

# Declarative Programming of TV Applications Using NCL

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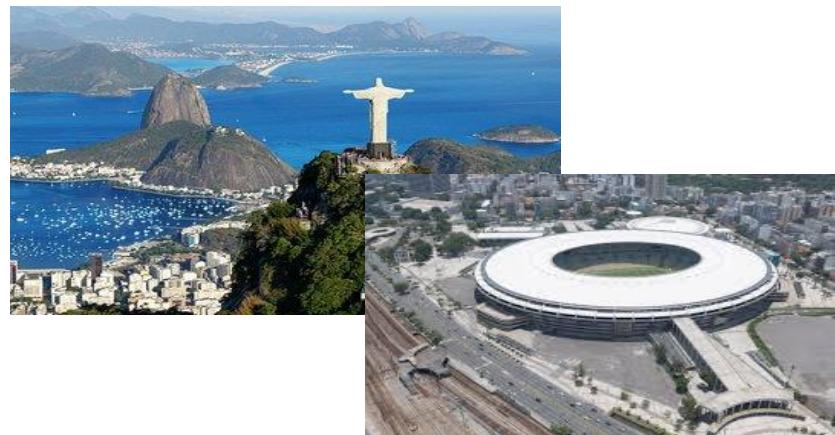
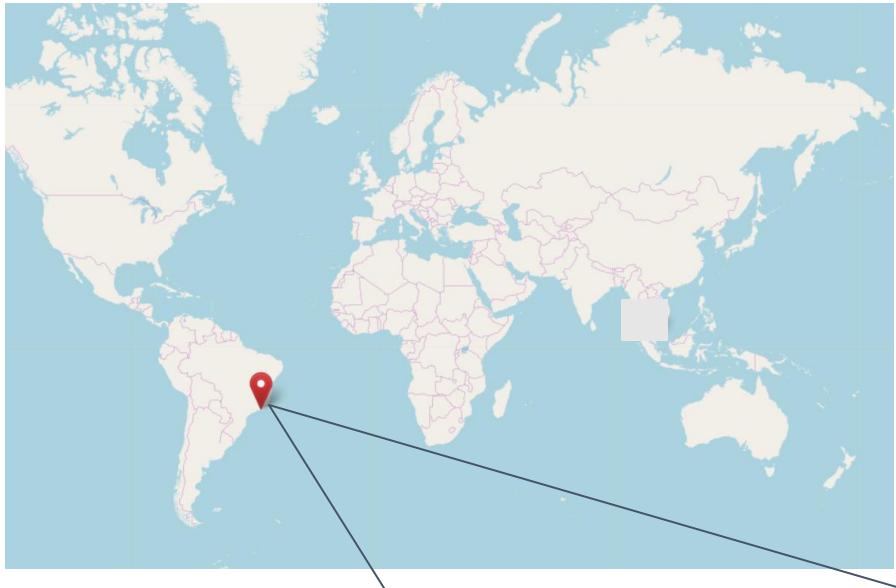


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# Agenda

- 
- About TeleMídia
  - What is NCL?
  - Final Remarks

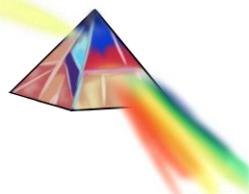
# TeleMídia Lab



## About

- Funded by Luiz Fernando (*in memoriam*)
- Headed by Sergio Colcher
- Interactive Multimedia and Multimedia Analyses (*Machine Learning*)

Pontifical Catholic  
University of Rio de  
Janeiro



# CWI & TeleMídia

## Working Together

### INTRODUCTION

#### Introduction to special issue: Human-centered television – directions in interactive digital television research

[Twitter](#) [LinkedIn](#) [Google Scholar](#) [Facebook](#) [Email](#)

Authors:  Pablo Cesar,  Dick C. A. Bulterman,  Luiz Fernando Gomes Soares [Authors Info & Affiliations](#)

Publication: ACM Transactions on Multimedia Computing, Communications, and Applications • November 2008 • Article No.: 24 • <https://doi.org/10.1145/1412196.1412197>

