**EGEA Net use cases and high-level requirements**

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# Terms and acronyms

|  |  |
| --- | --- |
| **Term / Acronym** | **Definition** |
| Compliance | A compliant client shall fulfil all requirements included in an existing specification. |
| DMS | Dealer Management System |
| ECSS | Electronically Controlled Safety System |
| EGEA | European Garage Equipment Association |
| EGEA Net | The standard workshop and PTI communication protocol that is the subject of this document |
| ENC | EGEA Net Communicator |
| ENC client | Any device or software (e.g. measurement device or DMS) compliant to EGEA Net specification. An ENC client can belong to a group. Example: a group is constituted by several ENC clients of a PTI test lane |
| ENC server | A piece of software installed in the network that coordinates the exchange of services and data between ENC clients |
| ENC VIP provider | A component of the ENC that has the function to communicate with the VIP |
| EU | European Union |
| IP | Internet Protocol |
| IT | Information Technology |
| MS | Member State |
| Order | A request to perform a task. A status is associated with an order. |
| PTI | Periodical Technical Inspection |
| PTI application | A legally relevant software module that is approved by the national authorities to handle the PTI workflow in the MS |
| rpm | Revolutions per minute |
| RSI | Road-side Inspection |
| test device | A piece of test equipment |
| TBD | To be determined |
| VIP | Vehicle Information Platform – as result of the European Tender MOVE/C4/325-1-2012 |

# Introduction

The EGEA Net is a standard communication protocol and data exchange format for PTI and workshop equipment, defined by a team of experts nominated by the EGEA members, with the following goals:

* easy installation of equipment to be used in PTI test centres, for roadside inspection, in repair and maintenance workshops, or body shop
* public specifications and conformance / validation test plan
* public conformance / validation tools;
* non-profit, non-discriminatory basis;
* single pan-European solution, leveraging existing PTI implementations;
* aligning with the goals of the EU Commission’s roadworthiness package – in particular the generation and secure transmission of harmonised electronic test certificates facilitating the cross-verification of PTI results for improved environment and road safety.

The EGEA Net is expected to bring major benefits to the manufacturers of test equipment and their customers:

* Interchangeability of equipment sharing the same connection protocol, meaning more flexibility in the market and more choices for the customers (PTI centres and workshops)
* Lower development costs for the development and installation of PTI equipment
* Higher reliability, lower maintenance and support costs
* Sharing of costs and resources for developing and maintaining the network specification, software and tools
* Refence solution for countries that have no PTI infrastructure in place, meaning the possibility to expand the PTI market beyond the EU

The EGEA Net is not targeted to a specific set of test equipment or vehicle categories and is designed to be easily extendable while maintaining compatibility with previous implementations of the standard.

# High level architecture

Figure 1 below shows the high level architecture of the EGEA Net within the overall PTI infrastructure. The scope of the EGEA Net is delimited by the dashed rectangle.

The main functions of the EGEA Net are:

* Connect test equipment, data management application (DMS or PTI application) and other services (e.g. data storage). This function is carried out by the “ENC communication server” block and by the “ENC interface” blocks that are shown inside each test device and PTI application.
* Connect to the VIP in order to retrieve vehicle technical data that are needed to carry out PTI. This function is carried out by the “ENC VIP provider” block.
* Provide additional services through a connection to the test equipment manufacturer internet site (e.g. software updates, storage of test results and other custom services). These functions are carried out by the “Additional service providers” block.

The individual test devices will generate their test results and secure them so that they cannot be modified later without recognition. The EGEA Net will transfer the PTI test result from the test devices to the PTI application. However, the integration of the individual test results in a single PTI result and its transmission to the national PTI result database is responsibility of the PTI application and is not in the scope of the EGEA Net.

Figure 1 shows also the possibility of having a remote or mobile inspection centre that can carry out the tests autonomously and then be connected to the main PTI centre to transfer the test results.

*Note: the blocks inside the dashed rectangle “ENC (EGEA Net Communicator)”in Figure 1 are shown as an example of a possible implementation. The use cases and requirements given in this document refer to the ENC as a whole without implying a specific implementation.*



Figure 1: High level architecture of a PTI application using the EGEA Net and connected to the VIP

The same network principles are also applicable to the case of repair and maintenance workshops and body shops.

