



CiViTAS
Cleaner and better transport in cities

ARCHIMEDES

AALBORG • BRIGHTON & HOVE • DONOSTIA - SAN SEBASTIÁN • IASI • MONZA • ÚSTÍ NAD LABEM

IASI

T12.1 Improved Ticketing in Iasi

Iasi

May 2012



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Project no.	TREN/FP7TR/218940 ARCHIMEDES
Project Name	ARCHIMEDES (Achieving Real Change with Innovative Transport Measure Demonstrating Energy Savings)
Start date of the Project	15/09/2008
Duration:	48 months
Measure:	No. 12: Improved Ticketing in Iasi
Task:	No: 2.6 Improved Ticketing
Deliverable:	T12.1 Improved Ticketing in Iasi
Due date of Deliverable:	15 th February 2012
Actual submission date:	25 th May 2012
Dissemination Level	Public
Organisation Responsible	Iasi
Author	Beatrice Fotache
Quality Control	Alan Lewis
Version	1.0
Date last updated	25 th May 2012



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1. Introduction

1.1 Background CIVITAS

CIVITAS - cleaner and better transport in cities - stands for Clty-VITAlity-Sustainability. With the CIVITAS Initiative, the EC aims to generate a decisive breakthrough by supporting and evaluating the implementation of ambitious integrated sustainable urban transport strategies that should make a real difference for the welfare of the European citizen.

CIVITAS I started in early 2002 (within the 5th Framework Research Programme);
CIVITAS II started in early 2005 (within the 6th Framework Research Programme) and
CIVITAS PLUS started in late 2008 (within the 7th Framework Research Programme).

The objective of CIVITAS-Plus is to test and increase the understanding of the frameworks, processes and packaging required to successfully introduce bold, integrated and innovative strategies for clean and sustainable urban transport that address concerns related to energy-efficiency, transport policy and road safety, alternative fuels and the environment.

Within CIVITAS I (2002-2006) there were 19 cities clustered in 4 demonstration projects, within CIVITAS II (2005-2009) 17 cities in 4 demonstration projects, whilst within CIVITAS PLUS (2008-2012) 25 cities in 5 demonstration projects are taking part. These demonstration cities all over Europe are funded by the European Commission.

Objectives:

- to promote and implement sustainable, clean and (energy) efficient urban transport measures
- to implement integrated packages of technology and policy measures in the field of energy and transport in 8 categories of measures
- to build up critical mass and markets for innovation

Horizontal projects support the CIVITAS demonstration projects & cities by :

- Cross-site evaluation and Europe wide dissemination in co-operation with the demonstration projects
- The organisation of the annual meeting of CIVITAS Forum members
- Providing the Secretariat for the Political Advisory Committee (PAC)
- Development of policy recommendations for a long-term multiplier effect of CIVITAS

Key elements of CIVITAS

- CIVITAS is co-ordinated by cities: it is a programme “of cities for cities”
- Cities are in the heart of local public private partnerships
- Political commitment is a basic requirement
- Cities are living ‘Laboratories’ for learning and evaluating

1.2 Background ARCHIMEDES

ARCHIMEDES is an integrating project, bringing together 6 European cities to address problems and opportunities for creating environmentally sustainable, safe and energy efficient transport systems in medium sized urban areas.

The objective of ARCHIMEDES is to introduce innovative, integrated and ambitious strategies for clean, energy-efficient, sustainable urban transport to achieve significant impacts in the policy fields of energy, transport, and environmental sustainability. An ambitious blend of policy tools and measures will increase energy-efficiency in transport, provide safer and more convenient travel for all, using a higher share of clean engine technology and fuels, resulting in an enhanced urban environment (including reduced noise and air pollution). Visible and measurable impacts will result from significantly sized measures in specific innovation areas. Demonstrations of innovative transport technologies, policy measures and partnership working, combined with targeted research, will verify the best frameworks, processes and packaging required to successfully transfer the strategies to other cities.

1.3 Participant Cities

The ARCHIMEDES project focuses on activities in specific innovation areas of each city, known as the ARCHIMEDES corridor or zone (depending on shape and geography). These innovation areas extend to the peri-urban fringe and the administrative boundaries of regional authorities and neighbouring administrations.

The two Learning cities, to which experience and best-practice will be transferred, are Monza (Italy) and Ústí nad Labem (Czech Republic). The strategy for the project is to ensure that the tools and measures developed have the widest application throughout Europe, tested via the Learning Cities' activities and interaction with the Lead City partners.

1.3.1 Leading City Innovation Areas

The four Leading cities in the ARCHIMEDES project are:

- Aalborg (Denmark);
- Brighton & Hove (UK);
- Donostia-San Sebastián (Spain); and
- Iasi (Romania).

Together the Lead Cities in ARCHIMEDES cover different geographic parts of Europe. They have the full support of the relevant political representatives for the project, and are well able to implement the innovative range of demonstration activities.

The Lead Cities are joined in their local projects by a small number of key partners that show a high level of commitment to the project objectives of energy-efficient urban transportation. In all cases the public transport company features as a partner in the proposed project.

2. Iasi

The City of Iasi is located in north-eastern Romania and is the second largest Romanian city, after Bucharest, with a population of 366,000 inhabitants. It is also the centre of a metropolitan area, which occupies a surface of 787.87 square kilometres, encompassing a total population of 398,000 inhabitants.

The city seeks to develop possibilities for habitation, recreation and relaxation for all citizens in the region, business opportunities and provide opportunities for more consistent investments.

The city has five universities with approximately 50,000 students, the second largest in Romania. The universities and their campuses are located in the central and semi-central area of the city. In the same area, there are also a large number of kindergartens, schools and high schools with approximately 10,000 pupils. This creates a large number of routes along the main corridor, served by the public transport service number “8” (Complex Tudor Vladimirescu - Copou) with an approximate length of 10 km. The City of Iasi will implement its integrated measures in this area to be known as the “CIVITAS+ Corridor”.

The city's objectives in CIVITAS - ARCHIMEDES are based on the existing plans related to transport, Local Agenda 21, approved in 2002, and the Sustainable Social-Economic Development Strategy for City of Iasi. The CIVITAS Plus objectives were integrated in the Integrated Urban Development Plan development which was finalized in October 2009.

3. Background to the Deliverable

Before the ARCHIMEDES project, the ticket distribution system in Iasi had 56 selling points, 20 of which also functioned as dispatching centres, mainly placed at the last stops of tram and bus lines.

The modern possibility to purchase travel tickets any time, increasing passengers' comfort, changing their travel behaviour and increasing the number of students and pupils using public transport motivated the decision of installing VTMs (Vending Ticket Machines) in Iasi. The VTM is a ticket vending machine that features innovative detail solutions and modern equipment characteristics.

3.1 Summary Description of the Tasks

Within this task, ARCHIMEDES has contributed to the purchasing and installing of 10 VTM along the CIVITAS corridor.

The VTM is a ticket vending machine that features innovative detail solutions and modern equipment characteristics. VTM systems permit the operation of automatic tickets via a touch screen. The degree of acceptance of currencies is high: coins, notes, chip cards and credit cards can be used. Various settings for data transfer to a centralised system can be designated depending on requirements, e.g. GSM/GPRS/Edge, wireless LAN or ISDN.

4. Improved Ticketing in Iasi

4.1 Description of the work done

Iasi organised a tender procedure for the acquisition of the 10 VTMs (see Figure 1).



