



EUCARIS Overview

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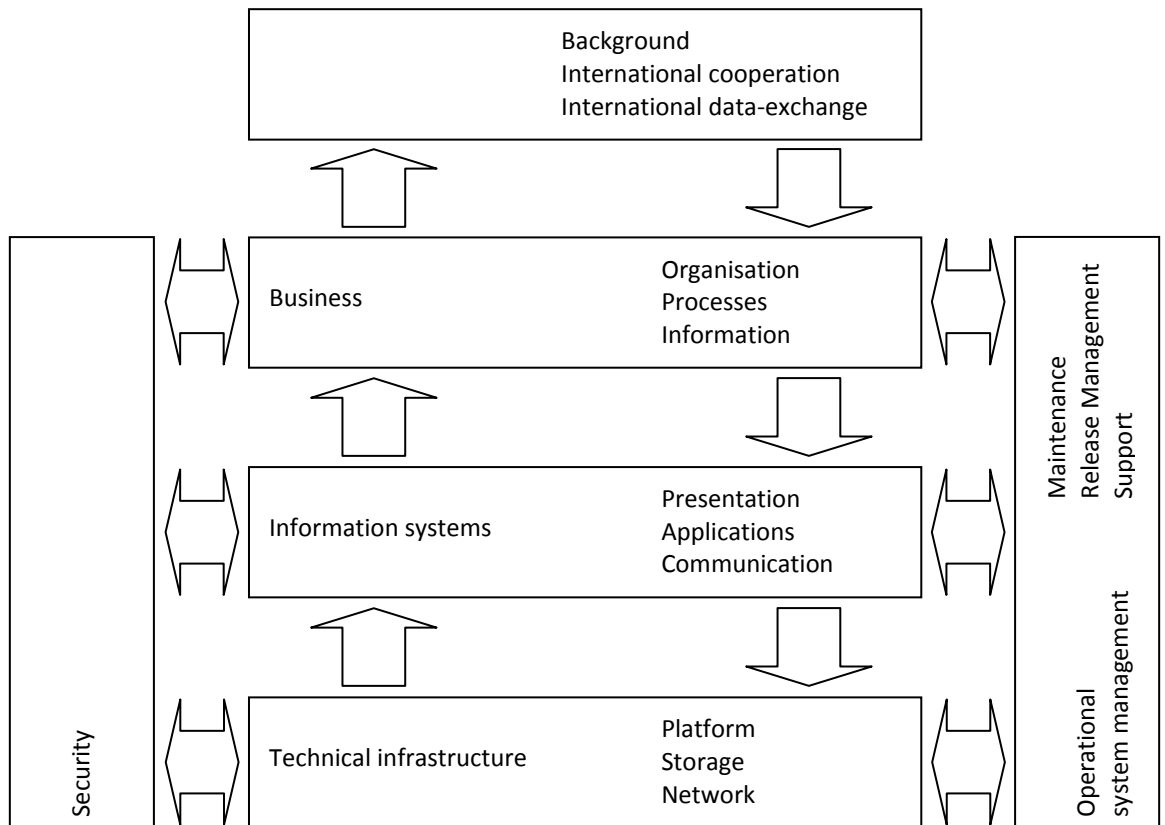
1. Introduction

EUCARIS can be described as a cooperation between central registration authorities of several European States. Formalised in a multilateral Treaty, this cooperation is focused on the data-exchange regarding vehicle registration, driving licences, and the accompanying personal data. For this exchange, a system is used which was especially developed for this purpose: EUCARIS II.

This document describes the context of the EUCARIS cooperation, the way of cooperating between the participants and, in particular, the system EUCARIS II. The purpose of this document is to offer an overall picture for potential users and others who may be interested.

1.1 Document outline

The description follows the headlines of the Generic Enterprise Model (GEM) used by Gartner Consulting. The descriptive model used in this document can be pictured as follows.



For each part of the descriptive model there is a separate document chapter, namely:

- context
- business
- information systems
- technical infrastructure
- security
- operational system management.

1.2 Referenced documents

Within this document the following documents are referenced:

Nr.	Title, version
[1]	EUCARIS Treaty, 29 June 2000
[2]	EUCARIS Rules of Procedure, 13 October 2000
[3]	Declaration of Endorsement, 4 October 2002
[4]	Memorandum of Understanding
[11]	Prüm Convention, 27 May 2005
[12]	Prüm Implementing Agreement, 26 November 2006
[21]	Development Guide-EUCARIS II version 4.1; 19-12-2007
[22]	Software Architecture Document EUCARIS version 4.1; 19-12-2007
[23]	XML Message Specifications EUCARIS II version 4.1; 19-12-2007
[24]	XML Message Specifications File Transfer Message and Asynchronous VOwnerHolder version 4.1; 19-12-2007
[25]	XML Message Specifications Vehicle-Owner-Holder Prüm version 4.1; 19-12-2007
[26]	Web Client-EUCARIS II version 4.1; 19-12-2007
[27]	Web Client-File Transfer version 4.1; 19-12-2007
[28]	Web Client-Prüm version 4.1; 19-12-2007
[31]	EUCARIS II Start Up Document version 4.1; 19-12-2007
[32]	User Documentation-EUCARIS Secretary Configuration Update; version 4.1; 19-12-2007
[33]	Install Guide-EUCARIS II version 4.1; 19-12-2007
[34]	Local Admin Guide-EUCARIS II version 4.1; 19-12-2007
[35]	Operational Manual-EUCARIS II version 4.1; 19-12-2007
[36]	User Manual-EUCARIS II; 12-07-2007
[37]	Acceptance Plan EUCARIS II v1.1; 26-11-2007
[38]	Acceptance Plan Prüm v2.0; 09-10-2007
[39]	Acceptance Plan File Transfer – Asynchr v4.1; 20-12-2007
[41]	EUCARIS Letter of Intent regarding the Service Level of EUCARIS; version 1.0
[42]	EUCARIS Statistics January / June 2007
[43]	Security Design EUCARIS v1.1; June 2006

1.3 Abbreviations and definitions

In this document the following abbreviations have been used:

Abbreviation	Description
.NET Framework	
C#	development language used to build the application
Centauri	monitoring tool registrating the availability and performance of the EUCARIS services in each Member State
Common name	
CRL	Certificate Revocation List
DNS	Domain Name Service
EUCARIS	European CAR and driving licence Information System
EUCARIS I	original EUCARIS system, based on Unix and Tuxedo; in operation from 1994
EUCARIS II	completely redesigned EUCARIS system, based on web service technology
Hosts file	
HTTP	Hyper Text Transfer Protocol
IDAGW	interface between EUCARIS I and the EUCARIS II system
IIS	Internet Information Server; system software on a Windows 2003 server, supporting the EUCARIS II application
INFONET	private network connecting the EUCARIS Member States
Legacy	registration of vehicles and/or driving licences in a Member State
Managed PKI	Public Key Infrastructure; certificates issued for a limited, managed group of users and procedures to request or revoke these certificates
MCI	Multi Country Inquiry; a request directed to all connected Member States in case it is unknown in what Member State a vehicle or person has been registered
Member State	European country participating in EUCARIS or using the EUCARIS application within the framework of the Prüm Treaty
MSI	
RDW	Dutch registration authority
Registration Authority	a governmental organisation within a country responsible for the registration of vehicles and/or driving licences
Secretary State	Member State or organisation assigned to the operational system management of EUCARIS. This includes monitoring, service desk support, development and deployment of new releases, reporting
SOA	Service Oriented Architecture
SOAP	
SQL MSDE version	
SSL	Secure Socket Layer; guarantees the exclusiveness of the information exchange by means of encryption/decryption of messages
sTESTA	private network used for the exchange of information between authorities and governmental organisation within the EU
TCP/IP	
Tuxedo	transaction monitor used in the EUCARIS I system
Unix	system software used by the EUCARIS I system
URL	
Web service	
XML	

2. Context

In this chapter the context of EUCARIS and the EUCARIS II system is described. Successively the description is about:

- the background
- the importance of international cooperation
- the importance of international data-exchange.

2.1 Background

The registration in Europe of vehicle, driving licence and accompanying personal data is organised nationally. Each State has formally assigned the registration of these data – mostly by law – to one or more dedicated governmental organisations, or – sometimes – to specific business organisations. These organisations are referred to as registration authorities.

Tasks of these registration authorities in the field of vehicles and driving licences are for instance to record identifying and technical data of vehicles, to issue licence numbers, to record the owner/holder of vehicles, to issue vehicle documents and driving licences, to record insurance, etc.

Due to the free flow of persons and goods within the EU these tasks can be performed less and less in isolation. For instance when a vehicle has to be registered, it has to be determined first whether this vehicle is not recorded as stolen elsewhere. Without this information a national registration authority may unwillingly legalise vehicles that have been stolen in other countries. Likewise, if a foreign driving licence offered for exchange into a national driving licence needs to be determined whether this driving licence is not suspended abroad.

This urges for international cooperation between registration authorities, to facilitate data-exchange. This cooperation is not limited to EU Member States only. The cooperation also includes potential EU Member States and European neighboring countries of the EU.

A first form of cooperation in the field of data-exchange emerged in the early nineties. Five EU Member States were involved, namely Germany, Belgium, Luxembourg, the Netherlands and the United Kingdom. The organisation of cooperating States was named EUCARIS after the name of the implemented system, European Car and Driving Licence Information System

Nowadays the cooperation includes 14 States, of which 13 EU Member States and one non-EU Member State. The organisation of the cooperation has been moulded into a multilateral Treaty between the initial five States. This EUCARIS Treaty [1] has been ratified now by three States (Germany, Luxembourg and the Netherlands) and shall fully enter into force after ratification by a fourth State. The fourth ratification is expected to be the ratification by the United Kingdom in the summer of 2008. Meanwhile, other States can join the cooperation in two ways: EU Member States by a Letter of Endorsement, other European States by means of a Memorandum of Understanding.

In the year 2005 another international cooperation entered into force. Here the mutual exchange of vehicle data is extended to the exchange of insurance and personal data of the vehicle owner/holder. This data-exchange is arranged in the so called Prüm Convention [11].

From the beginning of the EUCARIS cooperation the used data-exchange system was EUCARIS I. Since 2007 also the successor of this system, EUCARIS II, is in operation. EUCARIS II is a fully web based application. The migration of the users from EUCARIS I to EUCARIS II is now in full progress and is expected to be finished at the end of 2008. Both the Member States of the EUCARIS Treaty and the Member States of the Prüm Treaty use the EUCARIS II application. Therefore, only the set up and functioning of EUCARIS II will be described in this document.

2.2 International cooperation

In a register information is recorded about objects and/or subjects (persons). A registration authority is a formal assigned organisation to keep one or more registers. The primary function of a registration authority is to offer evidence to society. The registrations of objects and subjects support legal evidence. To perform this function as good as possible, registration authorities pursue the best possible reliability of the register. Reliability implies complete, correct and actual data.

The primary function of vehicle and driving licence registers is mainly the determination of the allowed vehicles, the determination of which vehicles are owned/holded by whom and who is licenced to drive a vehicle. Additional functions are for instance the determination of tax obligations, of insurance obligations, of inspection obligations, etc. These functions may vary and may be organised different by State.

The registers can be used in a broader sense and in practice they are more and more. The vehicle and driving licence registers are used for instance in the field of:

- law enforcement
- investigation and prosecution of offences
- tax evasion
- misuse of social security laws
- fighting fraud and crime
- fine collection
- security
- fighting terrorism.

Most of these issues are international in character. By the growing international attention and importance of these issues, the importance of international cooperation between vehicle and driving licence registration authorities grows as well. International cooperation enhances the reliability of the registers. International adjustment between registration authorities prevents double or missing entries in the registration and prevents incorrect or untimely recording. This enhances the possibilities for cross-border law enforcement.

2.3 International data-exchange

The importance of international cooperation requires the international exchange of data between central registration authorities. For this purpose EUCARIS II was developed. This system is now used for data-exchange in the field of:

- vehicle import / export
- inspection of parallel imported vehicles
- first registration of vehicles
- issuing of driving licences
- document verification
- prevention of vehicle theft
- fine collection
- investigations about vehicles and their owner / holders
- investigations regarding vehicle insurances

EUCARIS II uses for the data-exchange a peer-to-peer concept. That is to say that it uses a decentralised set-up in which all participating countries are connected to each other and are able – by means of an interface – to search in each other's register, without influencing the national chosen set up of their registers. So there is no centralised system and no central register to be searched by the registration authorities and no necessity for it.

