Graphics Architecture for Non-Desktop Devices: Studying Digital Television Receivers

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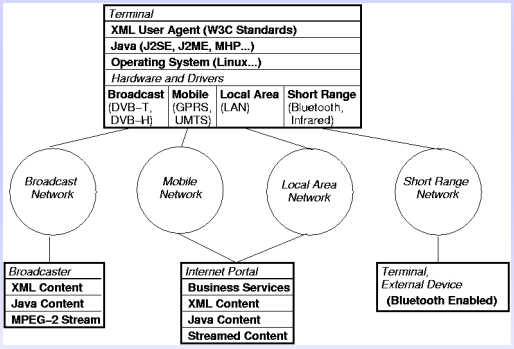
Graphics Architecture for Non-Desktop Devices:
Studying Digital Television Receivers – Pablo Cesar

Outline

- Introduction
  - Multimedia Terminals Chaos
  - Digital Television
- Graphics Architecture
  - From Windows to Scene Based Graphics Architectures
- Reference Implementation
  - Overview
  - Architecture
  - Screenshots
- Conclusions
- Video Demo (2:30 min)

Introduction



- Variety of multimedia devices
  - Desktop (PCs)
  - Non-desktop (STB)
- Number of networks
  - Broadcast
  - Mobile
- Diversity of Content
  - MPEG-2
  - Java
  - XML based

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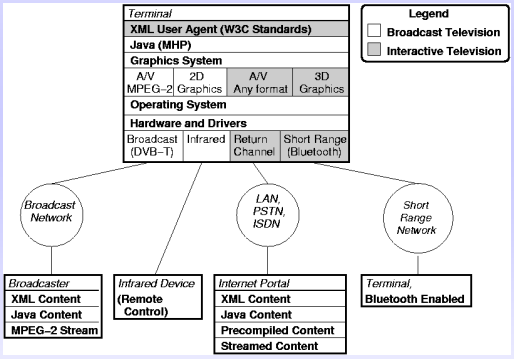
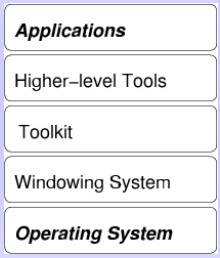
Introduction
Digital Television

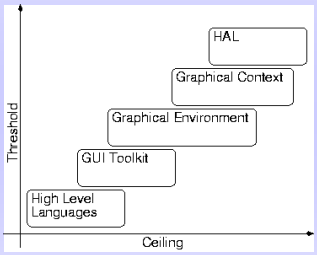


- Digital TV receivers today
  - Starting to show some technological maturity
- Digital TV receivers tomorrow
  - Evolution, so different configurations depending on the targeted group
  - Broadcast
    - Only uses broadcast network
  - Interactive
    - Uses, as well, interaction channel

Graphics Architecture

- Lack of pointing device
- Screen composed of multimedia objects
- Seamless integration of video, 2D and 3D objects
- Solutions such as X-Windows are too big
- A layered architecture, so developers can implement at any level





- HAL: an unified way to access hardware (hardware acceleration)
- Graphical Context: cross-platform abstraction of the rendering region
- Graphical Environment: means to control different contexts
- GUI Toolkit: ”ready-made” user interface widgets
- HLL: to develop simple services

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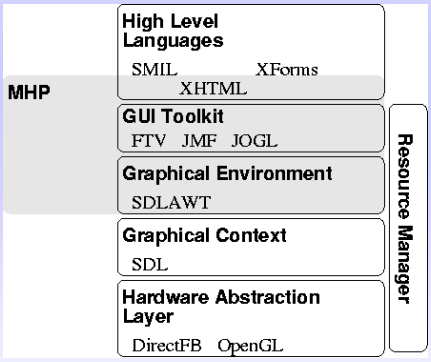
Reference Implementation
Ubik Overview

- Configurable, open, and extensible digital television receiver prototype (linux based platform)
- Platform that allows to study the evolution of receivers
- Goals
  - DVB-T: basic A/V support (MPEG-2) and video player
  - 3D graphics support: based on OpenGL
  - Java support: applications such as Teletext or Navigator
  - XML support: internet convergence (X-smiles)
- Output (2004)
  - Two journal papers
  - One conference paper
  - One doctoral dissertation
  - Collaboration with OpenMHP open source project

Reference Implementation
Ubik Architecture



- DVB-T reception and visualisation of the A/V stream
- Linux (Gentoo distribution)
- HAL: DirectFB and OpenGL
- Resource Manager: to control the different processes
- Graphical Context: SDL
- Graphical Environment: SDLAWT (java.awt)
- GUI Toolkit
  - FTV: 2D widgets
  - JMF: other video than A/V
  - Java OpenGL: 3D Graphics
- HLL: X-smiles (XHTML, SMIL, XForms)

Reference Implementation
Hardware Abstraction Layer Screenshots

- Example composition of scenes:
  - 3D graphics object
  - A/V Stream
- Performance
  - Around 60 FPS

Reference Implementation
Graphical Context Screenshots

- Example native 3D Graphics:
  - Some games downloaded from a portal
  - Default STB's games

Reference Implementation
Graphical Environment Screenshots

- Profile:
  - Broadcast Television
  - Java application
- Target:
  - Procedural language applications
- Languages:
  - DVB-J
- Interaction:
  - Colour Buttons
  - HAVi Widgets
- Multimedia Objects:
  - Images/Text
  - Animations
  - Video/audio

Reference Implementation
High Level Languages Screenshots (1/2)

- Profile:
  - Interactive Access
  - XML based document
- Target:
  - Information Services (limited interaction)
  - Internet Convergence
- Languages:
  - XHTML 1.1 & CSS
- Interaction:
  - Navigation (links)
- Multimedia Objects:
  - Images
  - Text

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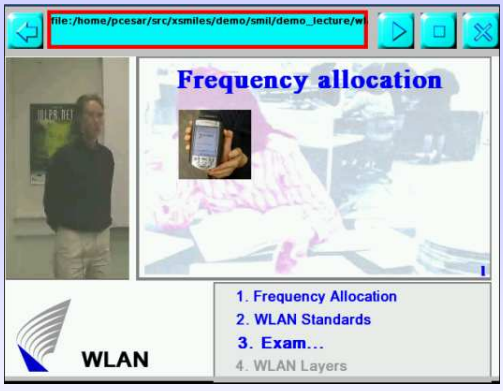
Reference Implementation
High Level Languages Screenshots (2/2)



- Profile:
  - Internet Access / High End
  - XML based application
- Target:
  - Complex Applications (interactive)
  - Temporal dimension
- Languages:
  - SMIL + XForms
  - XHTML 2.0 +Timesheets
- Interaction:
  - Navigation (links)
  - Buttons/Selections...
- Multimedia Objects:
  - Images/Text
  - Video/Audio

Conclusion

- Reference implementation as a working framework to continue research
- Possible extensions/modifications to MHP
  - 3D Graphics Java package
  - Declarative Internet Access Profile: DVB-HTML is not that successful
- More attractive environment
  - 3D graphics in the lowest levels (game console convergence?)
  - Video and audio player?

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Video Demo:
http://www.tml.hut.fi/~pcesar/ubik.AVI

Thank you !!

Questions, Comments ??