Figure 1: Example of a Vending Ticket Machine

They have been installed in the most crowded stops along the CIVITAS + corridor and in a few other stops throughout the city (see Figure 2).

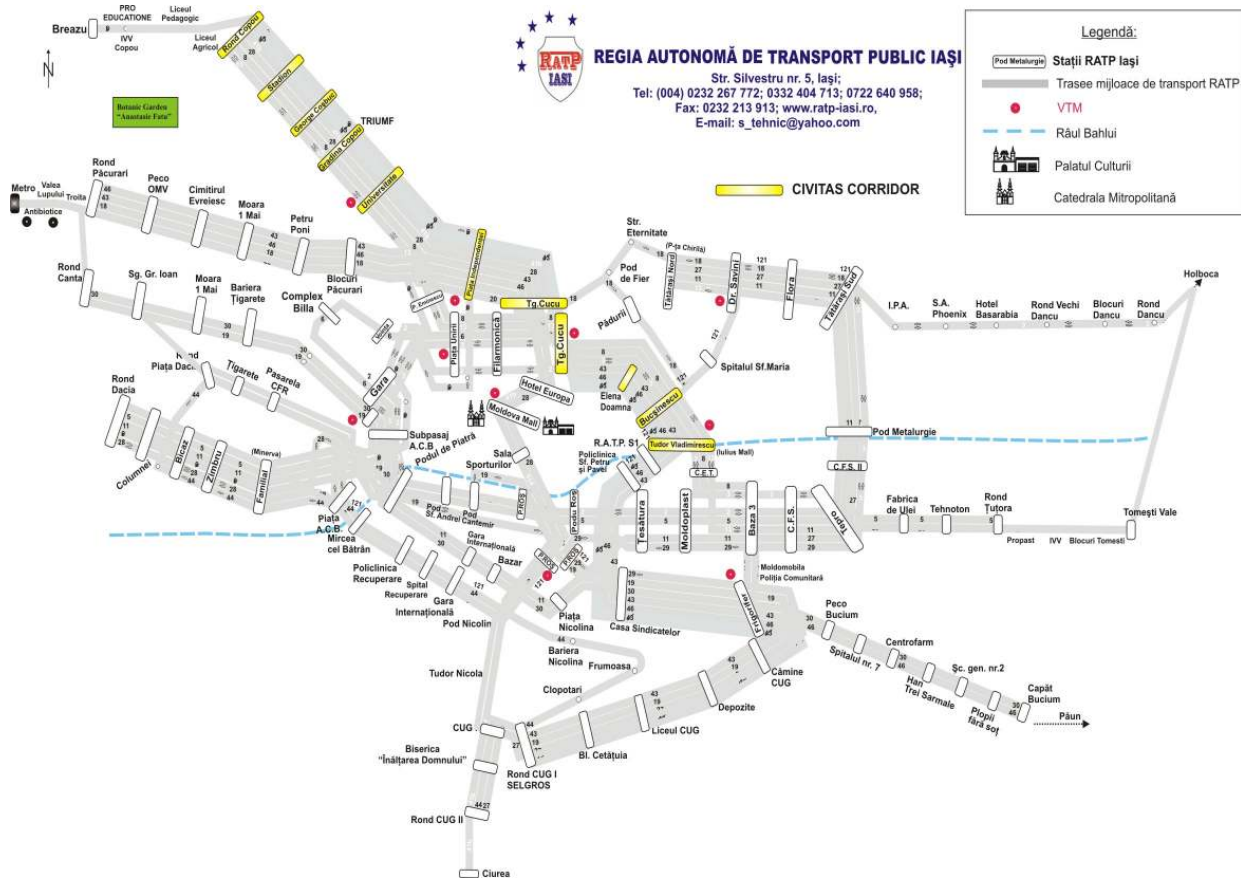


Figure 2: Map showing location of VTMs installed

The experience of the transport company has shown that the demand of tickets at these stops is particularly high both during the opening hours of the kiosk beside which the VTMs have been installed, and after the kiosks are closed. There are very many crowded stops outside the CIVITAS corridor, so that further criteria for choosing the location for the remaining VTMs were necessary. One was the existence of surveillance infrastructure so that the VTMs can be constantly monitored especially until they cease to be perceived as new items (which have been noticed to be particularly prone to vandalism) and the other was a balanced distribution throughout the city.

The VTM system follows a client-server model (See Figure 3).

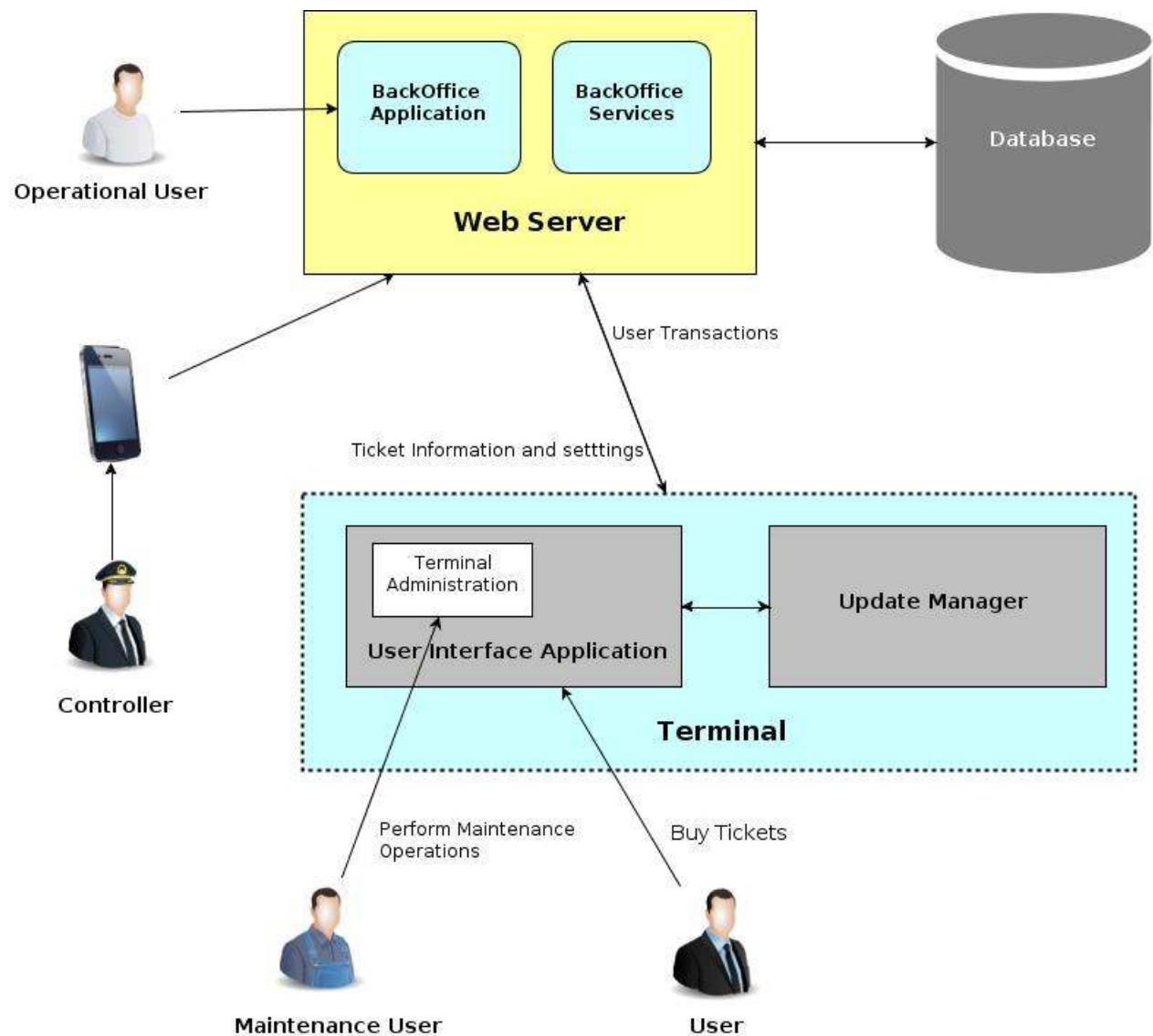


Figure 3: High Level Architecture Diagram

The components of the system that interact are (See Figure 4):