The decentralised setup is chosen, because the registers of the participants are adjusted to their national laws and therefore are very different. A central approach asks for a full functional and technical redesign of the national registers of the participants. This while the peer-to-peer concept only asks for a relatively cheap set of

data definitions. Using the peer-to-peer concept the national registers don't have to be adjusted and can keep their autonomy.

In addition the system offers the functionality that every registration authority autonomously decides which exchanged data are to be provided to which authorised inland organisations. For instance it is not desirable that English police directly uses data from German registers. However, this is possible through the intervention of English and German registration authorities. The requesting English registration authority guarantees the German authority that the query is of an authorised English organisation and that this organisation is entitled to get the asked data. The answering German registration authority determines whether exchange of the asked data is allowed. In this way legal problems are evaded and the requesting and answering parties can comply with their national data protection laws.

In the next chapters will be elaborated on the organisation of the cooperation and the system of data-exchange.

3. Business

This chapter is about the business architecture of the data-exchange. The organisation of the cooperation within EUCARIS and the set up of the system in use, EUCARIS II, are described. Successively it is about:

- the organisation of the cooperation
- the processes used for the data-exchange
- the data that can be exchanged.

3.1 Organisation

In the organisation of the cooperation there is a distinction between the cooperation based on the EUCARIS Treaty [1] and the cooperation based on the Prüm Treaty [11].

EUCARIS

In the EUCARIS network European registration authorities work together in the field of data-exchange. The rules of the cooperation are stated in the EUCARIS Treaty [1]. The main rules are about:

- setting up and maintaining a common system for the exchange of vehicle and driving licence data
- functioning and application of this system
- data protection
- monitoring of the data protection
- security of the system
- organisation of the cooperation
- responsibility and liability.

The EUCARIS Treaty was signed June 29, 2000 in Luxembourg by Belgium, Germany, Luxembourg, the Netherlands and the United Kingdom. Currently three countries have ratified the Treaty (D, L, NL). It is expected that the Treaty will formally enter into force in 2008, after the fourth ratification of the Treaty by the United Kingdom. After that, other States can accede to the Treaty if they apply the data protection provisions of Directive 95/46/EC of the European Parliament and of the Council of 25 October 1995 and if their application is unanimously approved by the existing parties.

While the Treaty has not formally entered into force, countries can access the cooperation network and use the system for data-exchange by signing a so called Declaration of Endorsement [3]. For EU Member States this is sufficient; for non EU Member States in addition a bilateral Memorandum of Understanding [4] has to be signed by the acceding country and every country with which they wish to exchange data. At this moment 13 countries, referred to as Member States, participate in the EUCARIS cooperation.

Prüm

In 2005 a data-exchange is developed that offers possibilities to exchange vehicle and insurance data including the associated personal data. The background of this expansion of the possibilities is the intensifying of cross-border cooperation in the field of fighting terrorism, international crime and illegal immigration. This form of cooperation is formally Stated in the Prüm Treaty [11]. The Prüm Treaty was initially signed May 27, 2005 by Belgium, Germany, Spain, France, Luxembourg, the Netherlands and Austria. Other EU-Member States like Finland, Italy and Slovenia have joined the Prüm-Community since. The Treaty has enters into force between those Contracting Parties which have ratified it. Accession to the Treaty is open to all EU Member States. Soon a decision of the Council of Ministers will make the parts of the Treaty relating to Vehicle Registration Data, together with DNA and Fingerprint data applicable to all 27 EU-Member States.

The main rules of the Prüm Treaty are about:

- exchange of DNA-profiles, of dactyloscopic (fingerprinting) and other data
- automated query of these data and of vehicle registration data
- measures to prevent terrorist offences

- measures to combat illegal migration
- other forms of cooperation
- general provisions on data protection.

The contracting parties of the Prüm Treaty use the EUCARIS II application for data-exchange of vehicle and insurance data including the associated personal data. For this purpose a specific Prüm-application was added to the EUCARIS system. In the so called Prüm Implementing Agreement [12] a description is given how the EUCARIS system should be implemented in a Member State within the framework of the Prüm Treaty.

It may be clear that the Prüm Treaty includes more than the exchange of vehicle and driving licence data. Besides that, in the field of data-exchange of vehicles it offers more possibilities for exchange than the EUCARIS Treaty. Moreover, the Prüm Treaty allows other parties, in addition to registration authorities, to implement the EUCARIS II system. Therefore different implementations of the EUCARIS system in the same State have become reality.

The totality of the cooperating States based on the EUCARIS Treaty and the Prüm Treaty can be shown as follows.

Cooperating Member States					
EUCARIS Treaty				Prüm Treaty ¹	
Participants				EU Member States	
Ratified	Signed	To accede	Associated	Ratified	Signed
Germany	Belgium	Estonia	Gibraltar	Austria	Hungary
Luxembourg		Hungary	Isle of Man	Belgium	
The Netherlands		Iceland	Guernsey	Germany	
United Kingdom		Latvia	Jersey	Luxembourg	
		Lithuania	Northern Ireland	Spain	
		Ireland		Finland	
		Romania		Slovenia	
		Slovakia		France	
		Sweden		The Netherlands	
		Italy			

Cooperation procedures EUCARIS

The organisation of the cooperation within the framework of the EUCARIS Treaty is regulated in the EUCARIS Rules of Procedure [2], as laid down by the Member States of EUCARIS. These rules are an elaboration of the EUCARIS Treaty and regulate organisation, administration, finances, promotion and reporting. The main rules are:

- the EUCARIS Board, consisting of representatives of the central registration authorities of the Member States, is responsible for the implementation and correct application of the provisions of the EUCARIS Treaty and of the correct technical and operational functioning of the EUCARIS system; the board is the governing body of EUCARIS
- at least once a year there is a Board meeting
- the Board assigns operational tasks (such as finances or operation of the system) to Member States; the assignment is for a period of three years; in case of the operation assignment a period of five years
- decision-making is by common consent or – if this is not possible – by a voting procedure; normally a simple majority is sufficient, unless otherwise Stated
- every Member State has one vote, irrespective of the number of delegates
- the Board can establish working groups on specific issues; working groups cannot take decisions, only bring out recommendations to the Board
- the accounts are audited by independent auditors

¹ Table possibly not reflects the current situation for Prüm.

