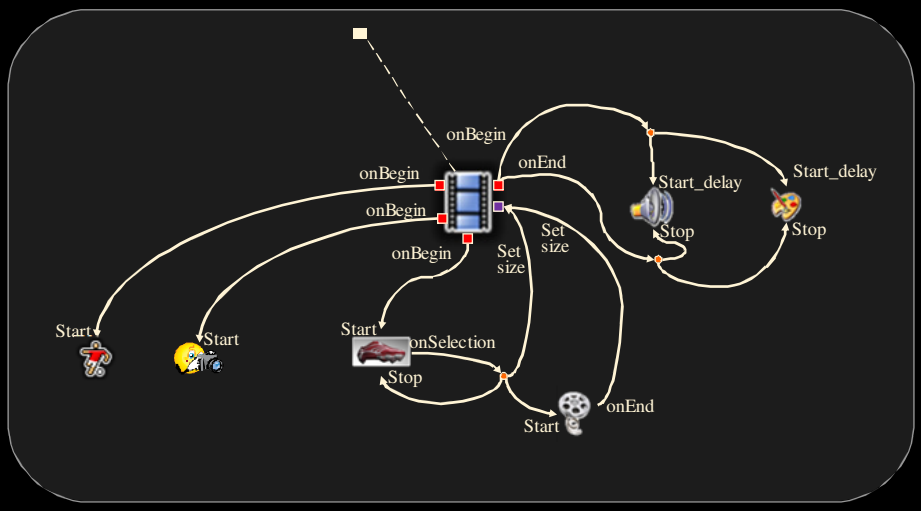
Example 3



Connector *on*KeySelectionStopSet_varStart

```
<causalConnector id="onKeySelectionStopSet_varStart">
        <connectorParam name="var"/>
        <connectorParam name="keyCode"/>
        <simpleCondition role="onSelection" key="$keyCode"/>
        <compoundAction operator="seq">
                <simpleAction role="stop" max="unbounded" qualifier="seq"/>
                <simpleAction role="set" value="$var"/>
                <simpleAction role="start" max="unbounded" qualifier="seq"/>
        </compoundAction>
</causalConnector>
```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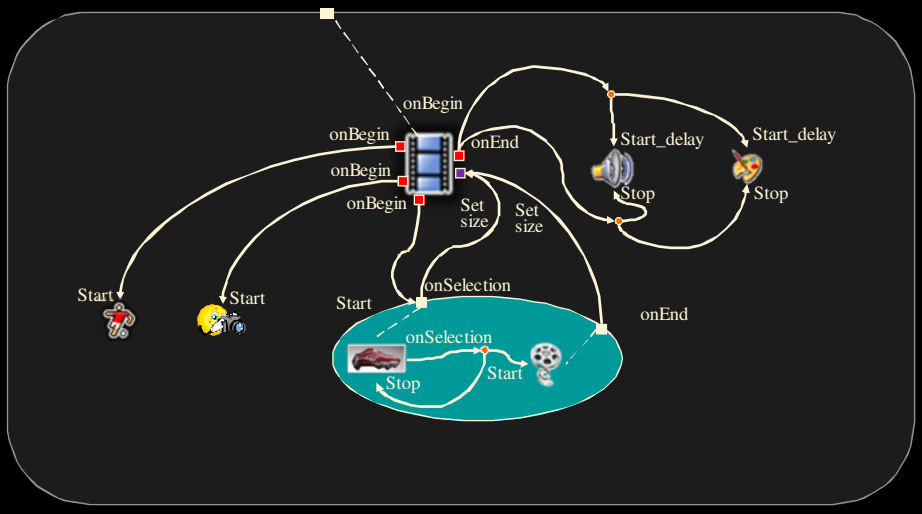
Example 4



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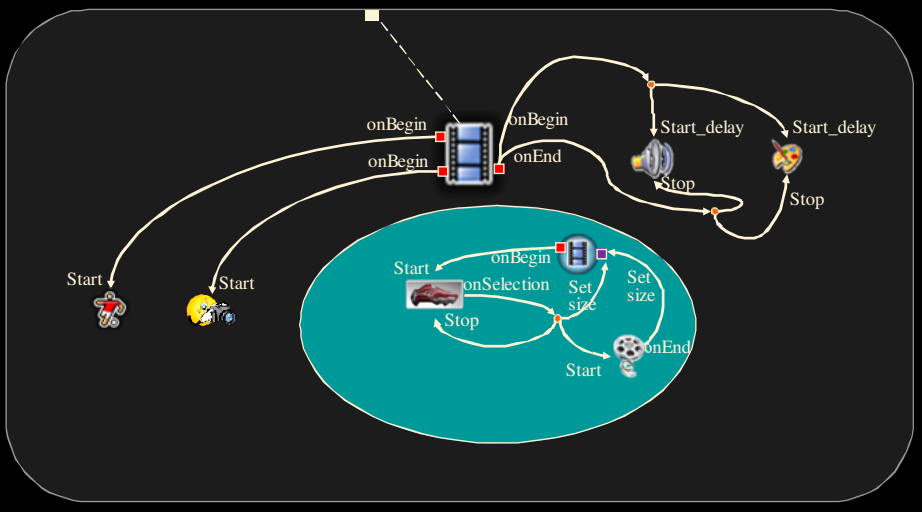
Example 5