1. User Interface Application – this contains the logic for processing the user input and communicating with the server
2. Update Manager – a Watchdog for the User Interface Application and the Hardware abstraction layer services, who ensures their accurate operation and, if needed, their update.
3. Hardware Abstraction Layer – Local services that ensures the communication between the User Interface Application and the hardware modules (printer, bill acceptor, coin acceptor, coin dispenser)

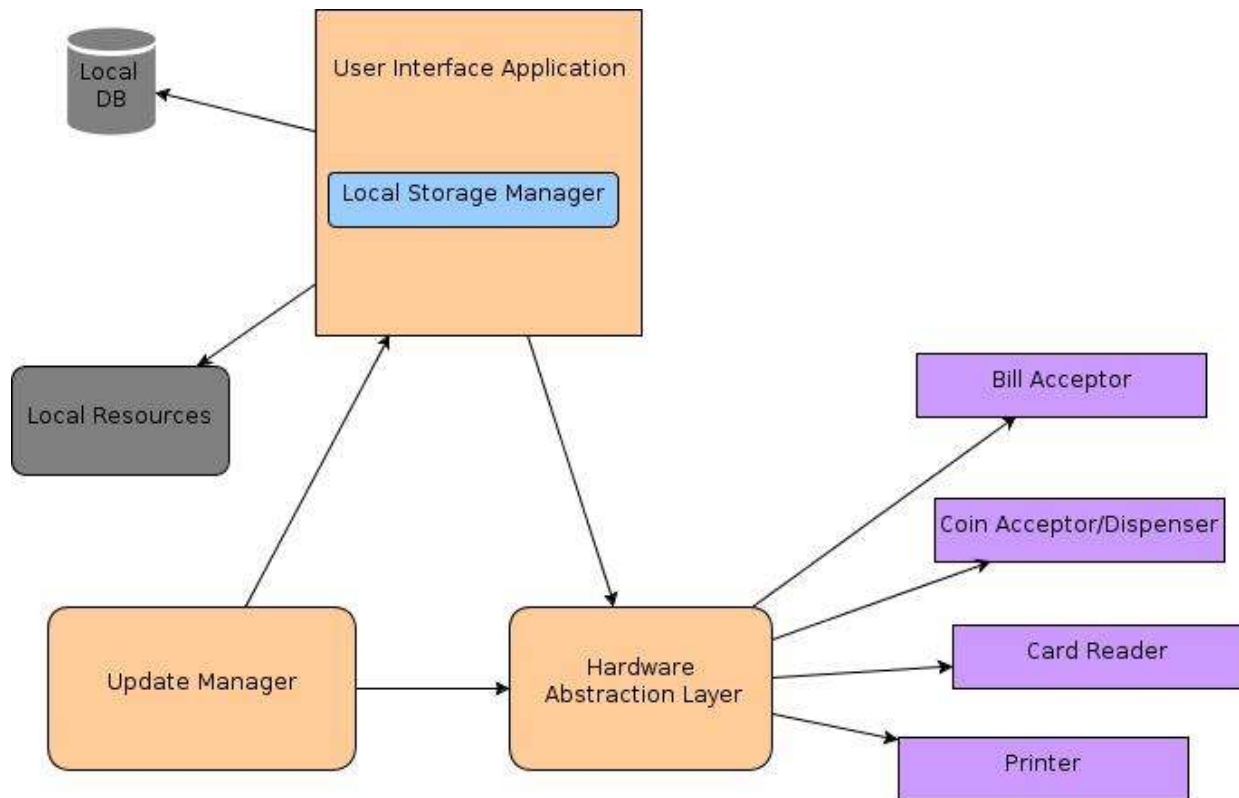


Figure 4: The interaction between system components

The **user interface application** follows the View-Model design pattern, each view having its own View-Model from which it gets its data (See Figure 5).

The user interface application is composed of the following modules:

1. Main Applications – the starting point of the terminal application. This starts the other components of the application.
2. Controls - the view of the application. The controls use the View-Model modules as their data context, presenting them to the user.
3. Themes – various styles that apply to the components in the view.
4. Common – common components of the terminal application. These components are used for enabling the communication with the Server and with the hardware services hosted within the terminal, as well as other data parsing and processing (localization, string formatting, etc.)
5. Resources – a library that contains the static localization resources of the application. It contains the dictionaries available for various languages supported by the application.
6. QR Generator - a library used to generate the QR code that is being printed on the subscriptions.
7. Local Storage - a library that provides access to the local database (allowing CRUD operation on various entities).
8. View-Models – contains the data that will be presented to the user in the View (Controls) component.

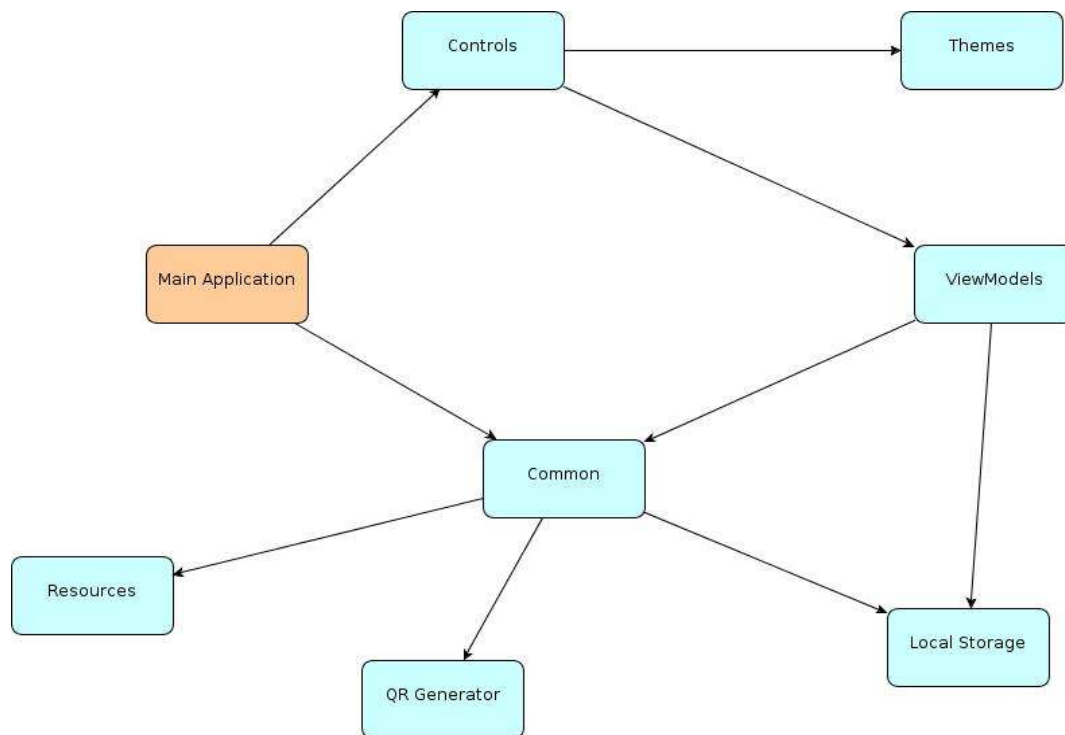


Figure 5: User interface application modules

The **client-server communication** is realised through two WCF services exposed by the server (See Figure 6):