# Use Cases and requirements for the EGEA Net

This section describes the use cases and operation of the EGEA Net in a PTI or workshop environment.

## General requirements

### Operating systems

The ENC server shall run on Windows and Linux systems (detailed version list is TBD).

The EGEA Net shall support clients running embedded operating systems (including embedded Windows, Windows CE, Linux, iOS, Android).

### Transmission protocols

The EGEA Net shall use the TCP-IP protocol without restrictions regarding the physical layer.

Data loss or corruption shall be detected so that the sender can retry the transmission.

### Data format

A common standard format shall be used for data exchange (e.g. XML, JPG, etc.)

Contents in different languages shall be supported with UNICODE.

### Documentation and specifications

The official documentation and specification of the EGEA Net shall be in English.

Definitions (names, keywords etc.) of the EGEA Net shall be in English.

The EGEA Net shall be based on public specification or source code for open, non-discriminatory use.

## Certification, Installation, Service

The use cases listed in this section cover the operations to be performed before the network can be used. Refer to COM2012-380 proposal, Article 11 and Annex V for background information on this section.

### Initial installation of the workshop network

Pre-Requirement: a working IP infrastructure in the workshop.

A piece of software, called “EGEA Net Communicator server” or “ENC server”, shall be installed in one PC in the network. The installation shall be easy enough that every user can follow the installation instructions.

Setting up the network infrastructure and configuration (e.g. router configuration, IP settings, etc.) is not in the scope of this use case: the IT infrastructure is supposed to be already in place.

Once the ENC server is installed all EGEA Net capable clients (see 4.2.2 for definition) can detect it and establish a connection.

The ENC server shall ensure that no other instance of an ENC server is already available; in other terms, the ENC clients will only detect a single ENC server.

The ENC server can be configured for automatic or manual acceptance of ENC clients. In the first case, all ENC compliant clients will be automatically accepted. In the second case, it shall be possible to manually configure the ENC server with the list of clients to be accepted.

### Verification of compliance of a new ENC client

Before a new ENC client (e.g. device or DMS) can be distributed and deployed as “EGEA Net capable”, its software shall be certified by an EGEA Net certification authority.

A conformance test plan and a corresponding conformance test suite shall be available to allow all companies to verify compliance in advance. The test suite shall be available also as source code for ease of debugging and troubleshooting. The test suite has to be maintained and updated as new features are implemented in the EGEA Net or if problems are found in the field.

Certification steps:

 1. Register for certification; receive the test suite and whatever else is needed (e.g. electronic certificate)

 2. Carry out all tests locally following the test plan and using test tools of the suite

 3. Complete the official certification procedure

*Note: the certification concept and the use of the EGEA name in the certification process needs to be approved by the EGEA board.*

### Install a new ENC client at a customer

When a new ENC client is installed, it can detect an ENC server running in the network. If needed, the user has to enter only the configuration data required for the ENC client.

The user does not have to carry out any ENC server configuration when a new client is introduced, if automatic acceptance is enabled on the ENC server.

If groups are used, the ENC client shall allow the user to assign a group name (e.g. “TestLane1”) and optionally a sequence number within this group.

Regardless of whether automatic acceptance is enabled or not on the ENC server, the new ENC client registers itself automatically with the ENC server.

### Status report of EGEA Net and of connected ENC clients

The user can request the ENC server to perform a connection and communication test.

Output: list of all connected ENC clients with their communication status and additional information as, for example, client identification and software version.

It shall be possible to retrieve the status of connected ENC clients even with a non-running or non-functioning ENC server, using an external diagnostic tool.

### Introducing new ENC client types and new services

Introduction of new ENC client types and new services shall be possible without affecting existing implementations (ENC server and clients), so that backward and forward compatibility is possible.

### Adding new information to existing services

It shall be possible to add new types of information without affecting existing implementations (ENC server and clients), so that backward and forward compatibility is possible.

This means that unknown fields in existing services shall be ignored.

### Software Updates

To enhance security of EGEA Net, access to Internet can be limited to the minimum required. A simple mechanism can be implemented in the ENC server to allow ENC clients to update their software with the following functionalities:

• Check of availability of ENC client software update on a given schedule

• Download of the update and make it available to the ENC client

• Notification to the ENC Client.