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Example 6 – Storyboard

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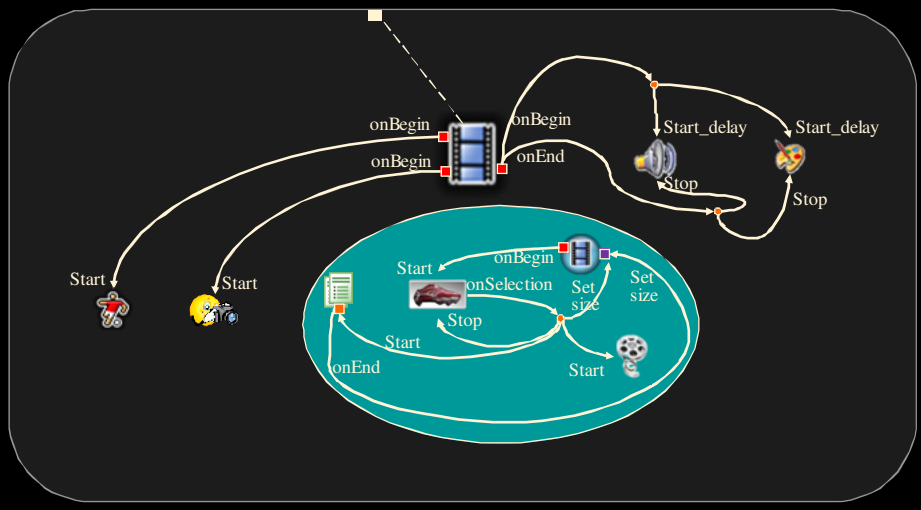
Example 6



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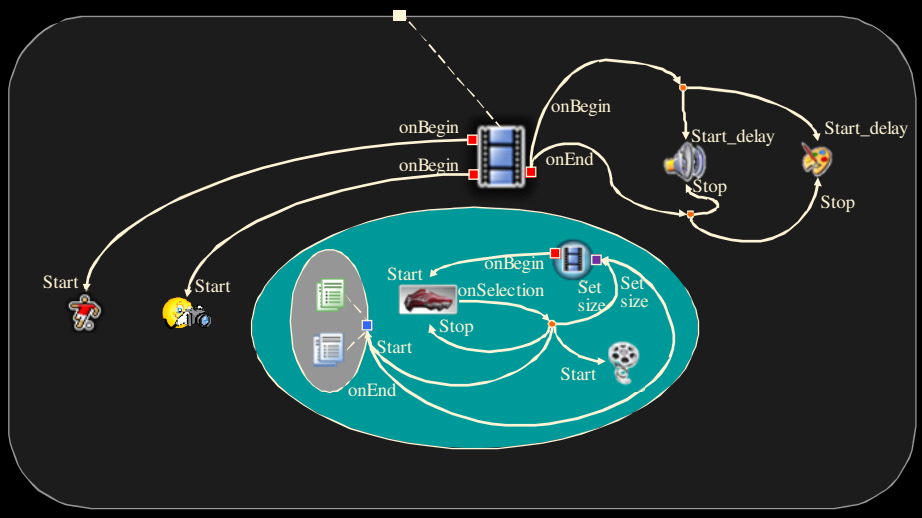
Example 7



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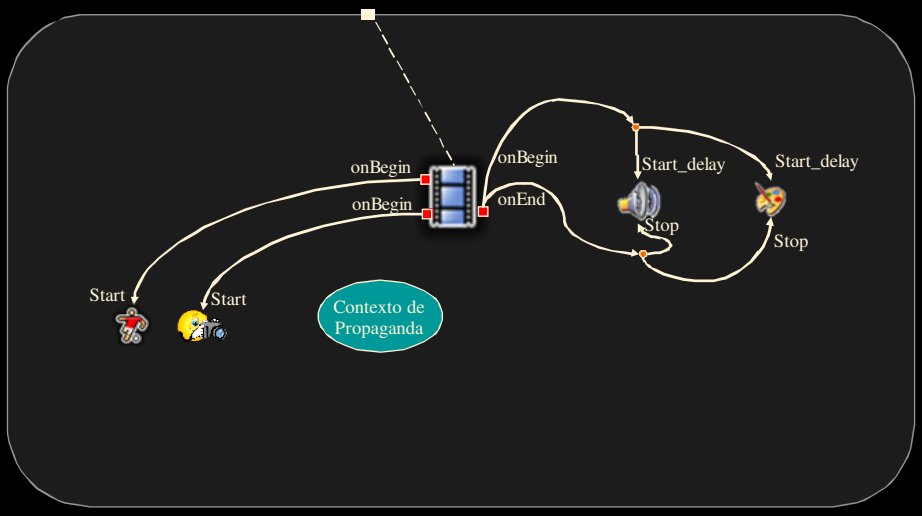
Example 8