[Open Access](#) | Published: 08 May 2009

Document engineering approaches toward scalable and structured multimedia, web and printable documents

[Maria da Graça Pimentel](#), [Dick C. A. Bulterman](#)  & [Luiz Fernando Gomes Soares](#)

[Multimedia Tools and Applications](#) 43, 195–202(2009) | [Cite this article](#)

1006 Accesses | 0 Altmetric | [Metrics](#)

## Two Declarative Multimedia Approaches



- XML-based
  - Layout control
  - Media Sync by composition sync-arcs
- XML-based
  - Layout control
  - Media Sync by event-based relationships



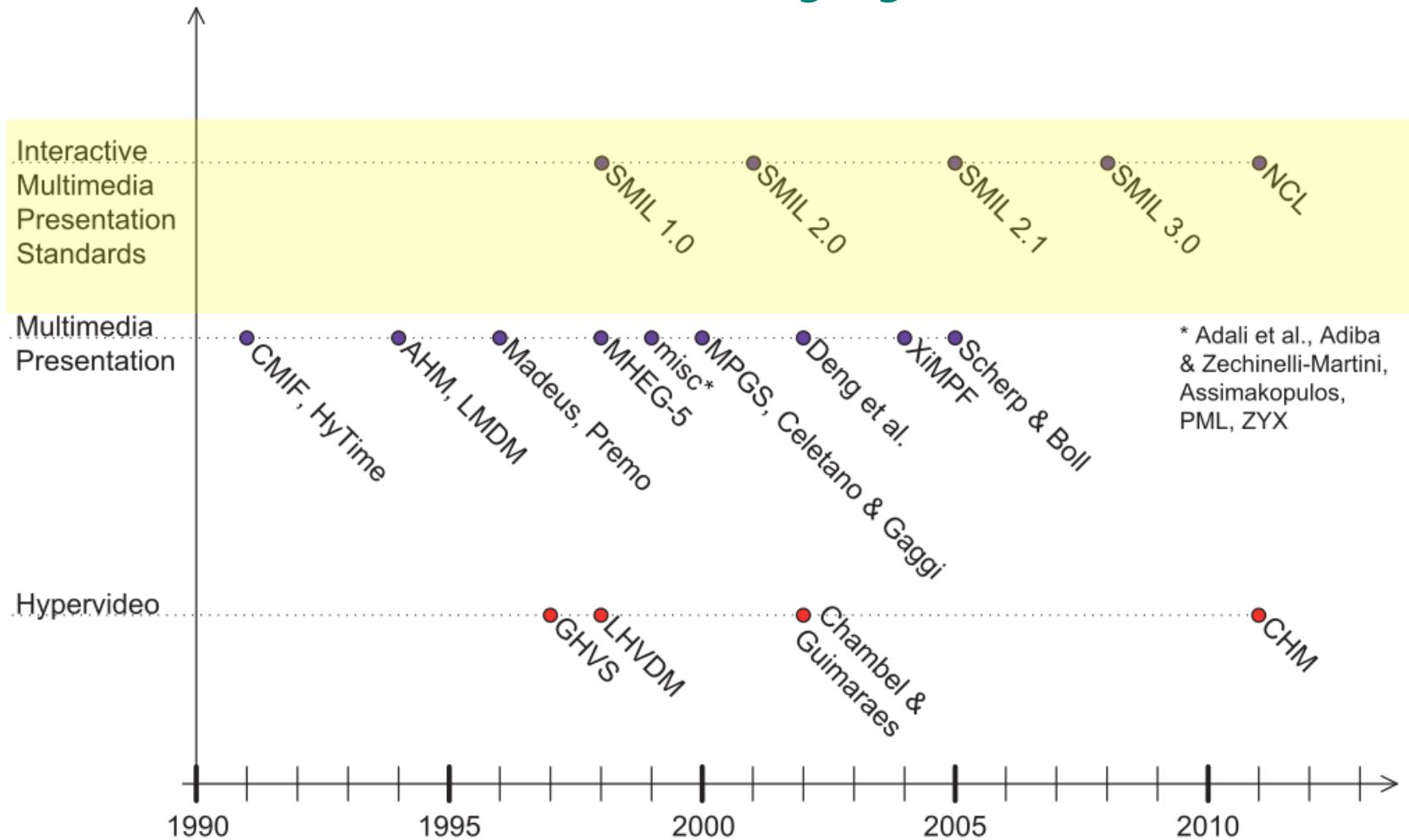
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# What is NCL?



