TELECOMMUNICATIONS SOFTWARE AND MULTIMEDIA LABORATORY

Graphics Architecture for Multimedia Non-Desktop Devices: a study of digital television receivers

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Non-desktop devices are evolving into advanced interactive multimedia terminals, generating a new set of requirements for their user interface software architecture. Thus, traditional approaches used in desktop computers have to be reconsidered. The thesis proposes a new graphics architecture model. Moreover, it presents the experiences of applying it for the design and development of a configurable digital television receiver.

Starting Assumptions

1) In the future, a number of multimedia terminals will have access through a number of networks to a variety of content and services

2) "User Interfaces are breaking out of the desktop", thus traditional graphics architecture model has to be reconsidereded

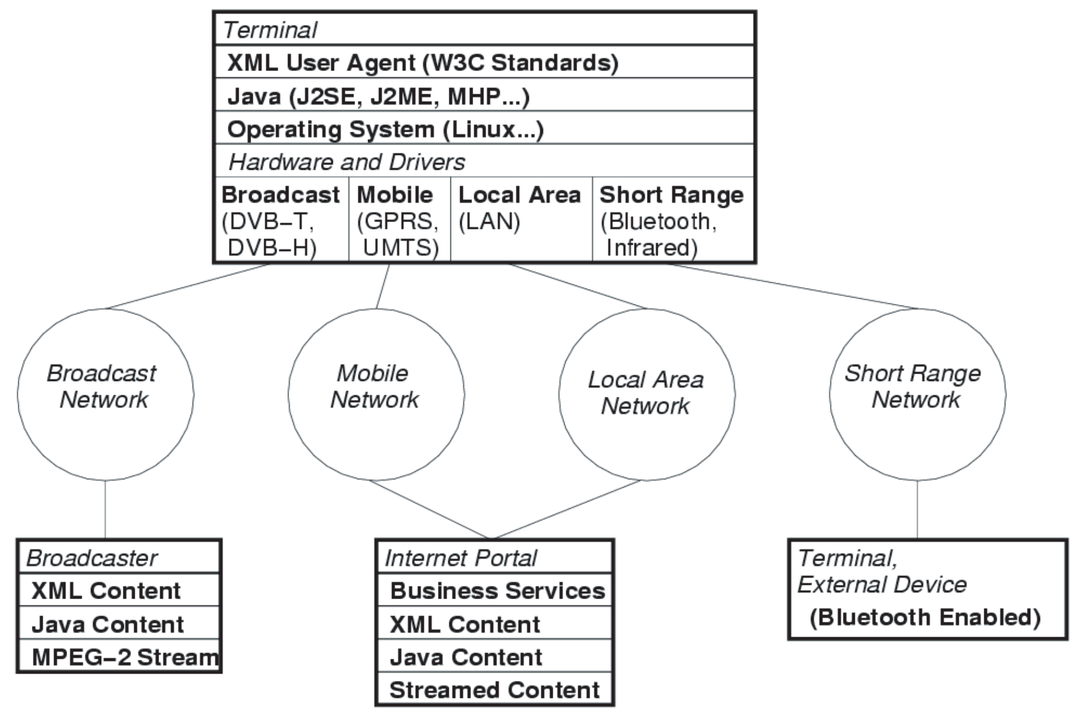

Figure 1. Device Chaos at the Turn of the Century.

Requirements for multimedia non-desktop devices:

* **Lack of input pointing device**
* **Seameless integration of video, 2D, and 3D graphics**
* **Scene metaphor**
* **Low memory footprint**
* **Support for several programming levels: Java, XML**

Digital Television

Digital Television receivers are studied as an example of non-desktop devices. They are starting to show a technological maturity level, but in the future they will evolve, so different configurations will be available.