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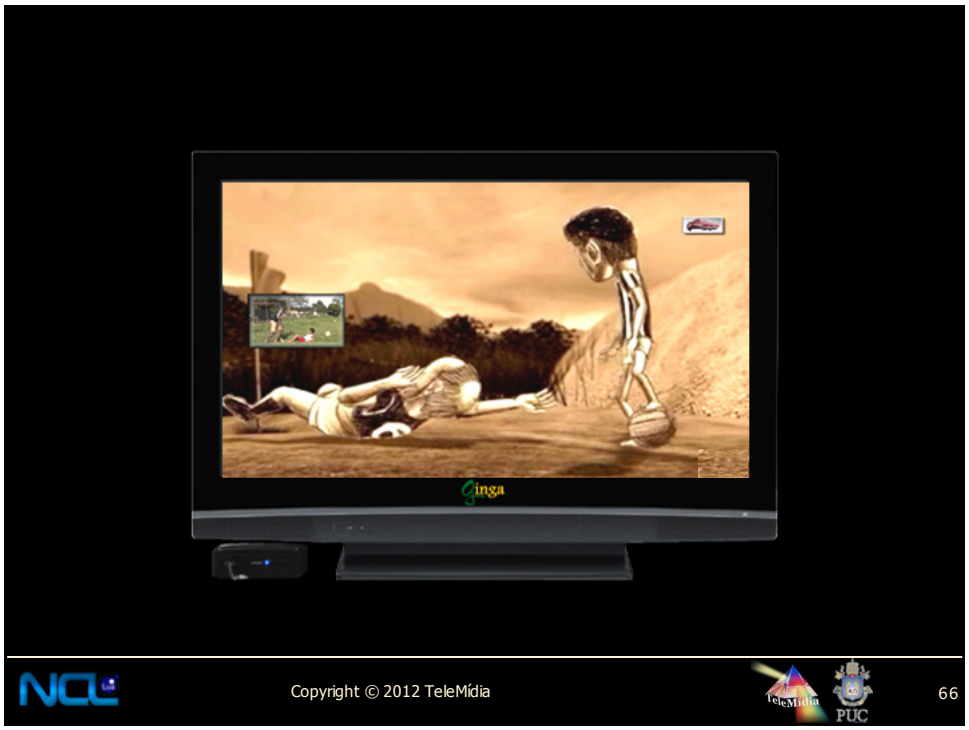

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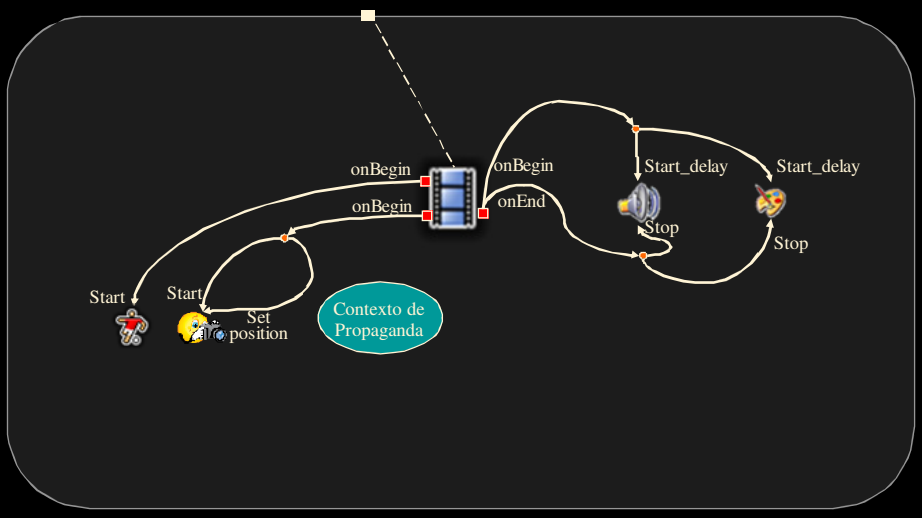
Example 9



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NCL Composer

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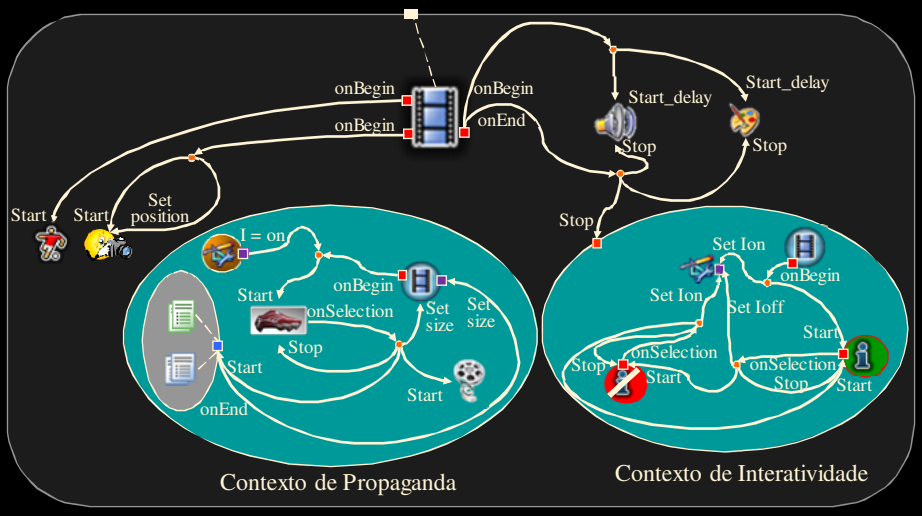
Example 10