# What is NCL?

NCL stands for Nested Context Language



- Meixner, B. 2017. **Hypervideos and Interactive Multimedia Presentations.** *ACM Computing Surveys 50, 1 (Mar. 2017), 9:1–9:34.*

# NCL Examples



## Standard, royalty-free and opensource

Brazilian standard for Terrestrial DTV (2007)

- Adopted by 14 countries
- Currently installed in more than 50 millions devices (TVs, set-top boxes, smartphones, etc.) in Brazil

• ITU standards for IPTV (2009)

- ITU-T SG16 - IPTV Multimedia
- ITU-R SG6 - Broadcasting Service
- ITU-T SG9 - Broadband Cable and Television



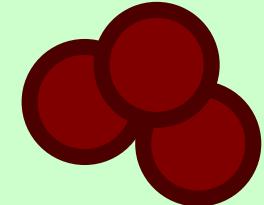
The screenshot shows the SIGMM website homepage. At the top, there is a navigation bar with links: Home, Chair's Message, Administrative Reports, Editorial Board, SIGMM Executive Committee, SIGMM Membership, and About us. Below the navigation bar, there is a sidebar titled "Sections" with links: Awards, Journals, Records, SIGMM Conferences, and Request new password. The main content area is titled "Open Source Projects" and contains a message: "Submitted by editor6 on April 6, 2011 - 04:04". It says, "This section lists multimedia open source projects. Feel free to contribute to this list!" Below this, there is a list of projects:

- [Advonet](#): aims at providing a model and a format to share annotations about digital video documents
- [Ginga](#): the middleware of the Japanese-Brazilian Digital TV System (ISDB-TB) and ITU-T Recommendation for IPTV services. Ginga is made up by a set of standardized technologies and Brazilian innovations that make it the most advanced middleware specification
- [GoalBit](#): a free open source video streaming platform capable of distributing high bandwidth live video content to everyone preserving its quality
- [Golden Retriever](#): is a light-weight but complete framework for implementing CBIR (Content Based Image Retrieval) methods
- [GPAC](#): an Open Source multimedia framework for research and academic purposes. The project covers different aspects of multimedia, with a focus on presentation technologies (graphics, animation and interactivity)
- [GpuCV](#): is an open-source GPU-accelerated image processing and Computer Vision library

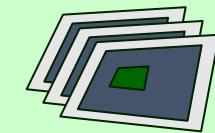
The last two items in the list are highlighted with a red border.

