

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

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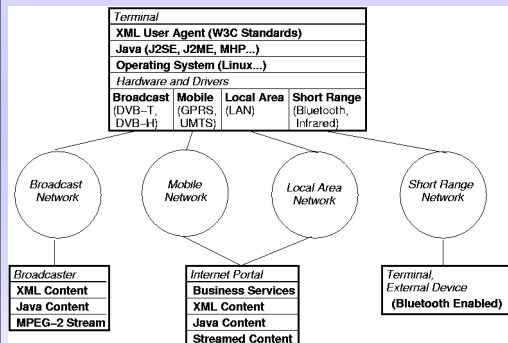
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Outline

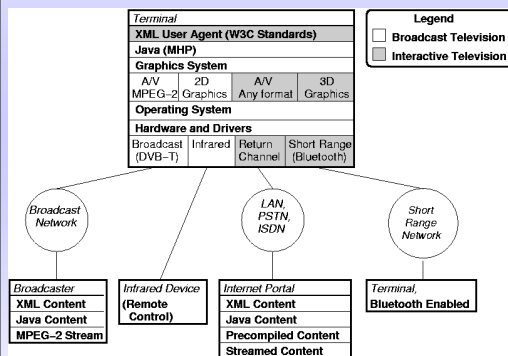
- Introduction
 - Multimedia Terminals Chaos
 - Digital Television
- Graphics Architecture
 - From Windows to Scene Based Graphics Architectures
- Reference Implementation
 - Overview
 - Architecture
 - Screenshots
- Conclusions
- Video Demo (2:30 min)

Introduction



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

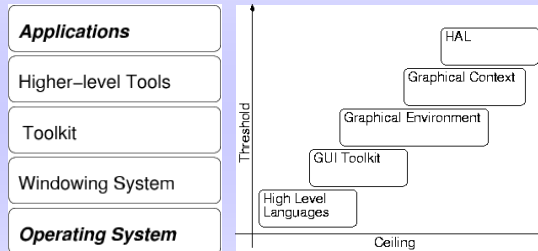
Introduction Digital Television



- 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

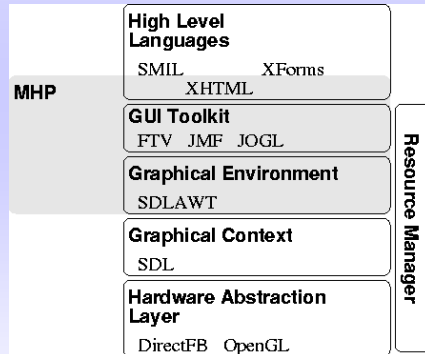


- HAL: an unified way to access hardware (hardware acceleration)
- Graphical Context: cross-platform abstraction of the rendering region
- Graphical Environment: means to control different contexts
- GUI Toolkit: "ready-made" user interface widgets
- HLL: to develop simple services

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

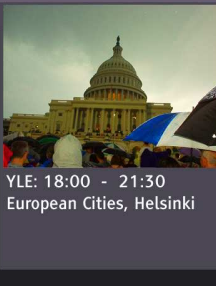


Reference Implementation Graphical Environment Screenshots

Super Teletext

MAIN INDEX

- News
- Weather
- TV Guide
- Finance
- Shopping
- Documentaries
- Travel
- Film



● GOTO ● BACK ● HOME ● HELP

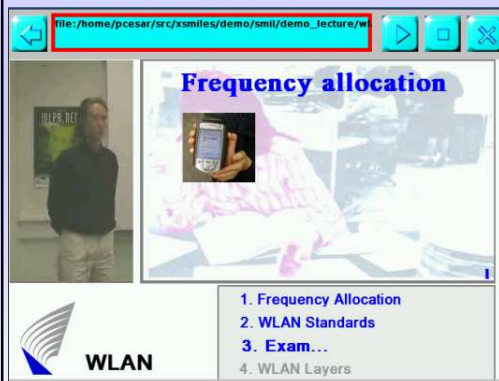
- Profile:
 - Broadcast Television
 - Java application
- Target:
 - Procedural language applications
- Languages:
 - DVB-J
- Interaction:
 - Colour Buttons
 - HAVi Widgets
- Multimedia Objects:
 - Images/Text
 - Animations
 - Video/audio

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

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?

Video Demo:

<http://www.tml.hut.fi/~pcesar/ubik.AVI>

Thank you !!

Questions, Comments ??