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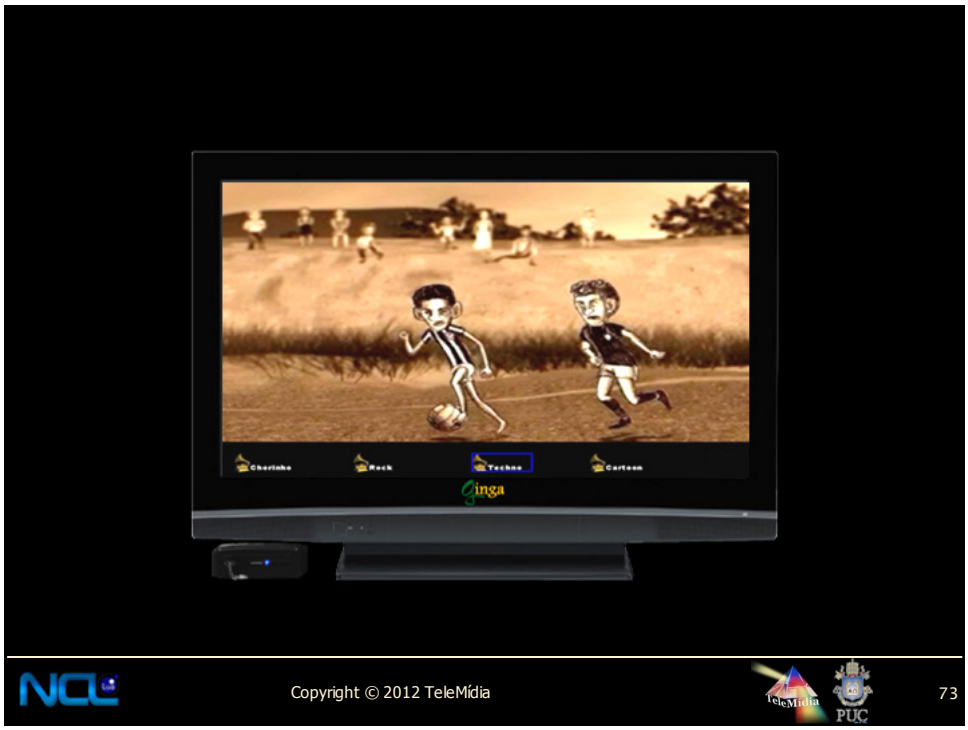

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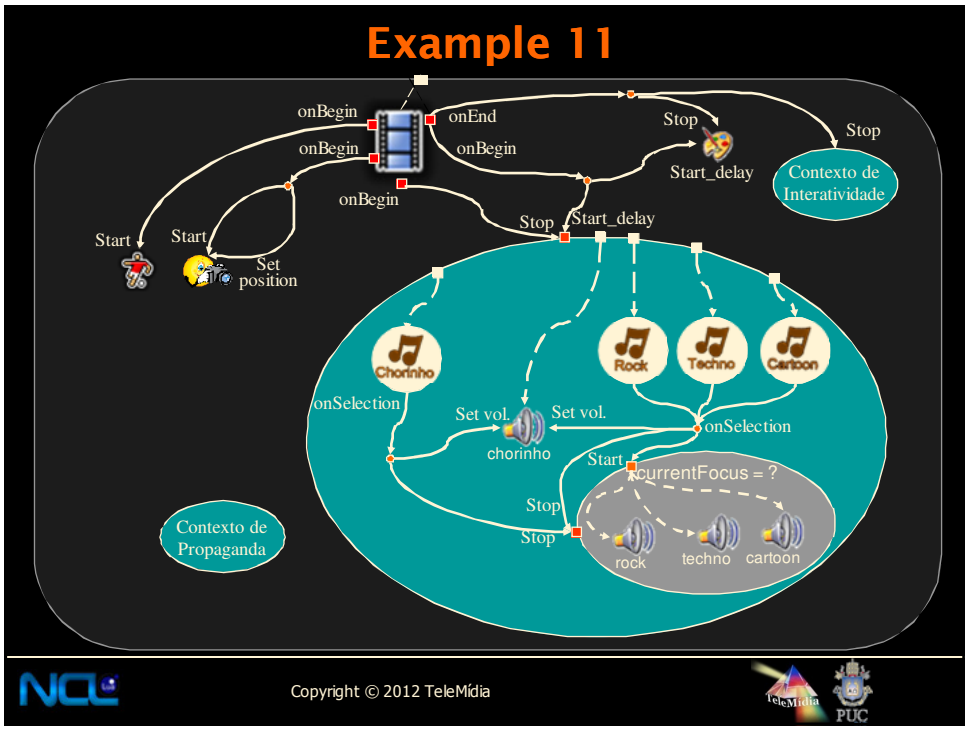

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Connector *onOrSelectionSetStopStart*

```
<causalConnector id="onOrSelectionSet_varStopStart">
   <connectorParam name="var"/>
   <simpleCondition role="onSelection" qualifier="or" max="unbounded"/>
   <compoundAction operator="seq">
         <simpleAction role="set" value="$var" max="unbounded"
                                                qualifier="par"/>
         <simpleAction role="stop"/>
         <simpleAction role="start"/>
   </compoundAction>
</causalConnector>
```