# NCL elements

what? **<media>**



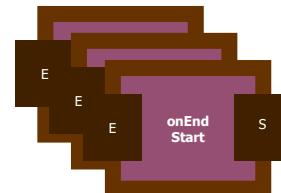
where? **<region>**



how? **<descriptor>**

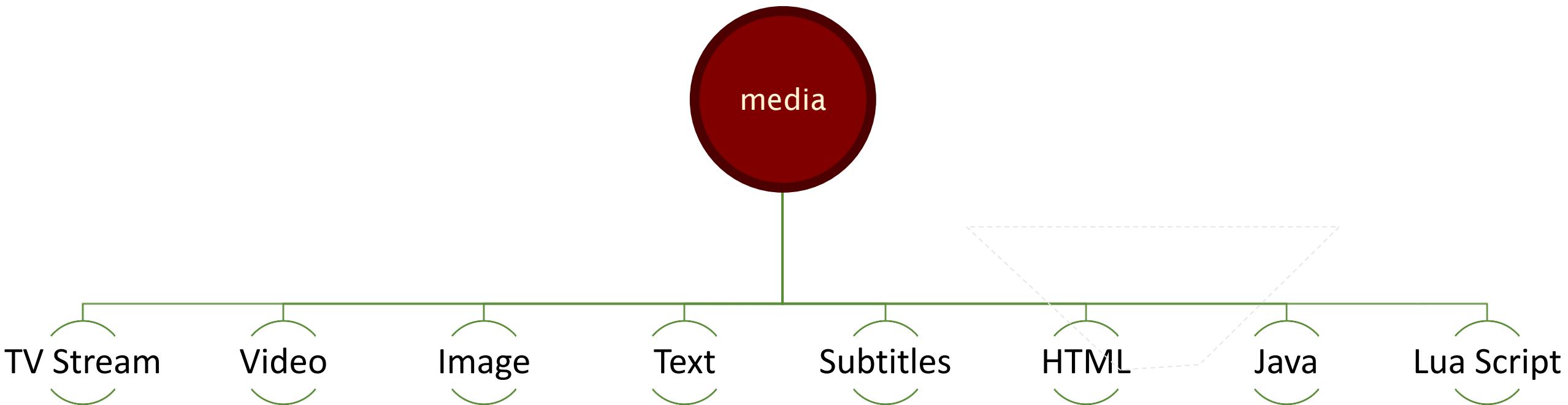


when? **<link>**



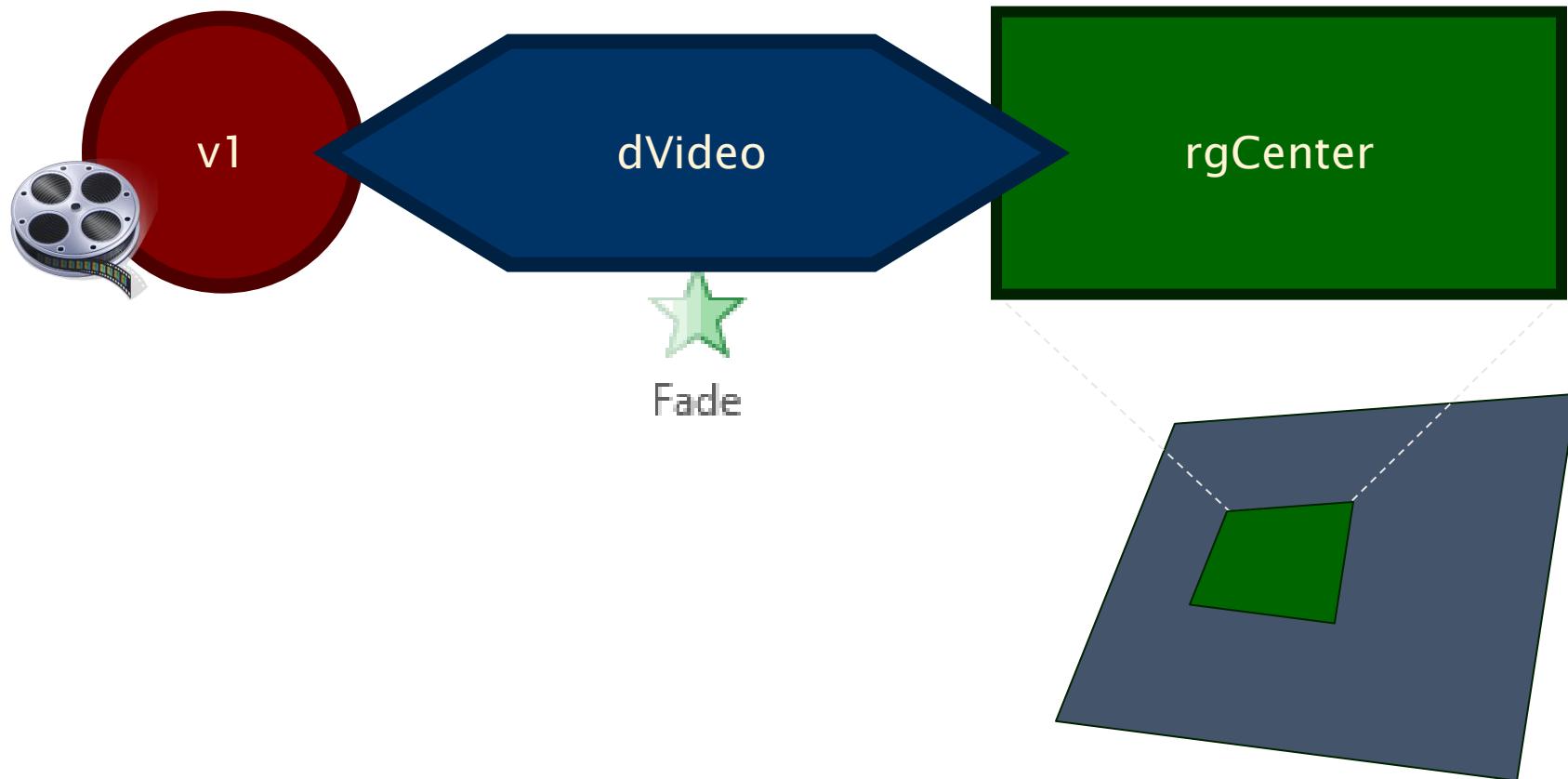
# NCL <media> (1/3)

