Project acronym: CONCERTO

Project full title: Content and cOntext aware delivery for iNteraCtive multimEdia healthcaRe applications

Grant Agreement no.: 288502

Deliverable 6.4

Demonstrator description and validation plan

Contractual date of delivery to EC	T0+36
Actual date of delivery to EC	24/12/2014
Version number	1.0

Lead Beneficiary	TCS
Participants	Siemens, BME, KU, VTT, UNIPG

Estimated person months:	29
Dissemination Level:	PU
Nature:	R
Total number of pages	60

Keywords list:
Demonstrator, hardware, validation, field trials

Executive Summary

Deliverable D6.4 intends to present the final implementation of the CONCERTO multimedia platform that has been developed during the project in order to demonstrate on a real-time implementation of the CONCERTO solution for different scenarios. The presented platform has been built in coherence with the CONCERTO cross-layer system architecture elaborated in the scope of WP2 and respects the specifications provided in D6.2 "Specification of the demonstrator" [14].
The deliverable presents a full description of the platform, listing the various hardware and software modules integrated and their interfaces. An overview of the demonstrator's functionalities is also included to give the vision of the platform capabilities. The integrated modules and functionalities are the result of the technical activities carried on all along the project and individually validated in the scope of technical work packages. Hence, in this deliverable only a high-level description of the different modules is provided, the full technical details being available in technical work packages' deliverables.

To validate the effectiveness of the CONCERTO solution through the developed platform, three demonstration scenarios, namely Emergency, Ubiquitous Tele-Consultation and 3D medical data storage and encoding, have been defined. These scenarios are based on use cases described in Deliverable D2.1 [9], each covering more than one use case.
A full description of the selected scenarios as well as details on the validation methodology used is provided in this deliverable. The results of the field tests and of the validation phases carried on in collaboration with the doctors of the hospital of Perugia are instead out of the scope of this deliverable and will be presented in the next and last deliverable of the work package: D6.5 "Report on final validation", expected in February 2015.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1 Introduction

The main purpose of the CONCERTO project is to provide the necessary techniques and algorithms to foster the use of ICT and multimedia solutions in the medical domain. The studies carried on in the different technical work packages allowed to identify innovative solutions and approaches to provide a better quality of experience (QoE) to both medical doctors and citizens and a higher efficiency in treating both medical and classic multimedia contents.
The various solutions proposed have been individually validated through analytic analysis and dedicated simulations. The combined performance of different blocks and the full system have then been validated for different use cases and simulation scenarios through CONCERTO system level simulator. These results are provided in Deliverable D6.3 [15].
The final step consists in implementing key components of the CONCERTO solution on hardware to build the CONCERTO multimedia platform which allow validating the interest of CONCERTO through field trials and real time demonstrations.
The specifications of this platform have been provided in Deliverable D6.2 [14]. The objective of this deliverable is to present, on one side, the final developed multimedia platform architecture, including its main components and the key implemented functionalities, on the other side, to describe the selected demonstration scenarios (based on CONCERTO use cases) and the validation strategies adopted.
In the final deliverable of WP6, which will be delivered in February 2015, the validation results will be presented as well as the received feedbacks from end user.

This deliverable is organized as follows: In Section 2 the CONCERTO multimedia platform is presented. This includes a description of the different components of the platform, their interfaces and the main functionalities implemented.
In Section 3 the selected demonstration scenarios are described. Three scenarios have been identified, for each of them the scenario storyline, the related CONCERTO use cases, the validation methodology and the realised and planned field trials are described.
Three annexes are also included in this deliverable providing more details on some of the functionalities integrated.

2 Structure of the CONCERTO multimedia platform

The overall picture of the multimedia platform built to demonstrate CONCERTO concepts is represented in Figure 1.