1. Device Service

- the service manages the communication regarding most of the interaction between the server and the client. It includes operations like:
 - i. Ping() – tests if the server is alive
 - ii. GetSettings() – gets the latest settings from the server (like the available tickets and subscriptions, various UI values : popup timeouts, change receipt threshold, ping interval etc). the Terminal application will not run until these settings are brought from the server
 - iii. SaveTickets() – sends the bought tickets and subscriptions to the server

2. Streaming Service

- the streaming service allows the terminals to download the newly added/changed media files (images, movies), as well as the updates for the application binaries. It includes operations like:
 - i. DownloadUpdates() – gets the latest main application updates. This is performed by the UpdateManager
 - ii. DownloadMediaFiles() – gets the various media files that have been added or changed since the last update

Internally, the User Interface application and the Update Manager communicate through a service exposed by the User Interface application which has the following methods exposed:

- IsAlive() – tests if the UI App is alive, and performs a restart if it is not
- SendCommand() - sends various commands to the UI App like restart, GetStatus etc.

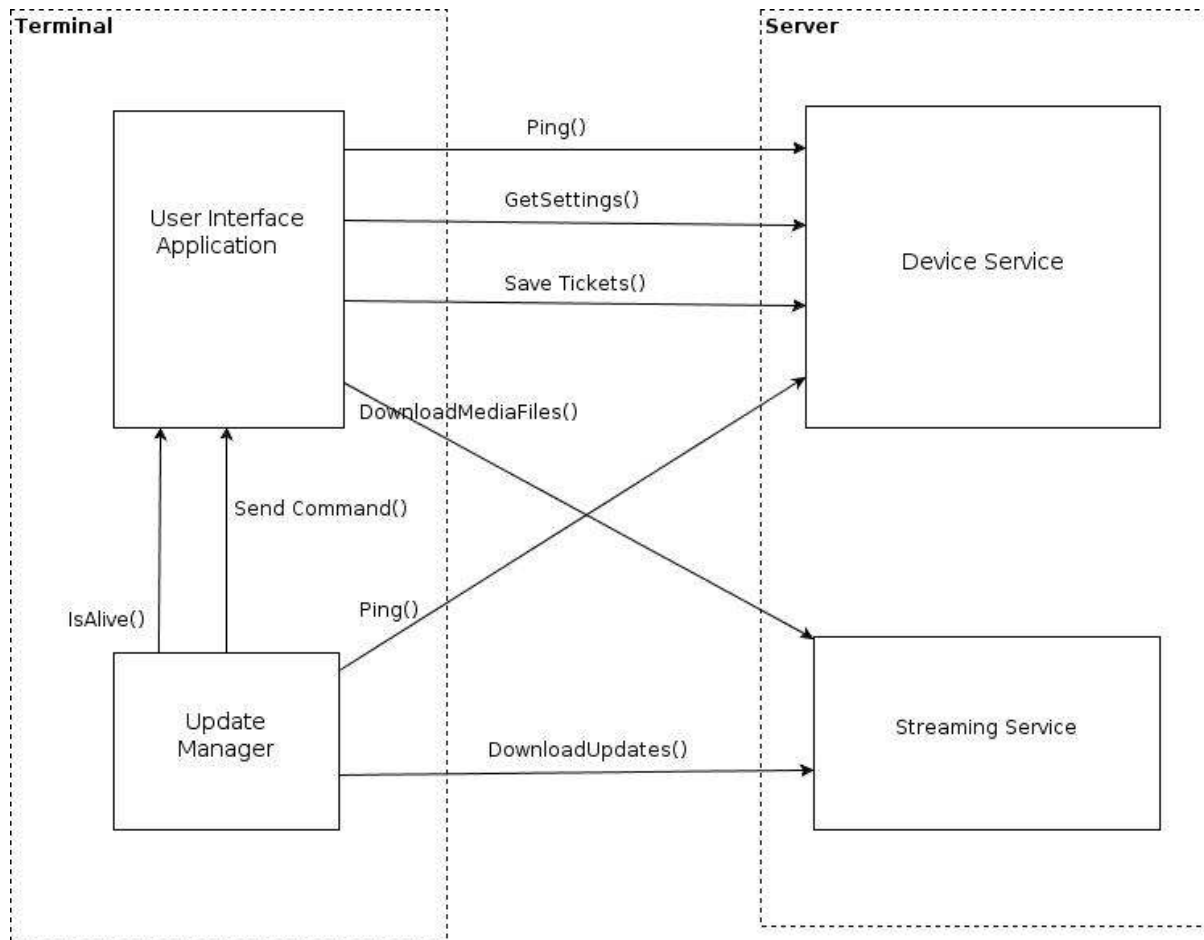


Figure 6: Client-Server Communication diagram

The **server system** (See Figure 7) exposes 3 main web applications that interact with an SQL Server 2008 database and the client applications:

1. WCF Service that exposes methods for client applications and provides access to the database.
2. WCF Service that exposes functionality for the Back office application and provides access to the database.
3. ASP.NET Website that exposes functionality for managing devices, ticket types, changing settings and generating reports.

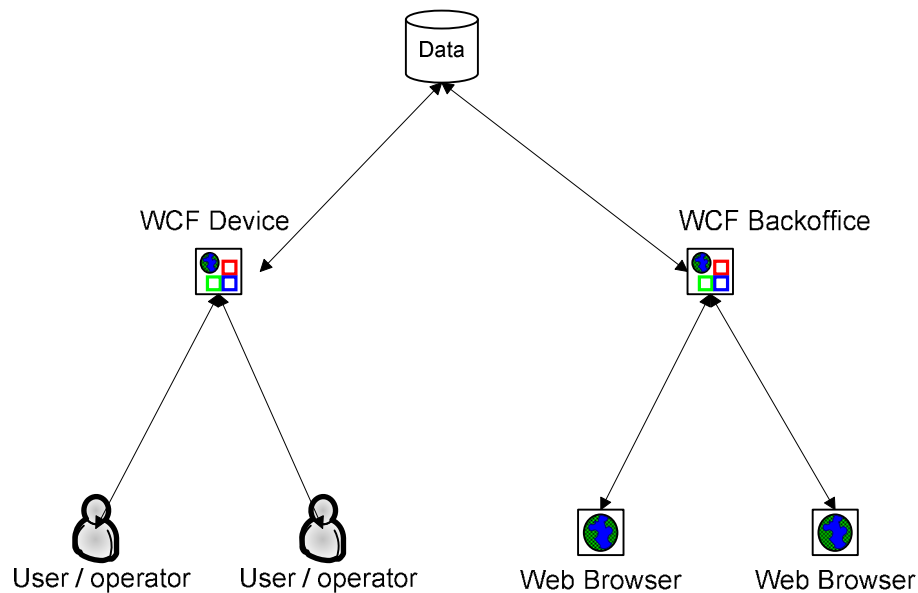


Figure 7 Server System diagram

The client application is the interface between the users (buyers) and the server system that exposes the functionality. The functionality is provided by a **WCF service** that receives the requests from the client applications, processes the request based on the type of request and the parameters provided and sends back the response to the client application.