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Continuous Media Streaming

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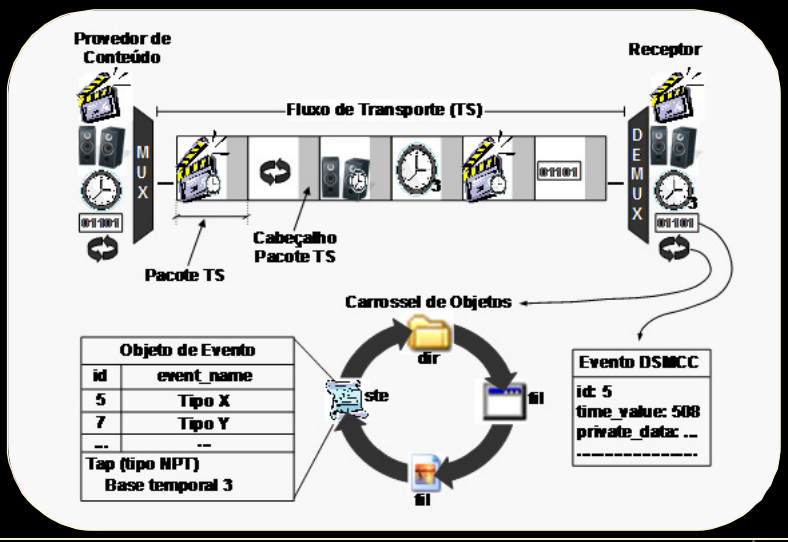
TS Stream



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Streaming

- How a content can be located?
  - programNumber?
  - componentTag?
  - What else?

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Streaming

- How a content can be located?
  - programNumber
  - componentTag
  - contentId
  - How to get the contentId?

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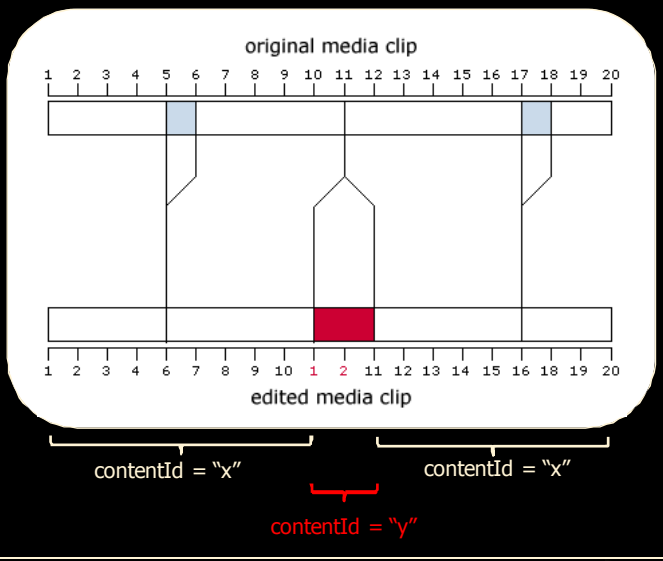
NPT



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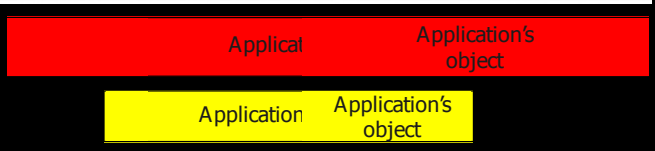
Synchronism

- NPT Control
- Application start point control



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Embedded NCLua Objects

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Interfaces

- <area id="a1" label="internal function">
- <property name= "internal function" value ="parameter">

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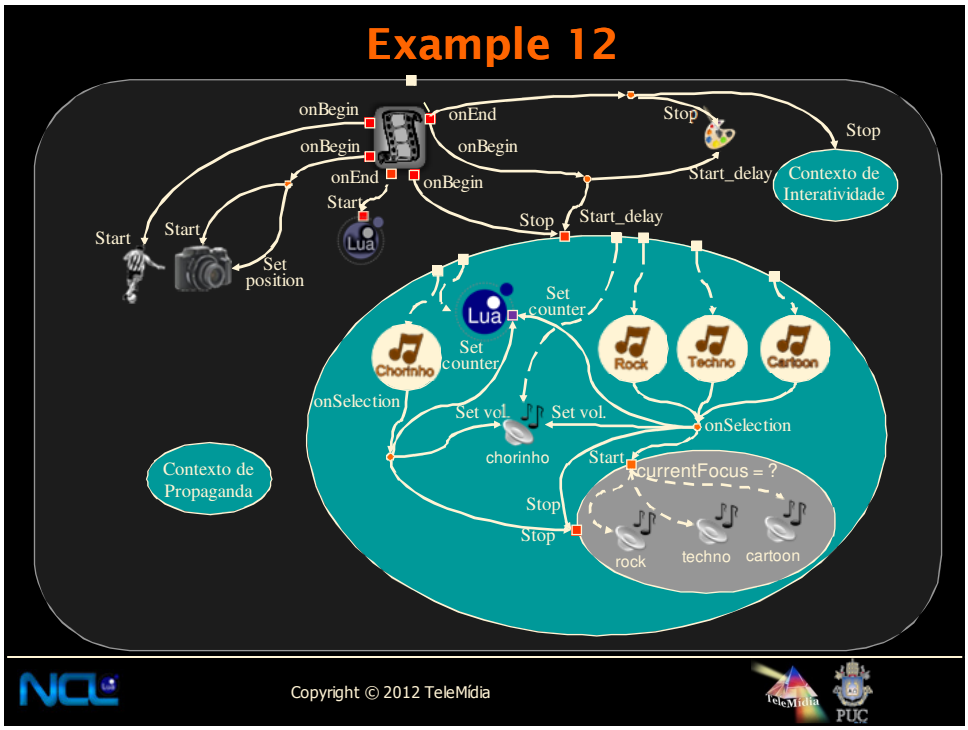


```
local counter = 0
local dx, dy = canvas:attrSize()        -- dimensoes do canvas

function handler1 (evt)
   if evt.class=='ncl' and evt.type=='attribution'  and evt.action=='start' and evt.name=='add'  then
      counter = counter + evt.value
      event.post {
        class   = 'ncl',
        type    = 'attribution',
        name    = 'add',
        action  = 'stop',
        value   = counter,
      }
   end
end

function handler2 (evt)
      canvas:attrColor ('black')
      canvas:drawRect('fill',0,0,dx,dy)
      canvas:attrColor ('yellow')
      canvas:attrFont ('vera', 24, 'bold')
      canvas:drawText (10,10, 'O número de vezes que você trocou de ritmo foi: '..counter)
      canvas:flush()
     event.post {
        class   = 'ncl',
        type    = 'presentation',
        label   = 'fim',
        action  = 'stop',
      }
end

event.register(handler1)
event.register(handler2,'ncl','presentation','fim','start')
```