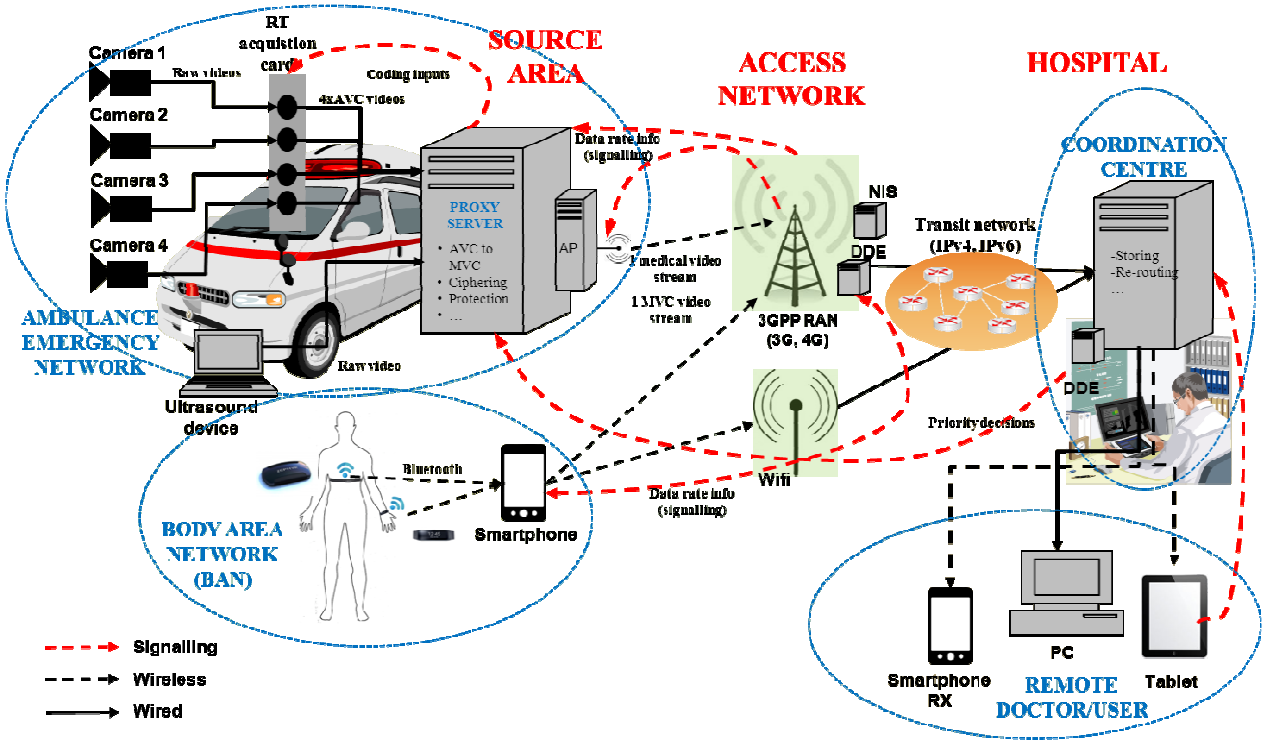

Figure 1: CONCERTO demonstration platform

The demonstration platform has been built in coherence with the CONCERTO system architecture described in Deliverable D2.4 [11], it includes the cross-layer signalling architecture defined in Deliverable D2.3 [10] and implements several techniques and solutions studied all along the project and described in the technical deliverables of WP3, WP4 and WP5.
Following the principle of the CONCERTO solution, the demonstrator has been conceived in a modular way. The different components can be combined or disabled/removed in order to implement different scenarios and to satisfy different requirements.

Three main areas are identified in the demonstration platform:

- Source Area
- Access Network
- Hospital

The **Source Area** represents the source of real-time data that have to be analysed by remote doctors. It is composed by video and data sources (cameras, medical devices, sensors…) and by one or more aggregators (e.g. the ambulance) that are in charge to collect the traffic generated by the different devices and to transmit them to the hospital size.
The different devices can be connected to the aggregator through wired connections or using a local Wi-Fi network.

The **Access Network** is composed by the different Radio Access Networks (RAN) that can be exploited to route the traffic between the Emergency Area and the Hospital. CONCERTO demonstrator can exploit both customized RAN and commercial ones. For the various demonstration scenarios the access networks selected are Wi-Fi and 3GPP RAN, both 3G and 4G. Tests have been carried out using commercial 3G and 4G networks, a customized 3G network (using a proprietary 3G femtocell) and both classic and customized Wi-Fi access points.

The **Hospital Area** represents the place where the traffic is received, stocked and analysed. In addition to represent the receiving and coordinating side in emergency-oriented scenarios (i.e., coordination centre), it also includes the devices on which doctors can access the various medical and environmental videos and data received in real time from a remote location or stored in local databases. These devices can be fix (e.g., PCs) and connected through wired networks or mobile (e.g., smartphones, tablets…) and connected wirelessly.

In the following sections the different hardware and software components, the interfaces and the key functionalities implemented in the CONCERTO multimedia delivery platform are described.

2.1 Components of the platform

2.1.1 Hardware components

2.1.1.1 Source Area

Ambulance Emergency Network

The emergency network built up at the ambulance is set up around five main hardware elements as defined in Figure 2:

- Video cameras;
- Real Time acquisition box (IMP);
- Medical ultrasound device;
- Aggregation PC (Proxy Server);
- An access point (3G/4G).