- the common activities of EUCARIS are financed by means of an annual contribution of the Member States and bilateral users.

Finances EUCARIS

The setting up of the financing of EUCARIS, also formally described in the EUCARIS Rules of Procedure [2], is as follows:

- investments will be paid in equal parts by all participants
- the total operating cost of the organisation, the system and the network will be paid by the participants based on the used functionality.
- new parties finance their own installation and integration with their legacy system
- operating costs of the register systems are borne by the countries requesting and providing information themselves.

Accession EUCARIS

For the accession of new parties to the EUCARIS Treaty the following steps in general terms have to be taken:

- the national government decides to apply for accession to the Treaty (possible reservations to parts of the Treaty included)
- announcement by the national government to the depositary of the Treaty in Luxembourg of the application for accession (possible reservations to parts of the Treaty included)
- the depositary informs the parties of the application (possible reservations to parts of the Treaty included)
- the application (possible reservations to parts of the Treaty included) is subject to unanimous approval by the Member States
- approval by the national parliament of the accession to the EUCARIS Treaty (possible reservations to parts of the Treaty included); depending of national procedures this step could be integrated with the former national decision making
- depositing by the applicant an instrument of ratification, approval or accession
- the depositary notifies the parties of the deposit and of the date of entry into force.

Cooperation procedures Prüm

The overall cooperation within the framework of the Prüm Treaty is organised by the Joint Working Group of Prüm and outside the scope of this document.

As far as the cooperation regarding the EUCARIS system concerns, the Rules of Procedure of EUCARIS are currently under construction to formally integrate the cooperation with the Prüm organisation, i.e.:

- changes to the EUCARIS system due to new functional developments in the framework of the Prüm Treaty / Council Decision shall be discussed by the EUCARIS Participants Board with a view to their implementation; all other changes shall be decided upon by the EUCARIS Participants Board.
- the Board can establish joint working groups on specific issues related to the Prüm Treaty where experts of both EUCARIS and Prüm Member States cooperate
- the joint working groups cannot take decisions, only bring out recommendations to the Board.

Finances Prüm

The overall financial organisation within the framework of the Prüm Treaty is organised by the Joint Working Group of Prüm and outside the scope of this document.

As far as the cooperation regarding the EUCARIS system concerns, the Rules of Procedure of EUCARIS are currently under construction, i.e.:

- the common activities due to the framework of the Prüm Treaty are financed by means of an annual contribution of the EUCARIS Member States and the Prüm Member States.
- investments will be paid in equal parts by all participants (EUCARIS and Prüm)
- the total operating cost of the organisation, the system and the network will be paid by the participants based on the used functionality

- the cost of participation in 2008 are € 14.000 in case of the EUCARIS functionality and € 7.000 in case of the Prüm functionality; the cost of the combination was € 21.000 per year.
- new parties pay themselves for the installation and the integration with their own legacy system
- operating costs of the register systems are borne by the countries requesting and providing information themselves.

Accession Prüm

For the accession of new parties to the Prüm Treaty the Joint Working Group of Prüm can be contacted.

3.2 Processes

In each Member State the Registration Authority and other governmental organisations are responsible for a series of administrative processes. Since the procedures and organisations involved differ, only a broad overview is given of those processes in which the international exchange of information by means of EUCARIS plays an important role.

Registration of Vehicles

An exchange of vehicle information takes place during the registration of used vehicles that (possibly) originate in one of the other Member States and have been registered before. Checks are carried out during vehicle registration after import and during vehicle registration in general, if during registration the outcome is that the vehicle has been registered elsewhere.

Main aims are to identify the vehicle, to prevent any fraud with stolen vehicles or insurances and also to exchange technical information supporting the registration process.

At the end of the process a notification of registration or rejection is given to the country of export.

The information exchange is based on art. 4a, 5, 7.1 and 9 of the EUCARIS Treaty. The following inquiries and notifications are available:

- Vehicle Inquiry on VIN in all Member States
- Vehicle Inquiry on registration number in one Member State (the exporting State)
- Notification of registration of imported vehicles

Issue of Driving Licences

In the issuing process of driving licences registrations in other Member States may be checked during general registration of a driving licence (check of the one-driving-licence-principle), on exchange or replacement of a foreign driving licence or in case the applicant is suspected to have a sanction in another State.

The information exchange is based on art. 4b, 7.2 and 9 of the EUCARIS Treaty. The following inquiries are available:

- Driving Licence Inquiry on licence number
- Driving Licence Inquiry on name and date of birth in all Member States

Collection of traffic fines

Administrative authorities are responsible for the collection of traffic fines, or at least for the disposal of holder data. In the international context there is an increasing exchange of owner/holder data in relation to traffic fines. The information exchange is based on bilateral agreements between States. The following functionalities are available:

- File Transfer; the file may contain any kind of structured or unstructured data, including personal data in any format, related to traffic fines
- Asynchronous exchange of (structured) owner/holder data

Enforcement

Administrative authorities, police, customs and judicial and national security organisations carry out inquiries in all participating Member States during road-side checks and during investigations related to traffic accidents and the prevention of terrorism, crime and fraud.

The information exchange is based on art. 2 and 9 of the EUCARIS Treaty, art. 12 and Annex C.1. of the Prüm Treaty or bilateral agreements between States. The following inquiries are available:

- Driving Licence Inquiry on licence number
- Driving Licence Inquiry on name and date of birth in all Member States
- Vehicle Inquiry on VIN in all Member States
- Vehicle Inquiry on registration number in one Member State
- Inquiry of vehicle and owner/holder data on VIN and on reference date
- Inquiry of vehicle and owner/holder data on registration number and on reference date
- Insurance Inquiry

3.3 Information

The following information is exchanged by the system:

- Vehicle information
 - Licence number
 - Vehicle Identification Number (VIN)
 - Document ID
 - Registration date
 - Additional identifying attributes like colour, make and commercial type of the vehicle
 - All EU harmonized attributes that are indicated on the Vehicle Document
- Driving Licence information
 - Driving licence number
 - Issuing authority
 - Date of validity/expiration
 - Personal data of the driving licence holder
 - Categories
 - Aspects and sanctions
 - Remarks and restrictions
- Owner/Holder information
 - Identifying attributes of the vehicle
 - Owner/holder of the vehicle at the requested reference date
 - Address of the owner/holder in printable format
- Insurance information
 - Identifying attributes of the vehicle
 - Policy number on reference date
 - Insurance company
- Traffic Fine information
 - Identifying attributes of the vehicle
 - Owner/holder of the vehicle
 - Address of the owner/holder in printable format

Details can be found in the message specifications of the system [23], [24], [25].