The ENC client shall notify the user that an update is available; the user is responsible for launching or not launching the update installation.

The ENC Client is responsible for checking the authenticity of the software package and should only allow installation of an authenticated software package.

### Retrieve test device information

The ENC clients shall provide their identification data (PTI relevant: e.g. serial number, calibration expiration) through the ENC server.

Typically this information is used by the PTI application to allow management tasks (e.g. verification of configuration, temporary replacement of faulty devices, etc.).

### Network diagnosis and troubleshooting

An analysis and diagnosis tool shall be available for the ENC, to allow troubleshooting of the ENC server and ENC clients running in the network.

The ENC server shall provide, on request, the list of all available services and the list of currently available services.

## Perform a PTI

The use cases listed in this section cover the operations to be performed when the network is used to carry out PTI.

Precondition: the ENC is correctly configured for accessing the VIP. This configuration is typically done manually.

### Creating an Order and tracking the Status

Orders are created by ENC client, e.g. DMS or PTI application, and sent to the ENC server.

The ENC server is queried for orders.

Each ENC client can register as listener to order and status changes.

The ENC server buffers the orders.

ENC clients can send information regarding their status and changes to the order data.

### Time synchronization

The ENC server shall be able to provide a reference time to be used by all ENC clients as time reference.

### Retrieve Vehicle PTI data from the VIP

Refer to COM2012-380 proposal, Preamble points (11) and (25), article 4 point 3.

In order to perform a PTI the test equipment needs a certain amount of technical information on the vehicle.

ENC clients can ask the ENC server about vehicle data. The ENC server / VIP provider shall request vehicle data to the VIP and make them available to the ENC clients.

Note: some data processing in the ENC VIP provider may be required to adapt to different data formats coming from different countries or sources. The final scenario is not known at present, so data processing is not in the current scope.

### Retrieve Vehicle data from the National Register

The PTI application connects to the National Register and exchanges vehicle identification data that are relevant to carry out PTI. Each MS can set specific requirements on the communication with the National Register and on the overall data exchange procedure.

In some MS the operation must be authorized by a central authority and a result is expected for each request of vehicle data. Such authorization may be handled via an electronic token. The token (authorization) is completely handled within the PTI application. If the token has to be included in the test result, it has to be added to the vehicle information sent to the test devices.

In some MS the PTI application will allow the user to correct the vehicle data and send them back to the National Register.

The PTI application holds session data (user, test devices, results, token, etc.).

This use case does not add any requirements for the ENC, as additional data are handled by the ENC in the usual way.

### Perform PTI tests

In this use case tests and measurements are carried out according to the PTI procedure, without interaction with the EGEA Net, except for the case of live data exchange (section 4.4.2).

Refer to COM 2012-380 proposal, article 6 and Annex II, ISO 18541-1 UC 5.1.4

### Transfer PTI result

After the test device has finished the measurement, it secures the test result according to the local requirements and sends the data to the ENC. The ENC shall not encrypt the data; however it shall be able to transfer encrypted data. If a token must be added to the result, this has to be done by the test device. The ENC does not have to decrypt, interpret or complete the data.

The ENC shall buffer the results until it can send them to the consumer of those results, e.g. DMS or PTI application.

Data are handled as binary data: this means that any kind of information can be exchanged in any formats.

It is responsibility of the PTI application to combine all test results in a “roadworthiness certificate” and communicate it electronically to the national PTI result database (refer to COM 2012-380 proposal, preamble points (22) and (24), article 8 and article 15).

The format of the roadworthiness certificate and the transmission protocol may be specific of the MS.

Other typical features of the PTI application that are not in the scope of the ENC may be:

* Journaling of any changes and additions done to the test results
* Guarantee privacy of sensitive information transferred over the internet
* Maintain traceability of test results to the test devices

*Note: this section assumes that the PTI application sends the combined result to the national PTI result database. Therefore the use case of sending PTI test results to the VIP is not in the scope of the ENC.*

### Retrieve PTI results

The PTI application as well as any other ENC clients can request via the ENC former PTI results. The PTI results will be retrieved from the VIP.

### Road-Side inspection

RSI runs in a similar environment as in a PTI centre. An ENC is required and all involved ENC clients (e.g. test devices, PTI application) have to register with it. The process is the same as for PTI.