**Content agnostic Node**



# NCL <media> (2/3)

Uses <descriptor> and <region>



# NCL <media> (3/3)

```
<ncl>
  <head>
    <regionBase>
      <region id="rgCenter" left="25%" top="25%" width="50%" /> regions – where?
    </regionBase>
    <descriptorBase>
      <descriptor id="dVideo" region="rgCenter"
        transIn="fade" /> descriptors – how?
    </descriptorBase>
  </head>
  <body>
    <port id="entry" component="v1" />
    <media id="v1" descriptor="dVideo" src="v1.mp4" /> <media>– what?
  </body>
</ncl>
```



# NCL <link> (1/4)

Causal Relationship among Nodes

C

Condition

A

Action



# NCL <link> (2/4)

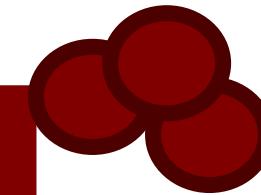
```
<ncl>  
  ...  
  <port id="entry" component="video1" />
```

```
  <media id="video1" descriptor="d1" src="v1.mp4" />  
  <media id="audio1" src="a1.mp3" />  
  <media id="img1" src="img1.png" />
```

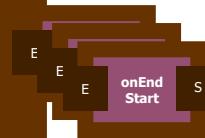
```
  <link xconnector="onEndStart">  
    <bind role="onEnd" component="video1" />  
    <bind role="start" component="audio1" />  
  </link>  
  <link xconnector="onEndStart">  
    <bind role="onEnd" component="audio1" />  
    <bind role="start" component="img1" />  
  </link>
```

```
<ncl>
```