The exchange processes now comprise around 6.000.000 inquiries per year. For exact use statistics see [42]. A strong growth is foreseen for the next few years.

4. Information systems

The EUCARIS system was realised in the early nineties. The communication in the original EUCARIS I system was based on a transaction monitor, Tuxedo, and hosted on UNIX platforms. The message protocol was specific. In 2003 the EUCARIS Participants Board decided to start the development of a new version of the application based on web service technology. This new version is called EUCARIS II and has been designed to send and receive signed XML messages and to run on a Windows platform. The realisation of EUCARIS II was completed at the end of 2006. Deployment started in 2007 and is expected to be finalised at the end of 2008. Therefore, in this document only the architecture of EUCARIS II will be elaborated.

The EUCARIS architecture consists of the following components that are described below and in the next chapters:

- National Registries
- An EUCARIS application in each Member State
- A closed TCP/IP network
- A connection between EUCARIS I and EUCARIS II (temporarily).

National Registries

Each Member State is responsible for its own Registry of vehicle and driving licence information and its own registration procedures. Though European harmonisation is advancing, differences in these procedures are still substantial. For instance, in most States a vehicle licence identifies a vehicle and can be transferred from one owner/holder to the next. In other States this licence is issued to a person, and can be transferred from one vehicle to another.

An EUCARIS application in each Member State

EUCARIS is basically a centrally developed application that is deployed in each Member State. The application consists of two parts. These parts are a Web client and the so-called 'Core' application, responsible for the secure handling and communication of the messages, between the European Member States at one side, and the national Registry and the national users at the other side.

The main philosophy of EUCARIS is a direct 'peer-to-peer' communication, so all States communicate directly to one another, without any central component. Both synchronous (interactive) and asynchronous (batch) communication are supported.

4.1 Presentation

At the front-end, the 'Core' receives requests from its national users, working with either the 'standard' EUCARIS Web client application or with custom-Web clients that may be integrated in systems of other organisations like the national police. The EUCARIS system has been setup to support multiple clients.

EUCARIS Web client

The system is delivered with a browser based Web client that supports:

- Multilanguage user interface enabling an administrator to translate screen items
- Multilanguage message interface enabling an administrator to translate coded attributed
- Multiple languages per country/user
- Group role access control per application function
- Configuration management
- Single Sign-on

Using the default EUCARIS Web client, a new participating Member State can access the Registries in other countries within a few days. For details on the Web client, see [26], [27], [28].

Customized client

Besides the default client application a so called customized client can be developed. Such a customised client can be incorporated in a larger application (e.g. a police system) or in the workflows within the organisation. A customized client application uses:

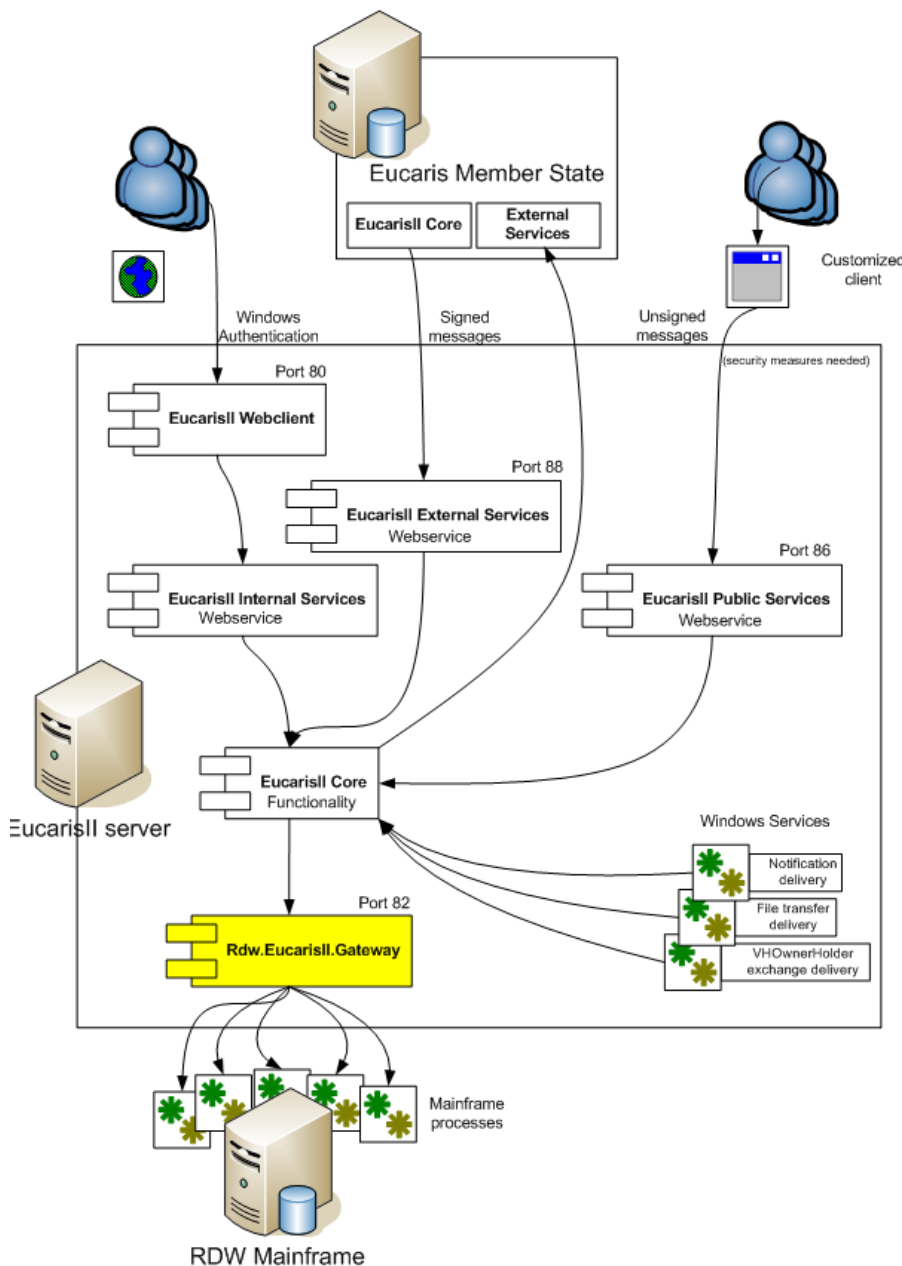
- The EUCARIS II Public web services for accessing services in other countries,
- The EUCARIS II Internal web services for retrieval of meta information on authorisation or for translation of the various message elements like vehicle colours, vehicle signals, etc.