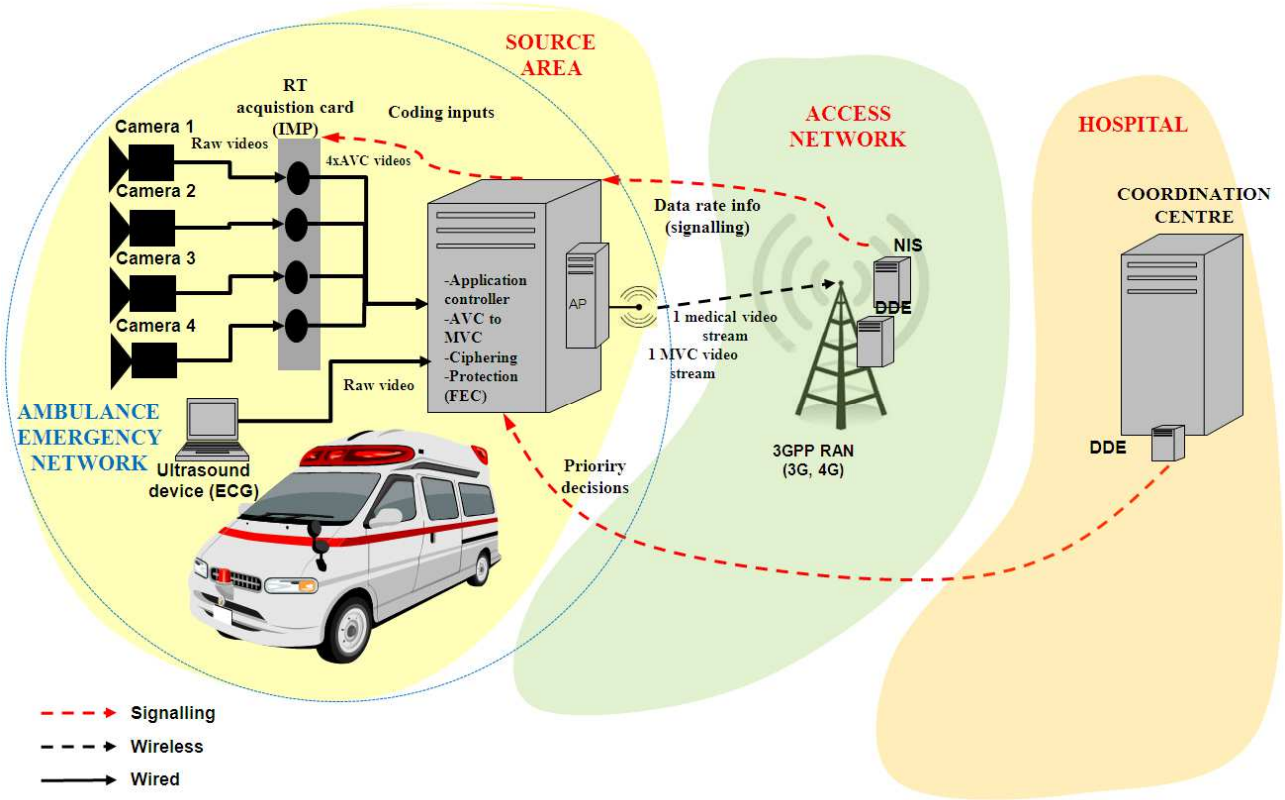

Figure 2: Building blocks and interfaces at Emergency Area

The video cameras (analogue PAL format) can be deployed both inside and outside the ambulance to capture ambient videos from the emergency area.

The cameras are wired connected to a compression server, called IMP box, which can encode in real-time 4 different video sources (see Figure 3). The IMP box transfers one encoded video source per camera in AVC to the Proxy Server. The connection can be wired or wireless through a local wireless network.

Finally, the Proxy Server is connected to an access point who manages the connection to the 3G or 4G RAN.

Figure 3: IMP box

A portable ultrasound device is also available at the ambulance and used to acquire medical ultrasound videos directly in the emergency area. The selected device is the GE-Vivid E, whose characteristics are provided in the table below.

Table 1: Ultrasound device characteristics.

ULTRASOUND EQUIPMENT	ANALOG VIDEO OUT Real-time	DIGITAL PORT No Real-time	WIRELESS CONNECTION	STANDARD IMAGE	RESOLUTION
GE - VIVID E (portatile)	VGA only	N°2 USB	OPTIONAL	DICOM (Standard)	800X600 PIXEL
		Ethernet		RAWDICOM (GE format)	
		LAN wireless		JPEG o SR	
		Bluetooth		MPEGvue	
				AVI	

This device provides a resolution sufficient to doctors to perform preliminary diagnosis and has the advantage to have reduced size (around the dimensions of a standard laptop), as it is visible in Figure 4.

Figure 4: Ultrasound device GE – VIVID E

The medical videos acquired are transferred in real time to the Proxy Server using as exit the VGA port of the ultrasound device. This port is selected since it is the only one which allows real-time transmission of the acquired video. To go from the device to the Proxy Server, two boxes are included to convert the analogue video flow in digital. The TVONE TASK 1T-C2-150 (Figure 5) receives the analogue video through a VGA port and gives back the video still analogue but on a coaxial cable.