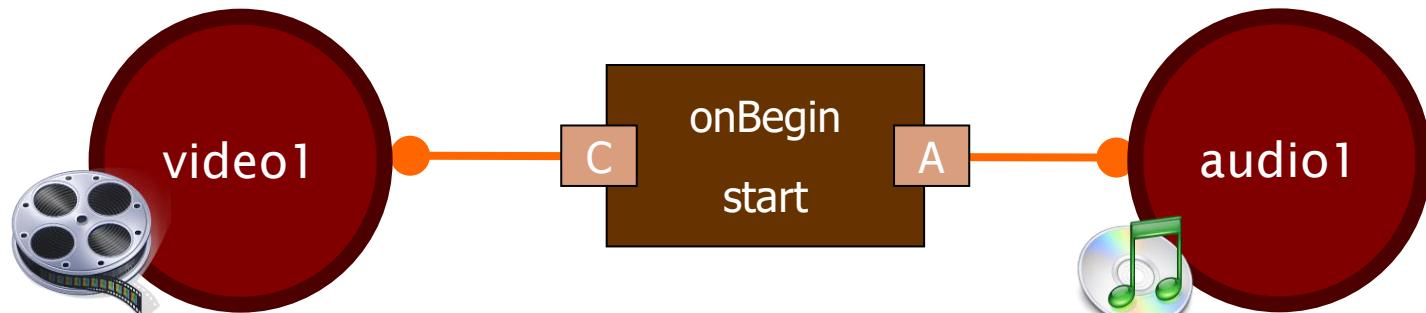
<media> – *what?*



links  
(condition/actions)  
- *when?*



# NCL <link>(3/4): over <media> anchors



**onBegin video1 at 0s**

```
<media id="video1" descriptor="d1" src="v1.mp4" />
</media>
<media id="audio1" src="a1.mp3" />
<link xconnector="onBeginStart">
  <bind role="onBegin" component="video1"/>
  <bind role="start" component="audio1" />
</link>
```

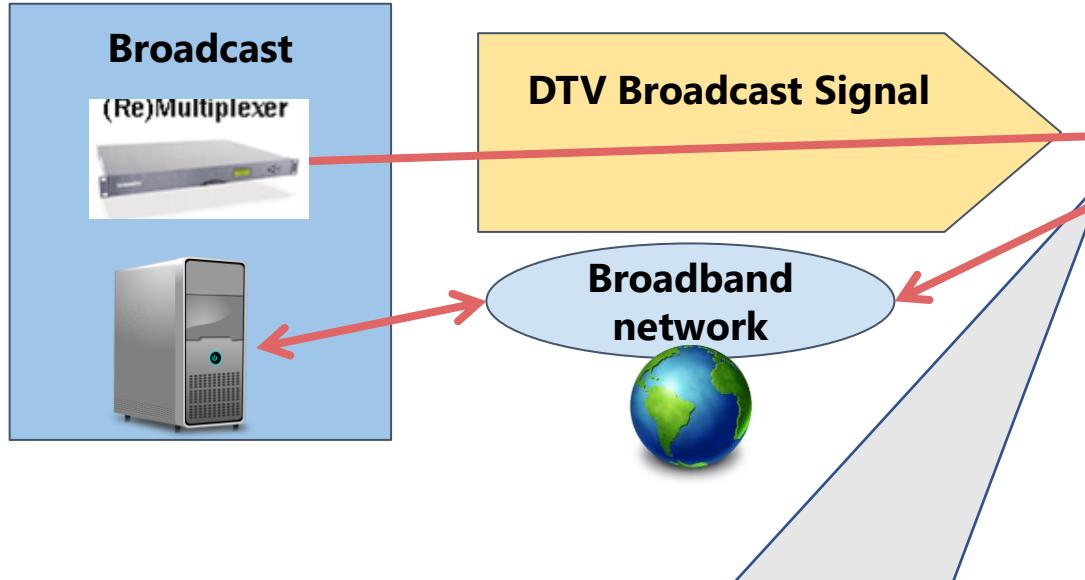
**C** Condition    **A** Action



**onBegin video1 at "ad" period**

```
<media id="video1" descriptor="d1" src="v1.mp4" />
  <area id="ad" begin="3s" end="10s" >
</media>
<media id="audio1" src="a1.mp3" />
<link xconnector="onBeginStart">
  <bind role="onBegin" component="video1"
    interface="ad" />
  <bind " role="start" component="audio1"/>
</link>
```