4.2 Applications

The EUCARIS II application has been written in the Microsoft C# development language. The application consists almost entirely of so called managed code, only for the processing of certificate information the unmanaged CAPICOM library is used. Managed code runs on top of the Microsoft Common Language Runtime environment (CLR). The CLR provides a secure platform for running applications.

SOA

The EUCARIS application has been setup using SOA techniques. The so called 'core' application consists of Web service interfaces for External and Public Services and a series of 'core' libraries with generic functionality used by the EUCARIS II Web client and the External and Public Services. Communication between services is based on SOAP and XML messages.



The core application is connected to the legacy of a Member State via a dedicated gateway that is no part of the EUCARIS application, but has to be developed by each individual Member State since it contains functionality

very specific for that State. In the scheme the gateway between EUCARIS II and the Dutch Registry (RDW Mainframe) has been depicted. For more details on the architecture see [21] and [22].

Core libraries

The EUCARIS core libraries contain a number of generic functionalities used by the various services. The following core functions are available:

- Signing of a message
- Validation of a signed message
- Logging of messages
- Validation of message on conformity to the XSD
- Authorisation
- Authentication
- Message distribution to other countries (synchronous)
- Message distribution to multiple countries (Multi Country Inquiry) (synchronous)
- Consolidation of incoming responses on a Multi Country Inquiry
- Message distribution to other countries (a-synchronous)
- Queueing

An important feature of the application is the so-called Multi Country Inquiry, a broadcasting mechanism sending a request to all connected Member States (provided that the inquiry is authorised). Response messages are consolidated and returned to the requesting user.

At the back-end, the Core application is connected via an interface to the national Registries providing the vehicle and driving licence information on request from other States. In this interface all coded information is translated to standardised values (e.g. colour-code or the indication that the vehicle is stolen).

External/Public web services

The external and the public web services provide access to a series of services. The only difference between the two categories of services is that the external web services require signed messages and validate the messages signature accordingly. The public services require unsigned messages. Security has to be organised outside the application, based on mechanisms like userid - password authentication and authorisation. The following services are available:

Service	Description
CollectExtractService	External web service hosted by the Secretary State which receives requested Extracted Logging and stores it into the Secretary State database.
ExtractLoggingService	External web service which provides access to Extracted Logging. See below
FileTransferService	Web service for submitting and retrieving File Transfer messages.
MessageOfTheDayService	Web service for submitting message of the day notifications. See below
RegistrationNotificationService	Web service for submitting registration notifications.
SearchDriversLicenseService	Web service for directing Drivers License Inquiry requests.
SearchVehicleOwnerService	Web service for directing Vehicle Owner Holder or Vehicle Insurance Inquiry requests.
SearchVehicleService	Web service for directing Vehicle Inquiry requests.
VHOwnerHolderExchangeService	Web service for submitting and retrieving VHOwnerHolder Exchange messages.

Internal web services

The internal web services provide access to the following services for local users of the standard EUCARIS II Web client.

Service	Description
ClientLogicService	Web service containing several web methods exposing Web client functionality to other local clients.
MessageOfTheDayService	Web service for submitting message of the day notifications.
RegistrationNotificationService	Web service for submitting registration notifications.
SearchDriversLicenseService	Web service for executing a Drivers License Inquiry.
SearchVehicleOwnerService	Web service for directing Vehicle Owner Holder or Vehicle Insurance Inquiry requests.
SearchVehicleService	Web service for executing a Vehicle Inquiry.

Windows services

Windows services are configured to handle asynchronous communications between EUCARIS servers. The services run continuously and trigger the webservices at regular intervals.

Service	Description
ExtractLogging	Windows service running exclusively on the EUCARIS server of the Secretary State, starting the ExtractLogging process. On activation the service requests logged messages from all Member States.
FileTransferDelivery	Windows Service which delivers the File Transfer functionality. Extracts locally stored FileTransfer messages and processes them via a queuing mechanism.
NotificationDelivery	Windows Service which delivers the Notification functionality. Extracts locally stored notifications and processes them via a queuing mechanism.
VHOwnerHolderExchangeDelivery	Windows Service which delivers the VHOwnerHolderExchange functionality. Extracts locally stored VHownerHolderExchange messages and processes them via a queuing mechanism.

4.3 Communication

Communication mechanism

The inquiries between the Member States are carried out in a synchronous way. This implies that the client application waits for a response. As a consequence the Member States are expected to respond within a reasonable time. Within the EUCARIS community the standard has been described in a Letter of Intent [41].