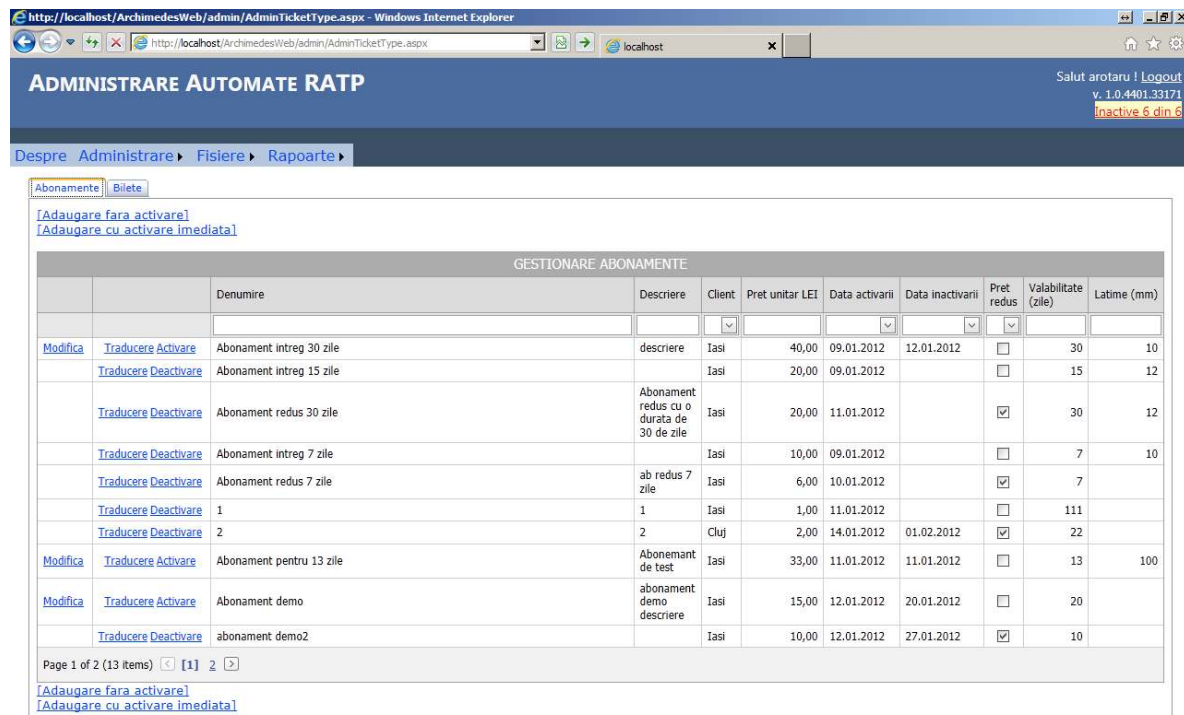
The main functions exposed by this service are:

1. Authenticate clients (devices)
2. Provide the settings and the multimedia content to client applications
3. Record the activity of the devices and the events that may occur (i.e. shock detection, lack of resources like paper, etc)
4. Provide support for transactions (buying tickets)
5. Send automatic / manual commands to individual devices

The **Back office application** (Figures 8 and 9) provides functionality for qualified personnel to manage the settings under which the system will perform.

The main functions are:

1. Create new users and assign roles
2. Manage (register) devices
3. Create ticket types and activate / deactivate them
4. Create tokens for discounted tickets
5. Manage change receipts (receipts that can be use at a later time to pay for tickets)
6. Support for multiple languages for client side application
7. Support for automatic updates of client applications
8. Support for defining/sending multimedia files to clients
9. Device status reports
10. Generate reports that show the activity recorded on client side like money income, the quantity of tickets sold in a certain interval of time, etc.

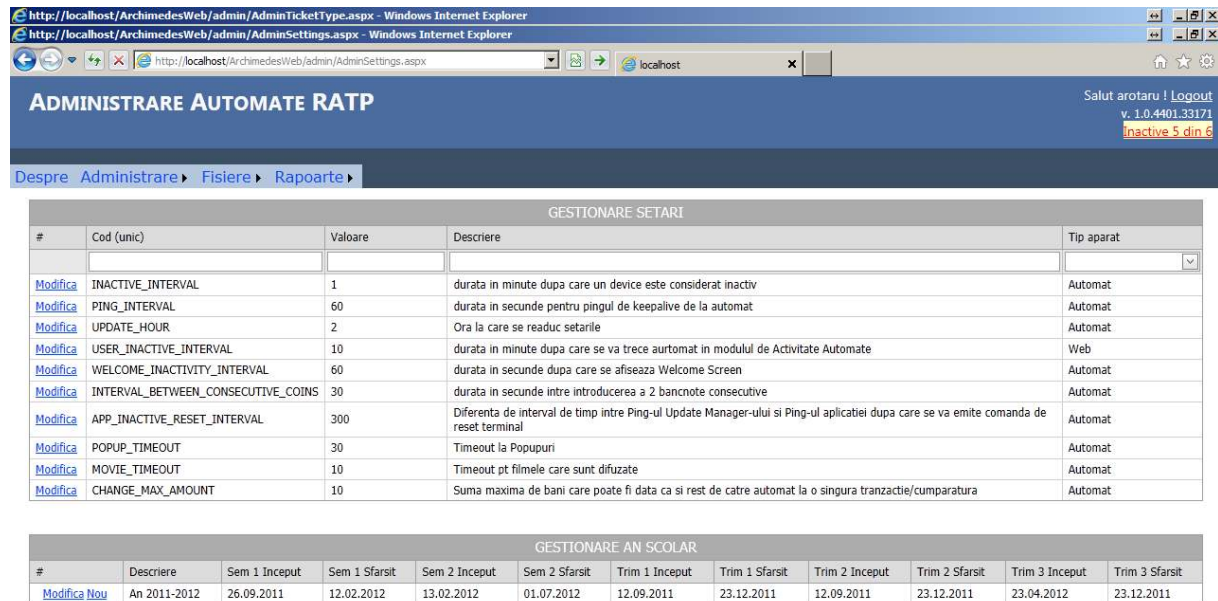


The screenshot shows a web browser window with the URL `http://localhost/ArchimedesWeb/admin/AdminTicketType.aspx`. The page title is "ADMINISTRARE AUTOMATE RATP". The interface includes a navigation menu with "Despre", "Administrare", "Fisiere", and "Rapoarte". There are tabs for "Abonamente" and "Bilete". The main content area is titled "GESTIONARE ABONAMENTE" and contains a table with the following data:

	Denumire	Descriere	Client	Pret unitar LEI	Data activarii	Data inactivarii	Pret redus	Valabilitate (zile)	Latime (mm)
Modifica	Traducere Activare	Abonament intreg 30 zile	Iasi	40,00	09.01.2012	12.01.2012	<input type="checkbox"/>	30	10
	Traducere Deactivare	Abonament intreg 15 zile	Iasi	20,00	09.01.2012		<input type="checkbox"/>	15	12
	Traducere Deactivare	Abonament redus 30 zile	Iasi	20,00	11.01.2012		<input checked="" type="checkbox"/>	30	12
	Traducere Deactivare	Abonament intreg 7 zile	Iasi	10,00	09.01.2012		<input type="checkbox"/>	7	10
	Traducere Deactivare	Abonament redus 7 zile	Iasi	6,00	10.01.2012		<input checked="" type="checkbox"/>	7	
	Traducere Deactivare	1	Iasi	1,00	11.01.2012		<input type="checkbox"/>	111	
	Traducere Deactivare	2	Cluj	2,00	14.01.2012	01.02.2012	<input checked="" type="checkbox"/>	22	
Modifica	Traducere Activare	Abonament pentru 13 zile	Iasi	33,00	11.01.2012	11.01.2012	<input type="checkbox"/>	13	100
Modifica	Traducere Activare	Abonament demo	Iasi	15,00	12.01.2012	20.01.2012	<input type="checkbox"/>	20	
	Traducere Deactivare	abonament demo2	Iasi	10,00	12.01.2012	27.01.2012	<input checked="" type="checkbox"/>	10	

Page 1 of 2 (13 items) [1] 2

Figure 8: Back office application



The screenshot shows a web application interface for managing RATP automatic ticket machines. The main heading is 'ADMINISTRARE AUTOMATE RATP'. Below it, there are navigation links: 'Despre', 'Administrare', 'Fisiere', and 'Raportare'. The application is running on a local host (localhost).

The 'GESTIONARE SETARI' table lists various system settings:

#	Cod (unic)	Valoare	Descriere	Tip aparat
Modifica	INACTIVE_INTERVAL	1	durata in minute dupa care un device este considerat inactiv	Automat
Modifica	PING_INTERVAL	60	durata in secunde pentru pingul de keepalive de la automat	Automat
Modifica	UPDATE_HOUR	2	Ora la care se readuc setarile	Automat
Modifica	USER_INACTIVE_INTERVAL	10	durata in minute dupa care se va trece automat in modulul de Activitate Automate	Web
Modifica	WELCOME_INACTIVITY_INTERVAL	60	durata in secunde dupa care se afiseaza Welcome Screen	Automat
Modifica	INTERVAL_BETWEEN_CONSECUTIVE_COINS	30	durata in secunde intre introducerea a 2 bancnote consecutive	Automat
Modifica	APP_INACTIVE_RESET_INTERVAL	300	Diferenta de interval de timp intre Ping-ul Update Manager-ului si Ping-ul aplicatiei dupa care se va emite comanda de reset terminal	Automat
Modifica	POPUUP_TIMEOUT	30	Timeout la Popupuri	Automat
Modifica	MOVIE_TIMEOUT	10	Timeout pt filmele care sunt difuzate	Automat
Modifica	CHANGE_MAX_AMOUNT	10	Suma maxima de bani care poate fi data ca si rest de catre automat la o singura tranzactie/cumparatura	Automat

The 'GESTIONARE AN SCOLAR' table shows the school year schedule:

#	Descriere	Sem 1 Inceput	Sem 1 Sfarsit	Sem 2 Inceput	Sem 2 Sfarsit	Trim 1 Inceput	Trim 1 Sfarsit	Trim 2 Inceput	Trim 2 Sfarsit	Trim 3 Inceput	Trim 3 Sfarsit	
Modifica	Nou	An 2011-2012	26.09.2011	12.02.2012	13.02.2012	01.07.2012	12.09.2011	23.12.2011	12.09.2011	23.12.2011	23.04.2012	23.12.2011

Figure 9: Back office application

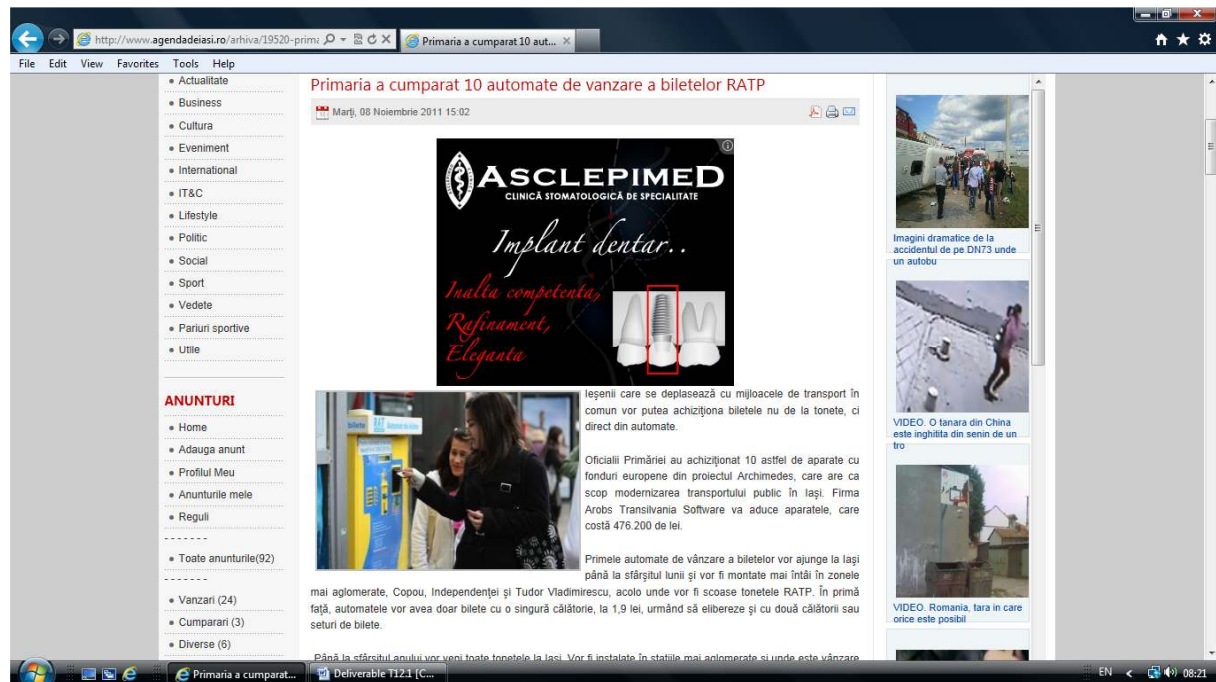
4.2 Main Outcomes

The 10 VTMs have been installed on the CIVITAS + corridor and at a few other stops throughout the city. These systems will permit the operation of automatic tickets via a touch screen. It ensures a user-friendly servicing exchange of tickets that is quick and efficient. With its performance abilities, the system still has potential for further development. This potential is given by its modernity. Being flexible, and thus adaptable to any future demands, it creates the premises for further extension throughout the city.

4.3 Communication Activities

Public were informed about the implementation of this measure and the utility of the VTMs by written press, radio and TV.