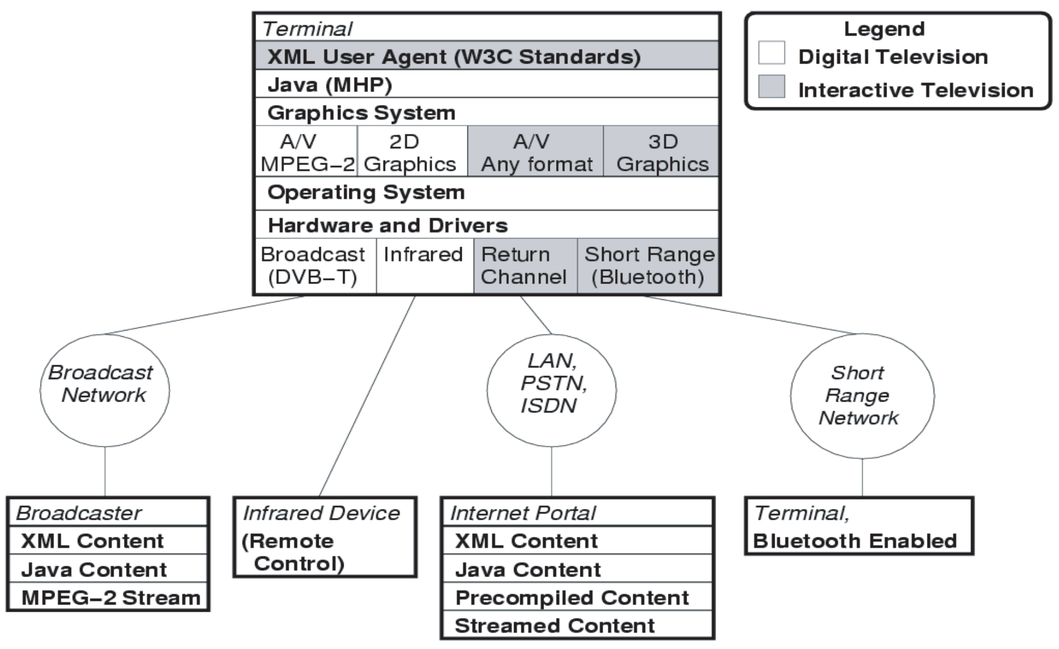

Figure 2: Configurations of Digital Television Receivers.

Proposed Graphics Model

Taking into account all the mentioned requirements of non-desktop devices, we propose a new graphics architecture model composed of five thin layers:

* **Hardware Abstraction Layer (HAL)**: provides a unified way to access hardware (e.g., hardware acceleration)
* **Graphical context**: a cross platform abstraction of the rendering region, which provides native graphics primitives
* **Graphical Environment**: provides the means to control different graphical contexts
* **GUI toolkit**: a set of "ready-made" user interface widgets
* **High Level Languages (HLL)**: to develop simple services

