WP9 - Validation on Platform

Deliverable D9mm.1 - Multimedia Application Requirements and Platform Analysis

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Visual Tools will develop a digital video viewer for StrongArm based handheld platforms that will be integrated with our range of Digital Video Recorders and Transmitters (DVRT) using Wireless Communications. We will call this application Visual Tools Wireless Viewer, VTWV from now on. It is an application oriented to videosurveillance.

We find very interesting the development of this application since several aspects to be developed within OCERA will be used. Particularly, this application is both, high resource consuming and running on a low performance platform (StrongARM) and thus the Resource Reservation components will be extensely used.

1.3. Motivation

1.3.1. PDA environment

In the last few years we have been witnesses of a rapid development of PDA platforms. The development of more powerful and low consuming CPUs and the integration of peripherals made it possible to have virtually a personal computer on a handheld.

Lots of resources have been dedicated to the development of general purpose Operating Systems for these platforms. In particular, Linux is working, already for a few years, in these platforms; check http://www.handhelds.org to see different platforms and distributions Linux is running on.

1.3.2. Wireless Technology & Multimedia

We have also seen in the last few years an explosion in Wireless technologies. It is now mature and cheap enough to be used in production, though it is not clear which standard, if any, will finally dominate the market.

In what respects multimedia, the 11 Mbps maximum throughput provided by IEEE 802.11b standard should be enough to transmit video streams for videosurveillance, where framerates keep, usually, between 1-2 to 10-16 fps depending on the particular application.

1.3.3. Benefits for Visual Tools

The development of VTWV is also in concordance with the evolution of Visual Tools Digital Video Recorders and Transmitters. Our products are capable to stream video over Ethernet, PSTN, ISDN and GSM but we lack Wireless LAN streaming and this application would be the first steps towards the integration of this technology in our range of products.

But apart from the "completion" of transmission media for our products, we find several interesting scenarios in video surveillance using wireless LAN communications. We could think, for example, of a Security Guard equipped with a PDA and VTWV that is in charge of a big building (museums, etc...) and that is able to see what is happening

when approaching certain area, or we could think of the police using this wireless viewer outside a bank that is being robbed, etc...

Chapter 2. Application Development

2.1. Application Description

We will develop an lightweight X Window application to receive wirelessly and present video streams transmitted by one (or several) Visual Tools DVRT. We will be able to find out which DVRT are present in the LAN and request them to stream video from any of its cameras.

Though Visual Tools' DVRTs are able to stream video over HTTP, making it possible to use a web browser as a client, we will not make use of a web browser for the following reasons:

- Web browsers with the features needed by our DVRT protocols are usually heavy.
- We want to build the application from scratch so we can integrate the OCERA Resource Reservation components in an easy way.
- We want to test other transmission protocols that are not reliable (e.g. UDP) to increase effective bandwidth, reduce latency, etc...

2.2. Application Requirements

This is the basic list of requirements the VTWV must fulfill:

- **Hardware Platforms**

  This application will be developed for a Compaq iPAQ which comes with an Intel StrongArm CPU. This will be the basic target platform. However we will also develop the application so it works on x86 platforms.

  The Compaq iPAQ will be equipped with a Compact Flash 802.11b Wireless LAN Card.

- **Integration with Visual Tools DVRT products**

  As stated before, this video viewer will be integrated with Visual Tools DVRTs. It will be able to find DVRTs in the LAN, request and receive video from them.

  We will test the software with different network topologies:

  - The basic topology will be a **managed** (also called BSS) wireless LAN were several DVRT are contected (wired) to an Access Point and the iPAQ wirelessly connected to the Access Point

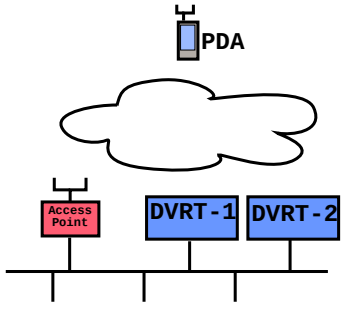

Figure 2-1. Basic Network Topology

- The other topology is also **managed** but this time, at least one DVRT is also connected wirelessly to the Access Point. This way we will test not only the video reception over wireless but also the throughput when transmitting.

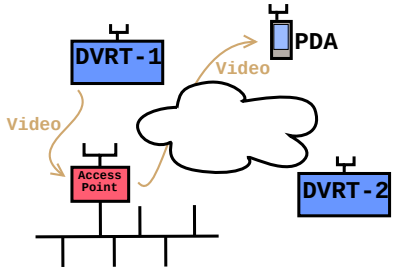

Figure 2-2. Complex Network Topology

- **OCERA Components to be used**

  As we stated in the Multimedia Applications Requirements deliverable, digital video processing is insatiable, in the sense that consumes as much CPU as it si able to. This is particularly important when working with an embedded platform and specially limited resources such as the StrongArm CPU,...

  This environment is clearly appropriate to test OCERA Resource Reservation components. Our application has not Hard Real-Time constraints and thus will not need Hard Real-Time OCERA components.

  In principle, the application will make use of the following components:

  - Scheduler for resource reservation in Linux
  - QoS manager
  - User Library for accessing previous components
  - A series of patches to the RT-Linux/Linux kernel to solve problems with preemption, low-latency and high-resolution timers patches.

Chapter 3. Verification and Measurements

3.1. Verification Process

There are no strict time constraints VTWV must respect. We are not forced to display a specific number of frames per second, nor to do some number of operations in a specific time interval, etc... In fact, the framerate received, aside from the Wireless LAN bandwidth, will depend on the DVRT state at that time (i.e. whether is recording an alarm or is programmed to record 16 fps from a camera, etc..)

That is why we characterize VTWV as a Soft Real-Time application and the reason why we cannot give quantitative measurements that might show up the success of the development.

Nevertheless after the tests we will perform, we will get comprehensive information about iPAQ wireless capabilities and how the use of OCERA components enhance it. In particular, at the end of the project, we will be able to:

- Know the limitations of the platform (StrongArm) processing Digital Video.
- Know the limitations of the media (IEEE 802.11b Wireless LAN) from two points of view:
  - Effective throughput in multimedia content transmission.
  - Effective working range of the Wireless LAN with this hardware (Compact Flash 802.11b Wireless LAN card)

3.2. OCERA achievements

Here we will present the OCERA achievements this application will verify:

- OCERA Framework for Embedded System development.

  We will use the project framework to develop VTWV and deploy it on the target platform (Compaq iPAQ)

- Validation of OCERA in StronArm platform

  One of the target architectures OCERA must work on is the Intel StrongArm chosen for the multimedia application.

- Resource Reservation components for Soft Real-Time applications

  We will make an extensive analysis and use of the resource reservation components and present the results of these tests.

  We will compare the results of running VTWV with and without OCERA Resource Reservation Components.

  We will make a benchmark where different configurations of the Resource Reservation OCERA components will be analyzed and compared