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Importing

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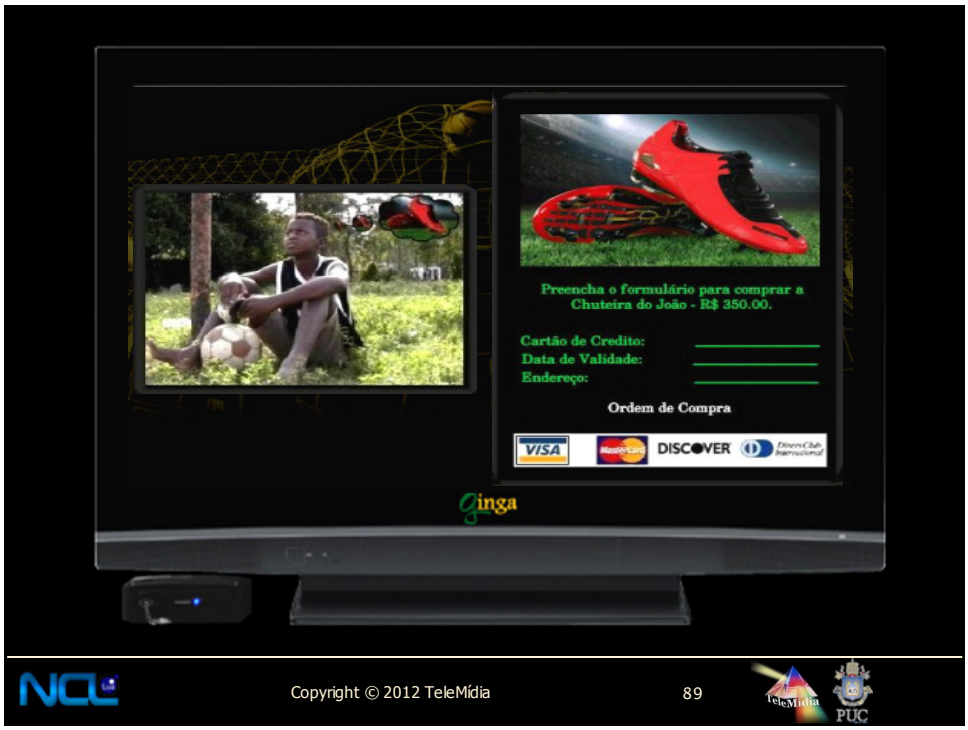
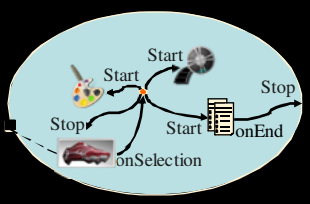


Examples 14, 15



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Ginga
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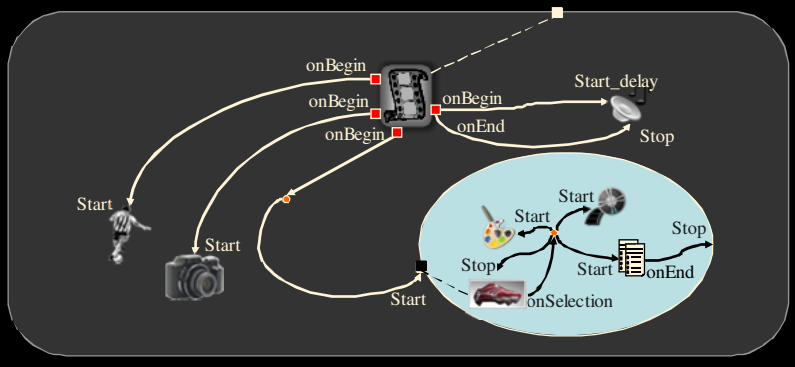
Example 13, 14