# NCL <link>(4/4): over <media> anchors



**onBegin video1 at "ad" period**

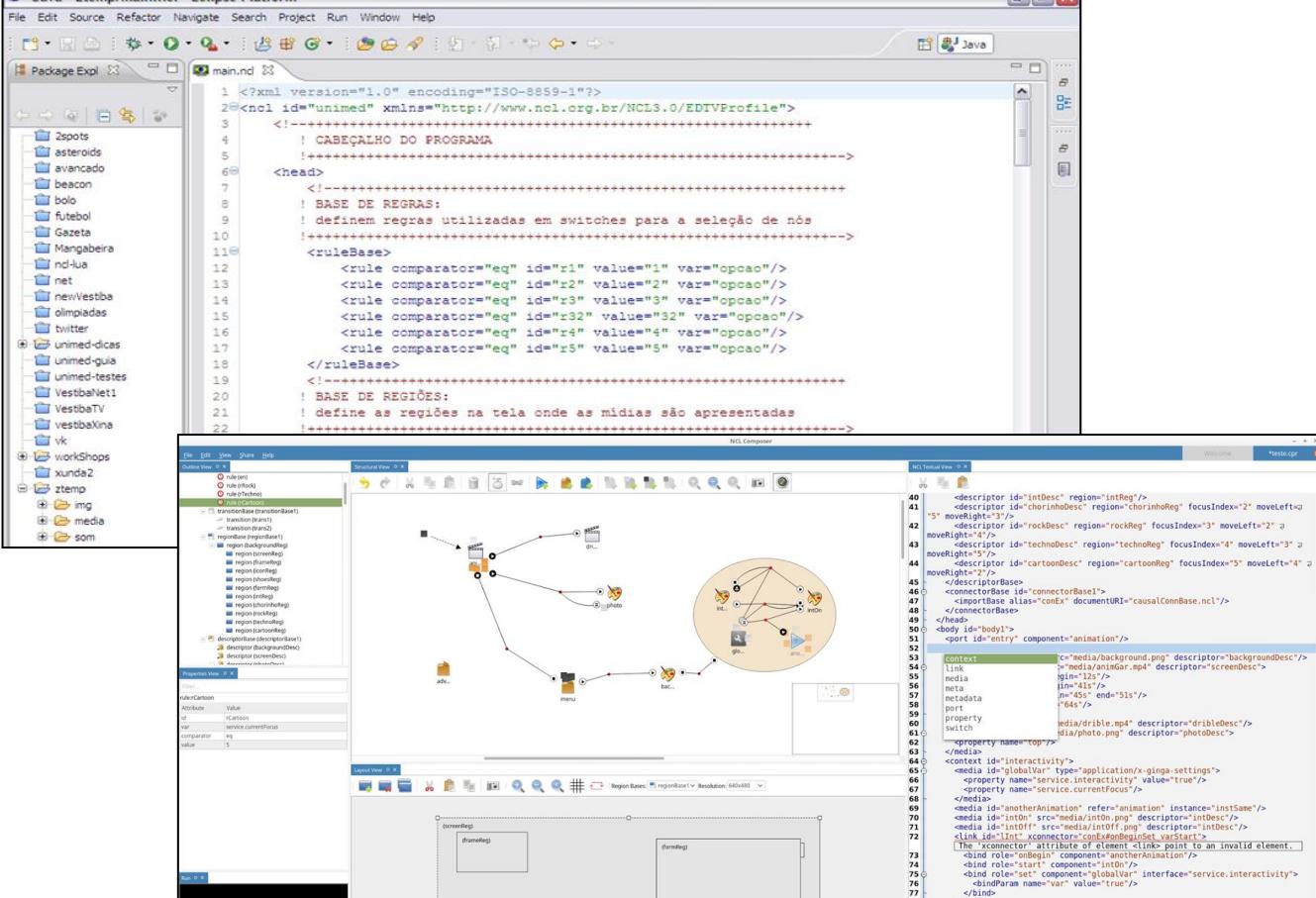
```
nclEditingCommand  
addInterface (  
...  
'video1',  
'<area id="ad" begin="now">'  
)
```

```
<media id="video1" descriptor="d1" src="v1.mp4" />  
<area id="ad" begin="now">  
</media>  
<link xconnector="onBeginStart">  
<bind role="onBegin" component="video1"  
interface="ad" />  
<bind " role="start" component="audio1"/>  
</link>
```