Example of press reactions:



<http://www.agendadeiasi.ro/arhiva/19520-primaria-a-cumparat-10-automate-de-vanzare-a-biletelor-ratp.html>



<http://www.eventul.ro/articol/automatele-de-bilete-ratp-functionale-din-februarie.html>



<http://newsiasi.ro/eveniment/actualitate/349-10-automate-pentru-bilete-ratp-pe-traseul-tudor-vladimirescu-copou.html>



<http://www.ziare.com/ziare-iasi/stiri-business/primul-automat-de-bilete-ratp-functional-in-mai-putin-de-o-luna-2905321>



<http://www.bzi.ro/se-monteaza-automatele-de-bilete-ratp-281414>



<http://www.newsiasi.ro/eveniment/actualitate/1878-de-joii-iesenii-isi-pot-cumpara-bilete-de-autobuz-de-la-automat.html>



<http://oradeiiasi.oradestiri.ro/in-loc-de-tonete-ratp-iasul-va-avea-de-azi-automate-de-bilete-pentru-mijloacele-de-transport-in-comun-vezi-unde-sunt-amplasate-acestea/actualitate/2012/05/03/>



<http://www.cronicadeiasi.ro/stiri/locale/Incepend-de-astazi-iesenii-isi-vor-putea-cumpara-bilete-de-autobuz-direct-de-la-automate-VIDEO/19553>



<http://www.ziaruldeiasi.ro/local/primul-automat-de-bilete-ratp-a-intrat-in-functiune~ni8fb2>

4.4 Problems Identified

No problem has been detected in the implementation of the VTMs.

4.5 Future Plans

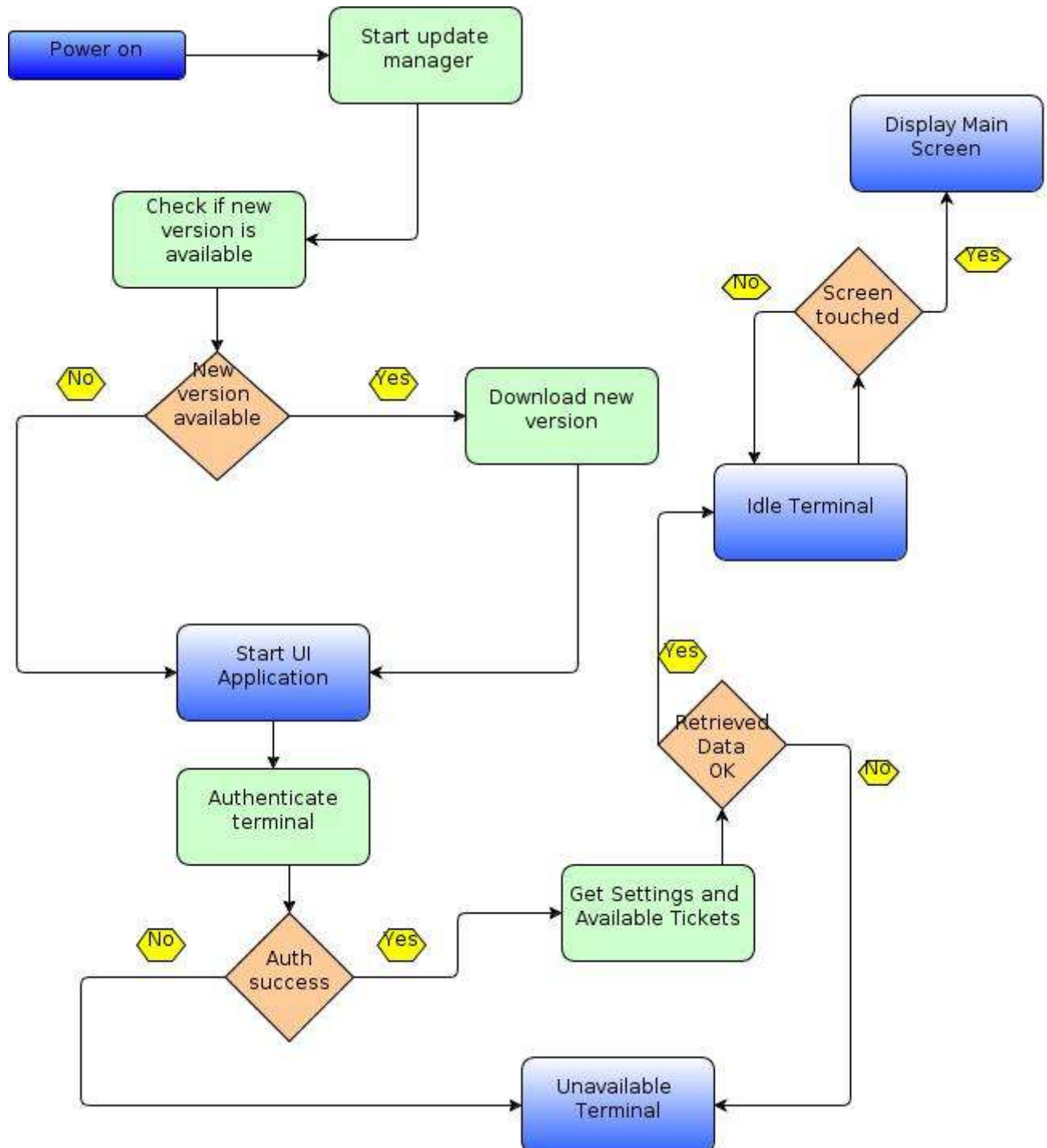
Given the utility of these equipments and their contribution to increasing the passengers' comfort, Iasi will extend the implementation of this measure, by installing more VTMs in various zones of the city, while keeping the same main criteria for choosing their future locations.

The measure will be evaluated based on the questionnaires by face to face interviews which will be addressed to PT users on CIVITAS+ corridor. They will be asked regarding the awareness, acceptance and quality of service levels.

