Brazilian Terrestrial Digital System

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Brazilian Terrestrial Digital TV System
Agenda

- SBTVD Reference Model
- Middleware Design Issues
  - Ginga Architecture
    - Common Core
    - Ginga-J
    - Ginga-NCL
      - NCL
      - Lua
  - Management issues
Brazilian Terrestrial Digital TV System
SBTVD
Reference Model
SBTVD-T Reference Model

- MPEG-4 HE-AAC@L4
- H.264 HP@L4.0
- MPEG-2 System
- BST-OFDM

- MPEG-4 HE-AAC@L3
- H.264 BP@L1.3

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SBTVD-T Reference Model

- MPEG - 4 HE-AAC@L4
- H.264 HP@L4.0
- MPEG-2 System
- BST-OFDM
- MPEG - 4 HE-AAC@L3
- H.264 BP@L1.3

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SBTVD-T Reference Model

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SBTVD-T Reference Model

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Demodulator
Dec. do Canal
Demux.
Dec. Áudio
Dec. Vídeo
CPUMemória
RF
IR CR
Video out
Audio
Surround
Audio out
RF out

Ginga - NCL
Ginga - J
Bridge

Apl 1 Apl 2 Xlet1 ... Apl n

OS

RF in

Apl 2

Apl n

API SO

Video out

Ginga - NCL

Ginga - J

Bridge

Apl 1

Apl n

OS

RF in

Apl 2

Apl n

API SO

Video out

Ginga - NCL

Ginga - J

Bridge

Apl 1

Apl n

OS

RF in

Apl 2

Apl n

API SO

Video out

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Ginga - J

Bridge

Apl 1

Apl n

OS

RF in

Apl 2

Apl n

API SO

Video out
Design Issues
Social Inclusion

Households: 54,61 millions

- Television: 95.7%
- Radio: 91.6%
- Mobile phones: 61.2%
- Fixed line telephone: 54.0%
- Computer: 22.1%
- Internet access (including through mobile): 21.0%
- Internet access (Computer): 16.9%
- Cable TV: 5.6%

91.12% (D, E classes)
~3.0% (D, E classes)
~0.3% (D, E classes)
Inclusion Applications

- T - Government
- T - Health
- T - Learning
- Etc.

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Non-Linear TV Programs

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Non-Linear TV Programs

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Middleware Requirements

- Synchronization support
  - Video based applications (structure-based synchronization)
  - Return channel provisioning

- Support to Multiple devices
Soccer game on a TV
Soccer game on multiple devices
Middleware Requirements

- Synchronization support
  - Video based applications (structure-based synchronization)
  - Return channel provisioning

- Support to Multiple devices

- Support for content and presentation adaptability

- Support for live editing
Ginga Architecture
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Middleware

- Sintonizador
- Filtro de Seções
- Processador de Fluxos de Dados
- Persistência
- Exibidores de Mídias (JPEG, MPEG2, MPEG4, MP3, TXT, GIF, HTML-based, etc)

- Declarative Environment (Ginga-NCL)
- Imperative Environment (Ginga-J)
- Bridge

- Operating System
- Ginga – Common Core
- Ginga – Specific Service
- JVM
- Declarative Environment
- Imperative Environment
- Bridge

- Operating System
- Ginga – Common Core
- Ginga – Specific Service
- JVM

- Declarative Environment (Ginga-NCL)
- Imperative Environment (Ginga-J)
- Bridge
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Ginga-NCL
NCL – Nested Context Language

- Synchronization support
  - Video based applications (structure-based synchronization)
  - Return channel provisioning

- Support to Multiple devices

- Support for content and presentation adaptability

- Support for live editing

- NCL is free software
Declarative Languages

- A declarative language should also include support for objects that contain imperative code.

- NCL allows:
  - HTML application with ECMAScript code
  - *NCLet* (imperative object with Java XLet code)
  - *NCLua* objects (imperative object with LUA code)
Why Lua?

✓ Lua is Simple and Powerful
✓ Lua is Portable
✓ Lua is Embeddable
✓ Lua is Fast
✓ Lua is Robust
✓ Lua is Free Software
JavaScript SpiderMonkey = 936 Kbytes
Lua = 120 Kbytes
LuaJIT = 150 Kbytes
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Some Games Using Lua

- Far Cry
- Warcraft
- Homeworld 2
- Impossible Creatures
- Grim Fandango
- Monkey Island
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Ginga Architecture

Operating System

Ginga – Common Core

- Playes’ API
  - User Interface
    - Media Players (JPEG, MPEG2, MPEG4, MP3, TXT, GIF, HTML-based etc.)
  - Update Manager
    - Graphic Manager
      - Application Trigger
      - Persistency
      - Data Stream Processor
      - Section Filter
      - Tunner
    - Main A/V Adapter

Conditional Access
  - Return Channel
    - Context Manager
      - Main A/V Adapter

- Media Players
  - JPEG, MPEG2, MPEG4, MP3, TXT, GIF, HTML-based etc.
Management Issues
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- Demodulador
- Dec. do Canal
- Demux.
- Dec. Áudio
- Dec. Vídeo
- CPUMemória
- VC
- RF
- IR CR
- Video out
- Audio
- Surround
- Audio out
- RF out
- Rede
- Rede Externa
- API SO
- MPEG TS
- PUSH
- Internet
- PULL
- SBTVD
- Video
- Data
- Audio
- Video out
- Data
- Audio
- Video out
Temporal Synchronization

- Hard synchronization
  - Temporal graph
    - Carousel management
      - Seamless switch: video quality X data bandwidth
    - Interactive channel management: resource reservation in advance
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Demodulador
Decod. do Canal
Demux.
Dec. Áudio
Dec. Vídeo
CPUMemória
VC
RF
IR CR
Video out
Audio
Surround
Audio out
RF out
Rede
Externa
API SD
MPEG TS
PUSH
PULL
Internet
SBTVD
Audio
Video
Data
Rede
Externa
Audio
Video
Data
API SD
Memória
Dec. Video
Dec. Audio
Video out
Audio Surround
PUSH
MPEG TS
PULL
Temporal Synchronization

- Hard synchronization
  - Temporal graph
    - Carousel management
    - Seamless switch: video quality x data bandwidth
    - Interactive channel management: resource reservation in advance

- Soft synchronization
  - Viewer interaction
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Adaptability

Operating System

Ginga – Common Core

Conditional Access

Return Channel

Context Manager

Playes’ API

User Interface

Media Players (JPEG, MPEG2, MPEG4, MP3, TXT, GIF, HTML-based etc.)

Update Manager

Graphic Manager

Application Trigger

Persistency

Data Stream Processor

Section Filter

Tunner

Main A/V Adapter

Persistency
Software Update

Operating System

Ginga – Common Core

- Playes’ API
  - User Interface
  - Media Players (JPEG, MPEG2, MPEG4, MP3, TXT, GIF, HTML-based etc.)
  - Update Manager

- Graphic Manager
  - Application Trigger
  - Persistency
  - Data Stream Processor
  - Section Filter
  - Tunner

Main A/V Adapter
Management Issues

- Synchronization
  - Resource reservation

- Adaptability

- Software update

- Security and Conditional Access
Digital TV only if with Ginga

- http://www.ncl.org.br (additional information about Ginga-NCL)
- http://www.ginga.org.br (Ginga portal)
- http://www.softwarepublico.gov.br (for Ginga-NCL downloads)
- http://www.abnt.org.br/m3.asp?cod_pagina=1249 (for the recommendations)

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