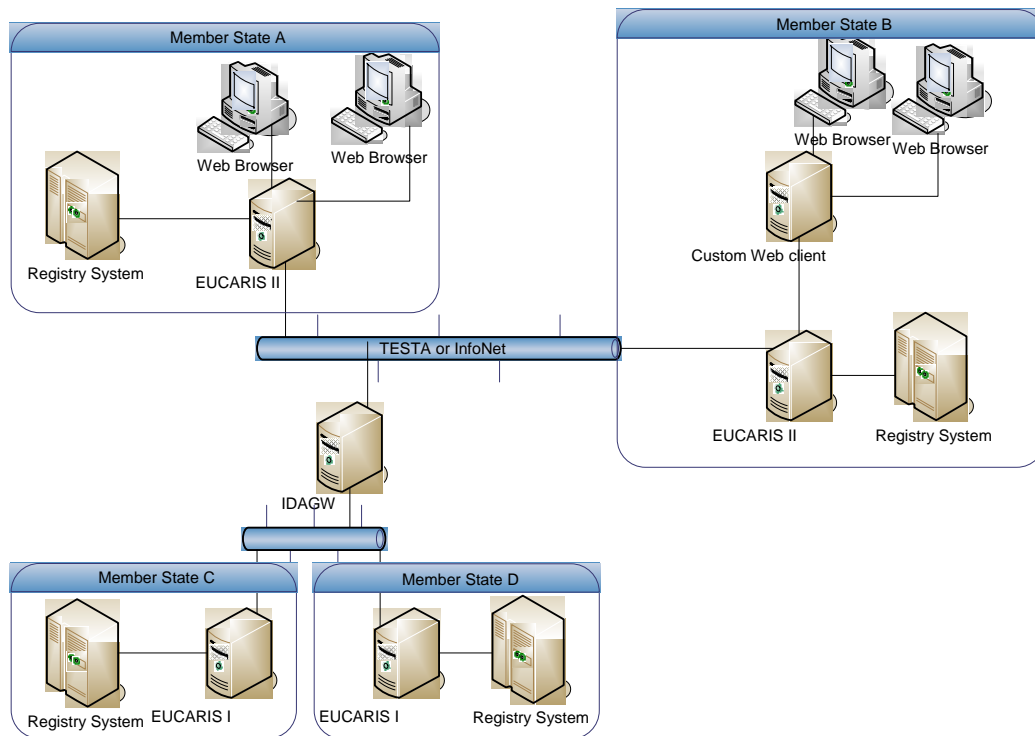
When a country is inquiring multiple other countries, the EUCARIS core will create a specific process thread for each country. This is done in a parallel way, so to all countries threads are started at the same time. On each thread the process will wait for a response. Finally responses from all threads/countries are consolidated and returned to the client.

Thanks to the parallel processing, a MCI lasts only slightly longer than the response time of the slowest country.

For a few services there is also an asynchronous mechanism in EUCARIS. These services are not time critical. Information transferred via these services is first stored in a queue in the local database and periodically a mechanism tries or retries to transfer the data to the other countries.

Connection between EUCARIS I and EUCARIS II

Below is a scheme of the system at the European level. The Member States are connected to the TESTA and/or INFONET network, using the EUCARIS application for their communication.



Member State A makes use of the standard Web client that is part of the EUCARIS application. Member State B is using a custom Web client. The EUCARIS Web client and one or several custom client applications may be combined in one Member State.

In order to enable a gradual migration from EUCARIS I to EUCARIS II, an interface has been developed, connecting both systems. In this interface, the so-called IDAGW, messages from the EUCARIS I system (Member States C and D) are transferred to messages for the EUCARIS II system (Member States C and D), and vice versa. The IDAGW makes the translation from the dedicated EUCARIS I message protocol to the XML used by EUCARIS II, and also links the Tuxedo transaction sessions of EUCARIS I to the web service oriented communication of EUCARIS II.

Messages to EUCARIS II are signed by the IDAGW with the certificates of the requesting Member States that temporarily have been installed at the IDAGW.

It is expected that by the end of 2008 all Member States will have migrated to EUCARIS II. The IDAGW will then be abolished.

5. Technical infrastructure

5.1 Platform & Operating system

The EUCARIS application has been set-up using as few as possible additional software to provide a lean, mean and cost effective system. The EUCARIS environment requires:

- Microsoft Windows 2003 with ample user licenses
- Microsoft .NET Framework 1.1 (no additional costs)
- Microsoft IIS (no additional costs)

The system has been designed with scalability as one of the design principals and therefore it can scale-up or scale-out to meet the requirements of the business. Performance tests have proven that the system will scale-up to at least 8 CPU. Expansion of the system can also be accommodated by network load balancing and multiple servers and database clustering.

Details of the required configuration are given in [31].

5.2 Storage

All data regarding logging, configuration and customization information is stored in the database. The EUCARIS system has been designed to support the following database configurations:

- Microsoft SQL 2000 on EUCARIS server using MSDE version (out of the box)
- Microsoft SQL 2000/2005 on EUCARIS server using full version
- Microsoft SQL 2000/2005 on external server
- Oracle 9 on EUCARIS server
- Oracle 9 on external server

Since EUCARIS uses a lean and mean database model, other versions of above database will probably work but are not yet tested.

5.3 Network

Network hardware

It is recommended to have two network cards available in the EUCARIS server. One network card should be assigned to the internal network and the other card to the EUCARIS (INFONET/TESTA) network. The EUCARIS server however will also work with a single network card, but then separation of internal network and EUCARIS network should be controlled by a router.

WAN - a closed TCP/IP network

All information is exchanged between the Member States via a secured private TCP/IP network. Originally EUCARIS I made use of a closed network managed by INFONET. Nowadays each Member State is connected to either INFONET or TESTA, a network managed under the auspices of the European Commission, connecting administrations in the EU Member States.

Both networks are physically interconnected at Schiphol-Rijk in the Netherlands. The intention is to phase out INFONET by the end of 2008.

DNS

Currently there is no DNS server configured. The EUCARIS environment however supports full DNS by its operating system. The host entries for all countries are maintained in the hosts file on each EUCARIS server. Configuration of these entries is controlled via the secretary management tool to ease configuration. Future use of DNS is to be expected once EUCARIS has been migrated to TESTA.

6. Security

6.1 Security between the Member States

The security between the Member States is controlled by the EUCARIS server core. The messages are transferred over an SSL connection.

All messages exchanged between the States are signed with the use of a certificate. The EUCARIS server will verify the signature of the incoming messages and then forward the unsigned message to the registration server or requesting client application. Details on security are given in [43].

Certificate usage

Certificate information is only present on the server that initiates the communication. Validation of the message and signature is done by using the certificate information that is exchanged with each request, provided that this certificate has been issued by a trusted CA. No complicated certificate management between Member States is required.

The EUCARIS server supports multiple certificates from multiple PKI providers. Currently the EUCARIS States run their own managed PKI that makes use of Verisign certificates.