# NCL Authoring (1/2)

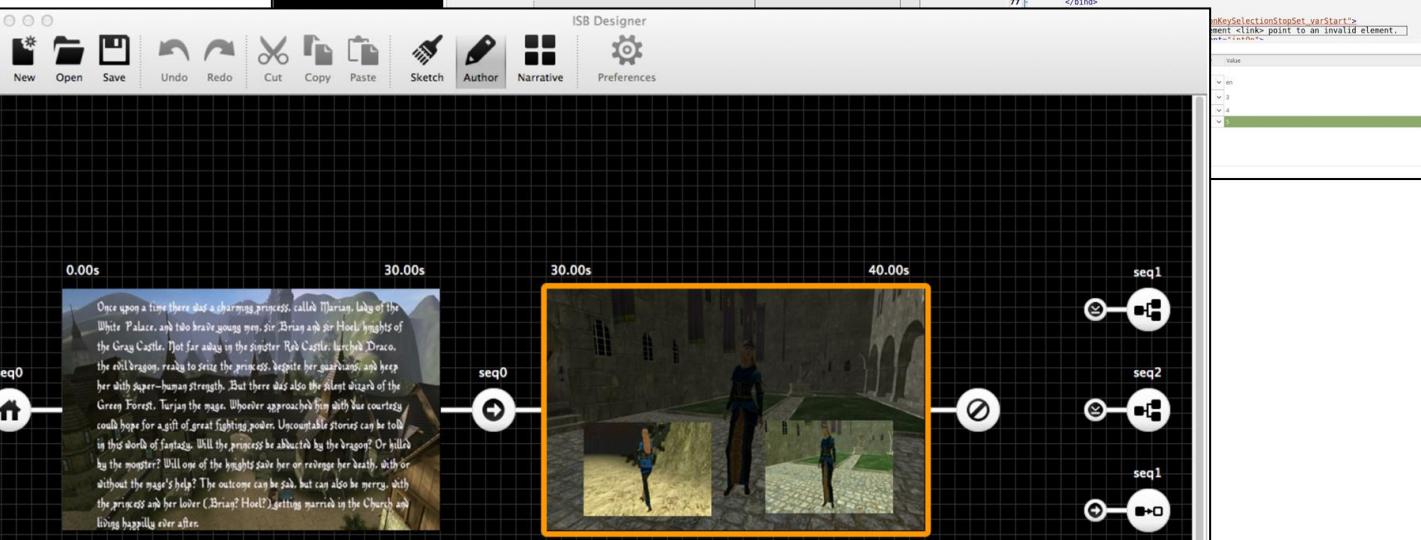
# TeleMídia Programmer Tools

- Textual Tool -- NCL Eclipse)
  - Visual Tool -- NCL Composer
    - Visual structure of NCL <link>s
    - Visual Layout of <region>s



# TeleMídia Non-Programmer tool

- ISB Designer
    - Story Board Metaphor for Hyper videos navigation



# Final Remarks



# NCL VS HTML (SmartTV)

## NCL-enabled receivers are cheap

- Receptors distributed for poor families
- Focus on social impact
  - Government social application (information jobs, health, funding)



## NCL-enabled receivers are lightweight

- Set-Top-Box
- Mobile Phones
- Portable receives



# Other Scenarios

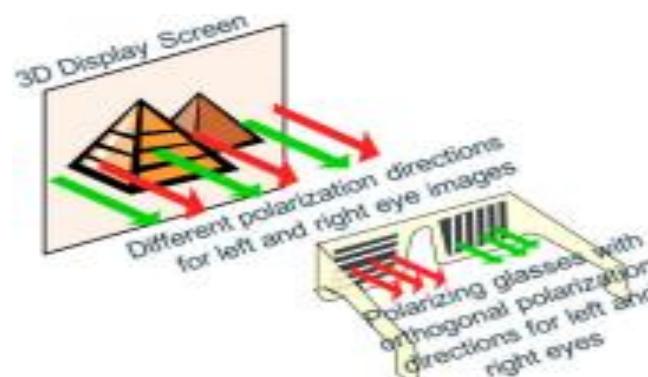


## Second Screen devices

```
<region device="systemScreen(2)">
```

## Stereoscopy

```
<media id="v1" src="video.mp4">  
<media id="left" src="mirror://v1">
```



## Multi-sensorial

```
<media id="video" ... >  
<area id="wind" begin="10s"/>  
<area id="light" begin="30s"/>  
<area id="smell" begin="70s"/>  
</media>  
<media id="wind" ... >  
<media id="light" ... >  
<media id="smell" ... >
```

# Thank you!

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