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Embedded NCL Media Objects

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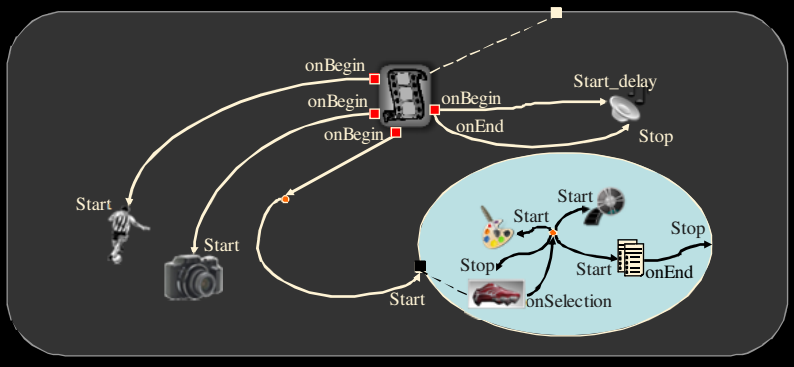
Example 15 (embedded)



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Interfaces

- <area id="a1" label="internal body port">
- <property name= "internal body port">

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Multiple Exhibition Devices

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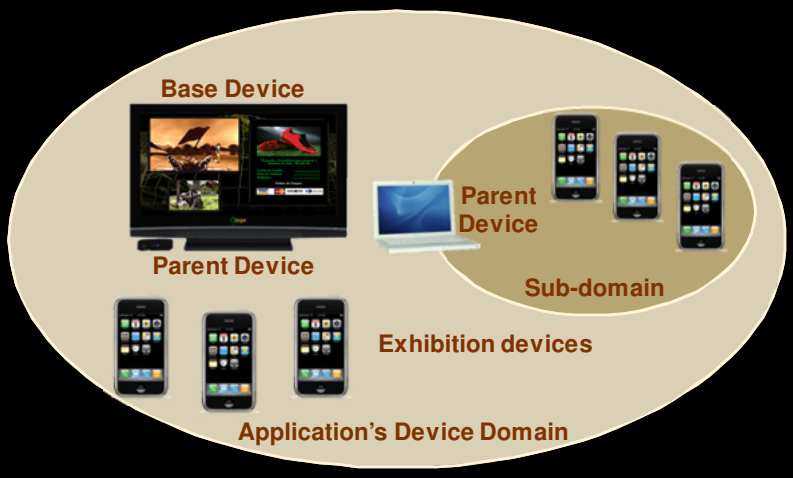
Hierarchical Device Control Model



NCL applications refer to devices by means of classes

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NCL Device Classes

- Number of device classes is unlimited
- But any device class must fall into one of two available types: active or passive.
  - An active device class groups devices able to run some media players and play media delivered by a parent device.
  - A passive device class groups devices not required to run media players, but at least able to display raw video and/or audio streams provided by a parent device.

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NCL Device Classes

- An exhibition device can join as many classes as it wants, simultaneously.
- Joining to a class is a task to the middleware and its tools, not to the application.
- The hierarchy is a tree. In a application domain:
  - A device cannot be a descendant of itself.
  - A device in a class can only exhibit media coming from its respective parent device
  - The Base device is the root

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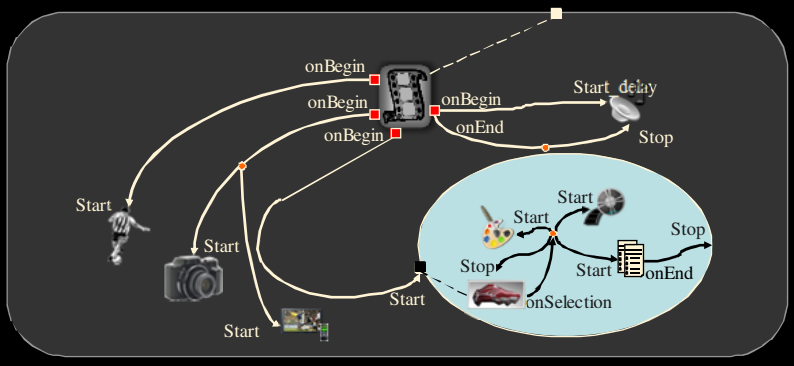
Example 16