The application has facilities to assign a specific certificate to one or several services.

Member State authorization

Member States authorise other States based on their bilateral agreements or an international Treaty. The common name (CN) on the certificate contains a country-code that is used to validate the authorisation of the requesting State or organisation. Multiple common names are supported by EUCARIS.

The EUCARIS application validates the message signing and permits/rejects a country to make inquiries based on its own access control information. Access control can be configured for each service and country via the Web client.

A Member States doesn't have to validate the requesting users in other Member States and therefore no complicated cross EUCARIS user management is required.

CRL

The Certificate Revocation List for the used certificates is stored on a central server at RDW. Since EUCARIS runs on a private network, the CRL which is published by the Certificate Authority (Verisign) on the public internet is not accessible and therefore is periodically copied to a server at RDW. To address this CRL an entry in the hosts file is added which will redirect the CRL checking request to SVRSecure-crl.verisign.com to the server at RDW.

6.2 User Authentication/Authorisation

Web client

EUCARIS users using the standard EUCARIS Web client are authenticated using the default Windows mechanisms. The users can be assigned to various Windows groups and each group can be authorised for particular functions of the application. The admin functions are separated from the regular users. Requests made to other countries are made on the credentials of a country, but user information is also transmitted in the request message to the requested country.

User registration

Registration of users is based on Windows. There are two possibilities to register users, see [34] and [35]:

- Local registration: users can be registered locally on the EUCARIS server. Whenever a user connects via the browser to the EUCARIS server, the user is prompted to enter username and password. This method doesn't support Single Sign On and password ageing.
- Domain authorization: this is the preferred method of adding users to the EUCARIS server. The EUCARIS server must be a Member of the Windows domain used within the Administration. Once the user

connects to the EUCARIS server his credentials are used to connect to the server without an additional logon screen. Password management applies to the same rules as defined in the Administration's Windows domain.

Customised client

It is the responsibility within the Member State to secure the inquiries made by a Customized client. This is outside of the scope of EUCARIS.

7. Operational system management

7.1 Software maintenance, delivery and deployment

Release management

A major change in one of the messages, or addition of a new service, will lead to a new release of the application. New releases of the EUCARIS application are always compatible with former releases, so e.g. a Member State with release 2.0 is able to communicate with a State using release 4.1.

Changes in a request message and changes in the structure of response messages will always lead to the definition of a new service. Addition of optional elements in the response messages results in a new version of the existing message.

Phased implementation

The EUCARIS software is delivered on CD, as a standard Microsoft MSI package. For installation some pre-requisites are required like IIS and the Microsoft .NET Framework.

Installation and configuration are supported by specific tools that are distributed with the application. For the local administrators only Windows knowledge is required. For details see [32] and [33].

It is possible to implement only the client functionality of EUCARIS, or to split the implementation in several phases, e.g. a first phase for client functionality, a second phase to connect EUCARIS to the national vehicle registration and a third phase to connect the drivers licence registration.

Acceptance procedure

A new Member State, or a State extending its service with a new message, will only be accepted in the production environment of EUCARIS after a formal test procedure, see [37], [38], [39].

During this procedure the Secretary State checks both requests from customised client applications and response message.

Consequences of the addition of a new Member State for other States

Addition of a new State in the EUCARIS network has some consequences for the other parties. All States have to authorise the new Member and to define their own rights to perform inquiries in the new State. Moreover, the IP address and URL's of the newcomer have to be registered in all States.

To support this process the Secretary State generates for each Member State the relevant configuration files by means of a specific tool and distributes these files to all States. Subsequently, the local administrators of the Member States can adapt their configuration within a few minutes.

Service levels and Letter of Intent

So far there is no formal Service Level Agreement. However the EUCARIS Member States signed a Letter of Intent [41], concerning the opening hours, availability and performance of the EUCARIS services, including their Registry systems.

The Prüm Member States intend to draw up such a Letter of Intent as well.

The actual service level offered by each State is reported monthly (see next chapter) and discussed during the yearly EUCARIS Participants Board.

7.2 Management and support

Error handling

At the European level, the EUCARIS environment consists of loosely coupled applications. This implies that there is no dependency between the systems in each Member State. In case of a failure of one of the systems, requests and replies of all other systems are still processed.

Error handling depends on the nature of the failure. Serious failures concerning e.g. network, hardware or authorisation, will result in an immediate error message that is returned to the local client application or the requesting Member State. When no response has been received within the configured time, the requesting country will generate a so called time-out error and inform the client.

The EUCARIS Web client application is able to show incomplete results, consisting of responses from some Member States and error messages from others.

Event logging

The EUCARIS system will report all information messages, warnings and error messages into the Windows Event log, see [35].

The Secretary State has a shortlist with causes and the solutions related to most of the messages and the actions to perform.

Message logging

All messages are optionally logged into the database for auditing, statistics or error handling. Per service there are several message types which can be logged. These message types are:

- Request entering the system from a local client (Web client, customized client)
- Request forwarded to another Member State
- Reply received from another Member State
- Reply returned to the client

- Request entering the system from another Member State server
- Request forwarded to the legacy (Registry system)
- Reply received from the legacy
- Reply returned to the requesting Member State

By using the Web client, an administrator can define for each individual service which message types are logged. So it is possible e.g. to log the Driving Licence Inquiries and not to log the Prüm Inquiries.

First, second and third line support

First line support has to be arranged by the participating country. For second line support the participating country can contact the service desk of the Secretary State (currently RDW). Support is available 7*24 hours. When required, RDW will pass the problem request to Unisys for further support.

Monitoring of availability by Centauri

RDW, in the role of Secretary State, will probe all EUCARIS servers in the network by means of a specific monitoring tool, Centauri. Currently polling has been set to occur each 10 minutes.

The tool sends at regular times for each service a request message to all connected Member States and reacts on the incoming response messages. Both availability and performance are registered. Whenever a system in one of the Member States is not available, this will be reported to the service desk at RDW and appropriate actions will be taken. The Member State involved will be notified. An incident report will be made.

An availability report is published monthly.

Functional support

Functional support concerning the content of individual registrations is given by the service desk of each individual State.

A comprehensive help text is available for the end users as part of the Web client application.