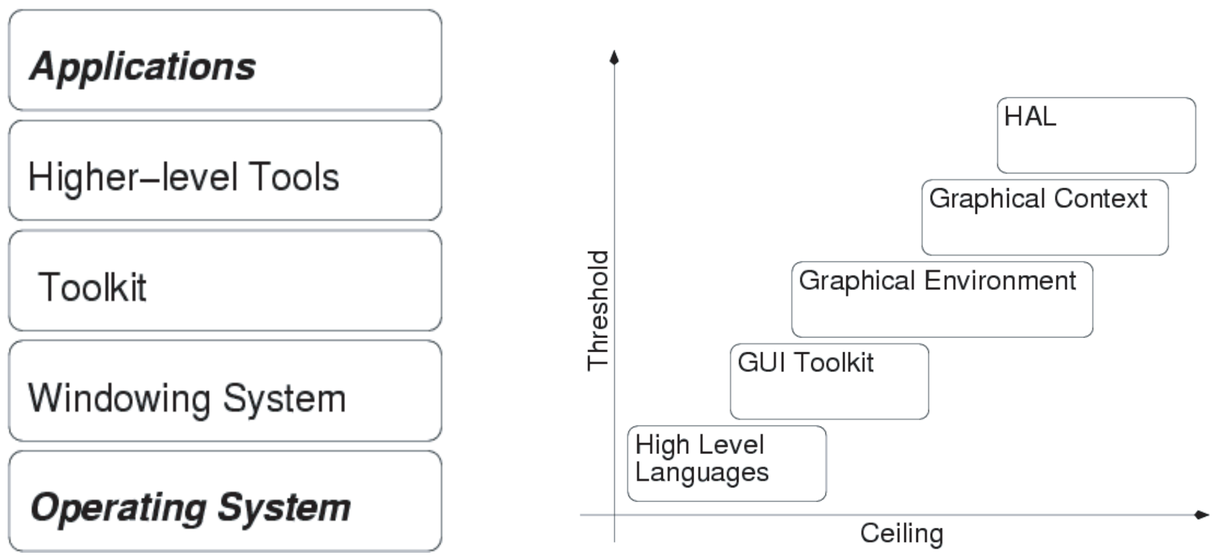

Figure 3. Classic Graphics Architecture (left) and Proposed Graphic Architecture (right)

Reference Implementations

Two implementation threads were followed:

* Otadigi: a real **digital television broadcast system**, operating in Otaniemi area, Helsinki, Finland. The author of the thesis is part of the technical committee. He implemented services and broadcasted them
* Ubik: a **prototype implementation** of a **configurable** digital television receiver

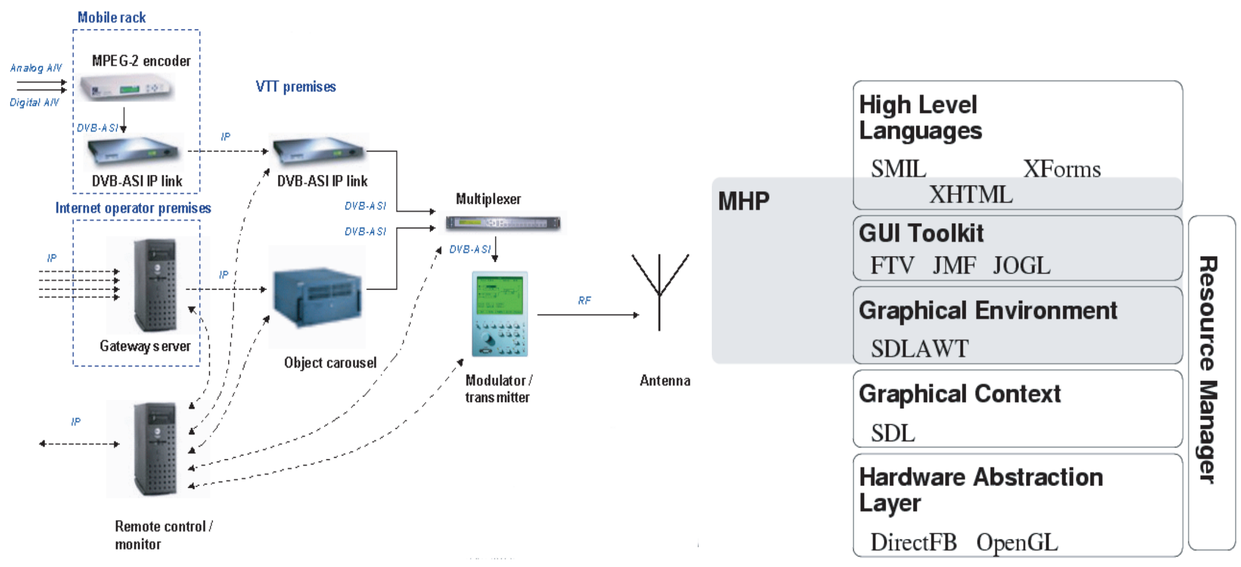

Figure 4. Otadigi Network (left) and Ubik (right).

Contribution

* Theoretical: looking from a **new perspective**, multimedia capabilities in non-desktop devices, previous research about **user interface software architecture**
* Standardisation: **extensions to MHP standard** such as 3D graphics support in digital television receivers
* Commercial: **new ideas**, tested in reference implementation, to receivers manufacturers such as **game console convergence** and **XML user agent supporting several W3C languages**