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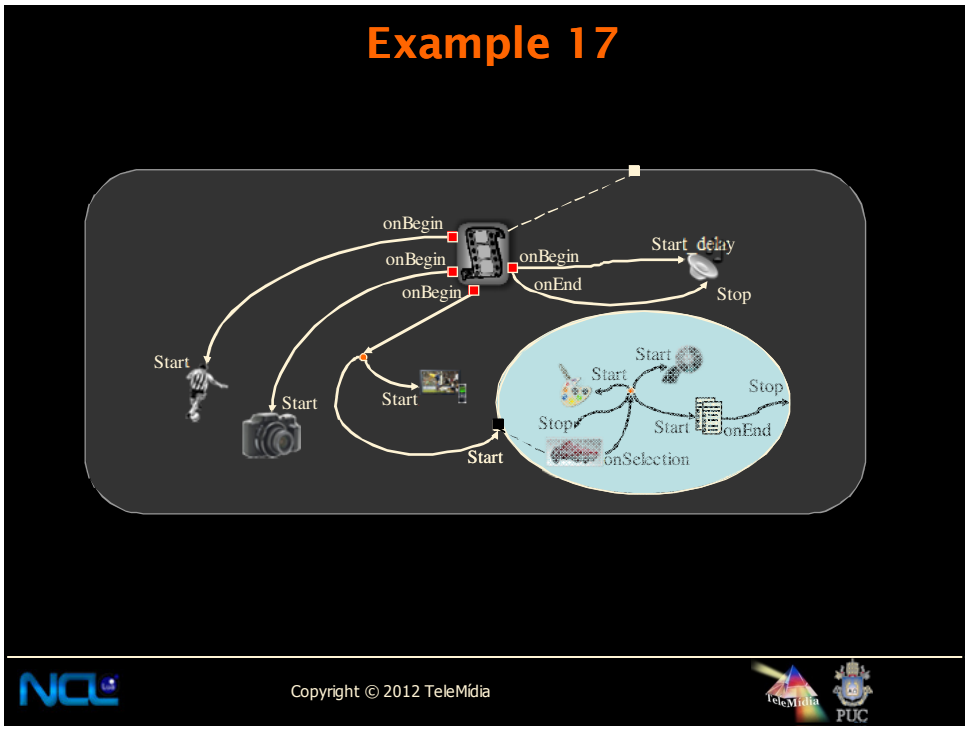

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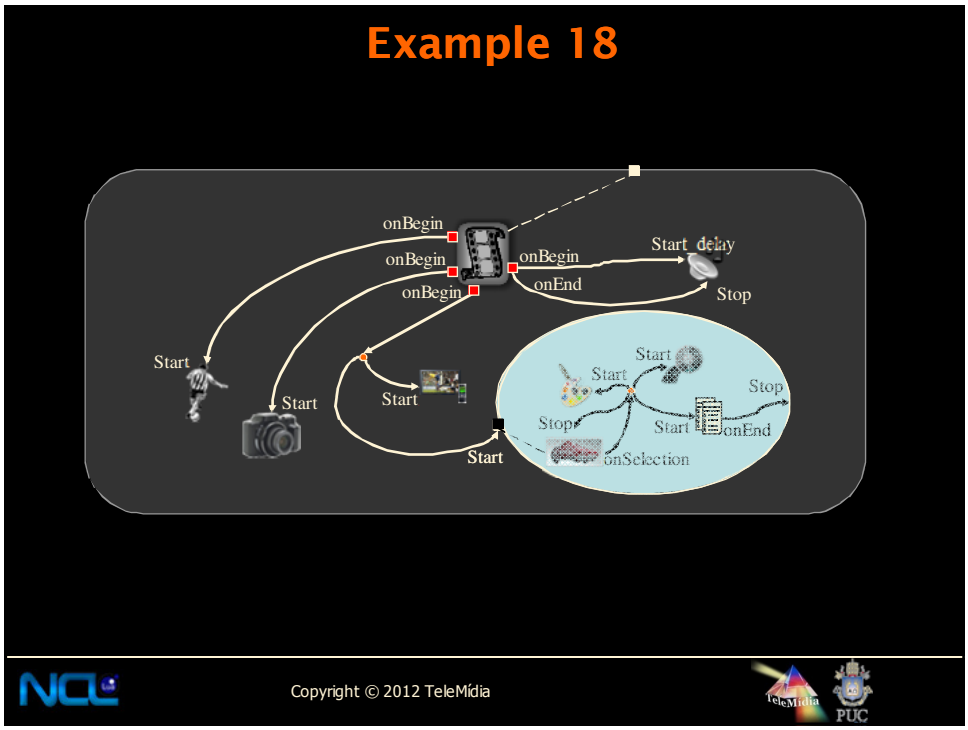
Example 18
onBegin
onBegin
onBegin
onBegin
onEnd
Start delay
Stop
Start
Start
Start
Start
Start
Stop
Stop
Start
onEnd
Start
onSelection
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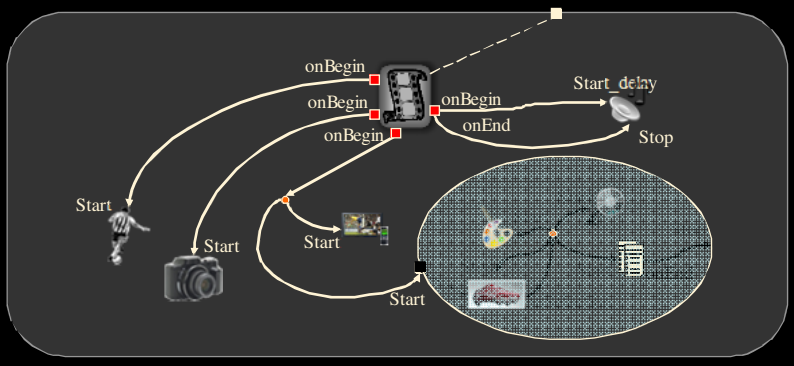
Example 19, 20



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- http://www.softwarepublico.gov.br
- http://www.telemidia.puc-rio.br

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