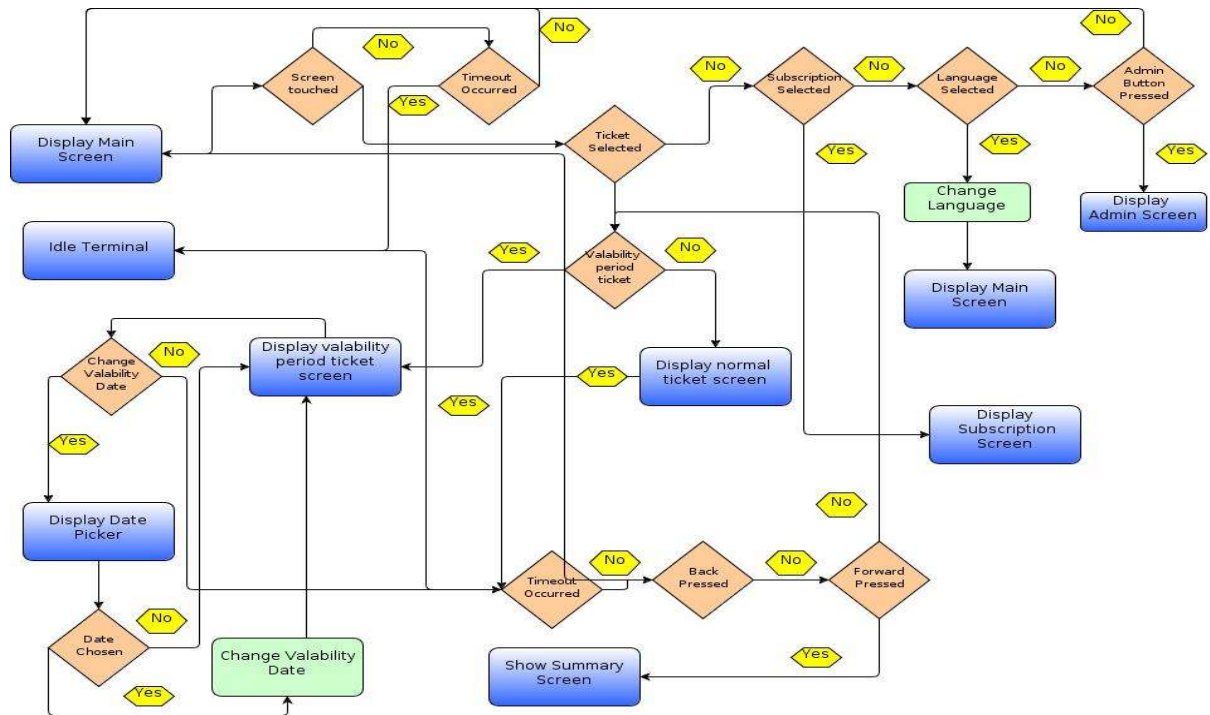
ANNEXES

Flow diagrams

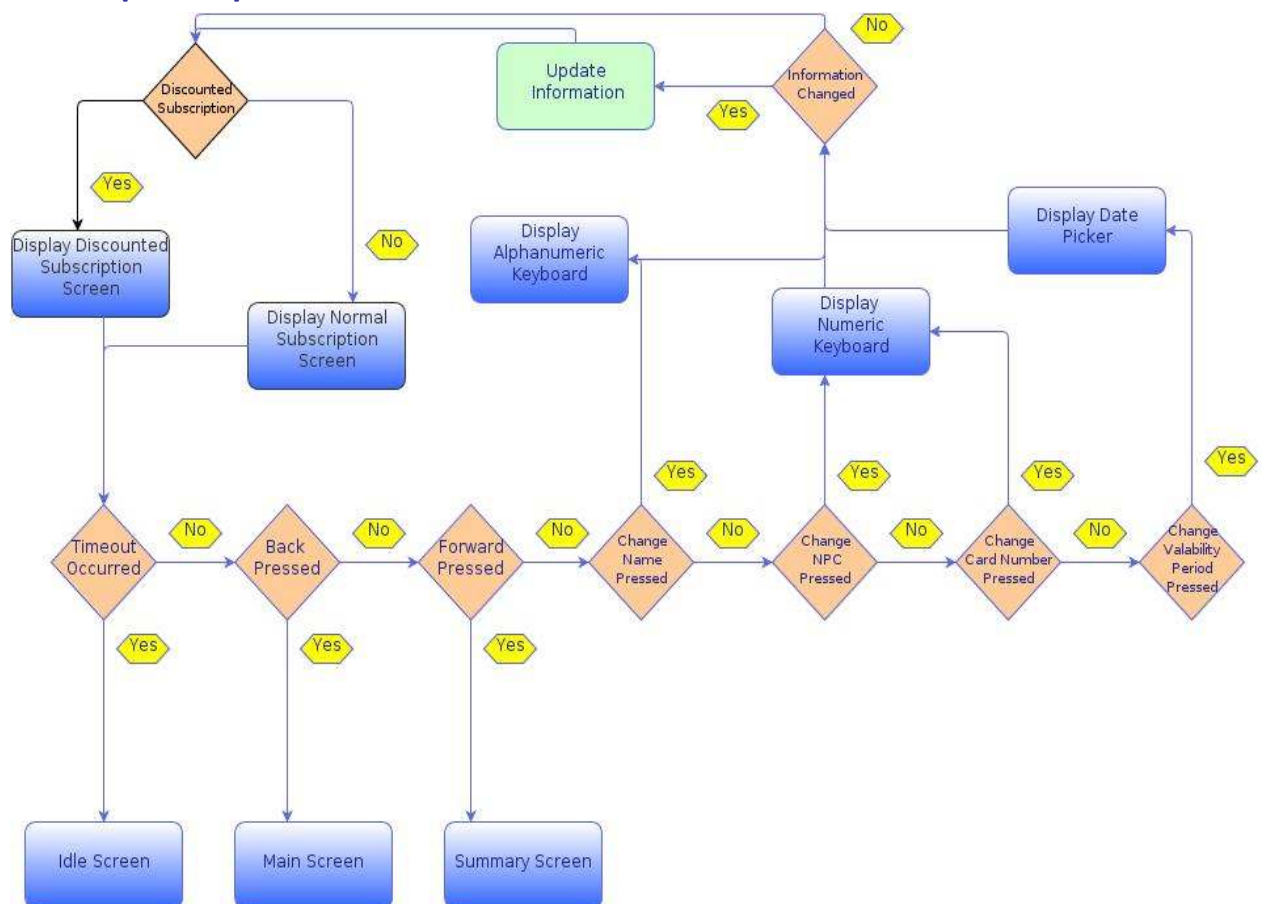
Terminal startup



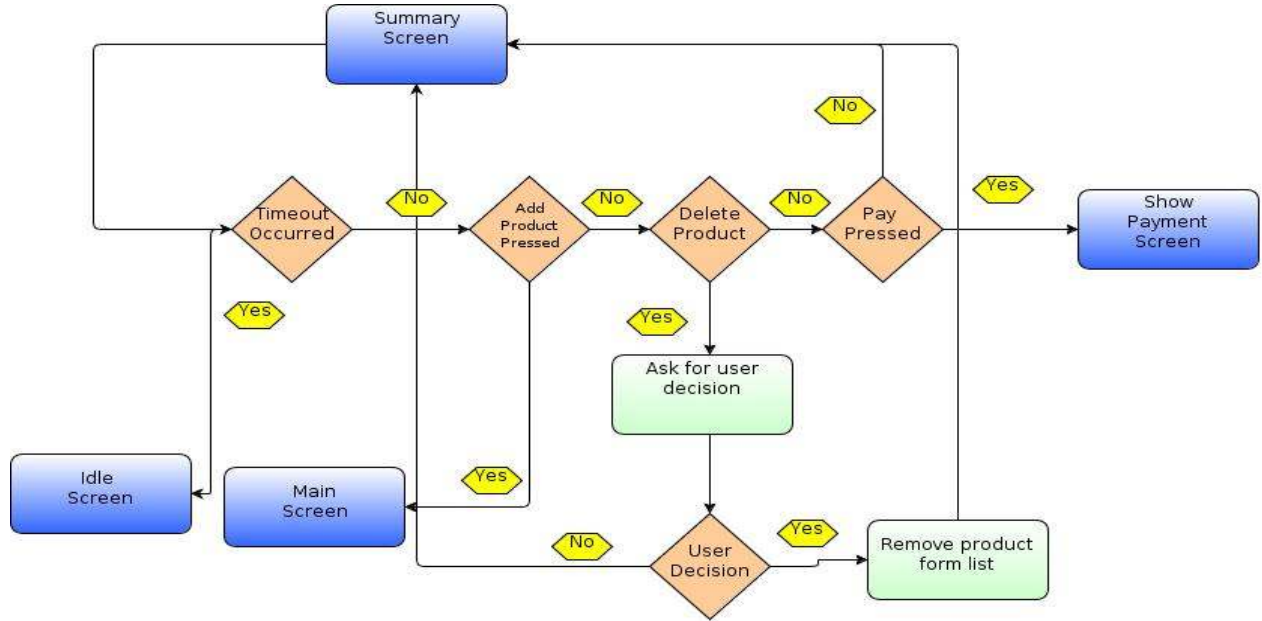
Main page and ticket flow



Subscription operation



Summary screen



Payment Screen