### Perform the PTI in an intermediate scenario

There are cases where a “local” ENC runs on a mobile workstation or notebook disconnected from the main PTI centre. This may happen for example in a mobile PTI test lane or for testing purposes. If this workstation or notebook is connected again to the PTI centre, the local ENC shall not disturb the PTI environment.

When connected to the PTI centre, the local ENC shall transfer all results to the ENC in the network. This ENC treats the results in the same way as its own. The local ENC can delete all results after the results have been transferred to the ENC in the network.

## Interaction between clients

### Trigger action (e.g. camera)

An ENC client requests the ENC that an action is performed on a specific ENC client type. The ENC checks if such an ENC client type is available. If so it sends the request to the ENC client of the given type. If group information is available, the request will be sent to the ENC client in the same group of the requestor.

The ENC client checks if the conditions exist for the action to be performed (e.g. action is supported and available) and returns the status via the ENC to the requestor.

If the action cannot be performed, no attempt is made by the ENC to correct the problem, e.g. by selecting a different ENC client.

### Exchange live data

Some examples where exchange of live data may apply are:

* Power testing combined with emission testing
* ASM (5015 and 2525) test – acceleration simulation mode
* Smoke opacity lug down test
* Readout of rpm and temperature from an OBD test device during emission testing
* Readout of diagnostic information from an OBD test device during ECSS testing

The communication shall be possible directly and via the ENC.

The ENC client requests information to the ENC about the data provider; the request contains the required data exchange parameters (e.g. update rate). The data provider is another ENC client.

The requesting ENC client sends the request to the ENC or directly to the data provider to start the transmission of measurement data.

The requesting ENC client stops the transmission by sending a stop-request to the data provider where the start request was addressed.

### Remote Control

Remote control allows an ENC client to request another ENC client to perform a command. The request contains the needed information to execute the command. The target ENC client can reply with a single answer or with multiple answers as in 4.4.2 “Exchange live data”.

## Vehicle Diagnosis and Repair

The use case in this section covers the operations to be performed when EGEA Net is used to carry out vehicle diagnosis and repair. No additional requirements are introduced here respect to the PTI use cases listed in the previous sections.

The same format and data definition for vehicle information and test results as defined for PTI shall be used if available. Otherwise data definition will be extended or custom definitions may be used. The process and authority for the extension of data definitions is to be defined.
Custom definitions shall not affect operation of other devices that do not support or know about them.

### Creating an Order and tracking the Status

Test devices and DMS are ENC clients.

The DMS can add one or more orders into the ENC.

ENC clients are querying the ENC for orders.

The ENC shall buffer the orders. Each ENC client can register as listener to order and status changes.

ENC clients can send information regarding their status and regarding changes to the order data.

### Send test results

The test device sends the result to the ENC and the ENC forwards it to the dedicated ENC client, e.g. storage application or DMS for subsequent actions depending on the process flow (e.g. accounting, ordering of spare parts, etc.).

### Retrieve previous test results

The ENC clients can request previous test results. Note: the service of storing and retrieving former test results is provided by dedicated ENC clients, e.g. DMS or storage application.

## Security requirements

A mechanism shall be provided to identify the originator of the test results and the authenticity of the contents.

Each PTI test device shall generate a digest of the test result and sign it with the private key of the device manufacturer (using SHA.1 and RSA algorithms or other algorithms TBD)

Local regulation may require additional information, for example traceability data of the test device.

Use of security is optional for the diagnosis and repair use cases (section 4.5).

# Possible future use cases

The following use cases are not in the initial scope of the ENC, but could be covered in future upgrades with the addition of the features needed to comply with the regulatory requirements.

## End of life disposals

### End of life for AC and cooling systems

Safe and complete removal of the AC refrigerant and coolant from the vehicle.

### End of life of other fluids

Safe and complete removal and disposal of fluids other than AC refrigerant and coolant (e.g. engine oil, transmission oil, brake oil, …) from the vehicle.

### End of life of batteries

Safe and correct removal and disposal of batteries from the vehicle.

### End of life deployment of pyrotechnic devices

Give evidence of in-vehicle deployment of all pyrotechnical components installed.

## Audit trails

### Audit trail of fluid refrigerants

Recording of refrigerant usage.