Verbundprojekt OrGoLo:
Organisatorische Innovationen mit Good Governance in Logistik-Netzwerken

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OrGoLo-Projektbericht Nr. 20

ORFE: Online Rail Freight Exchange
– a software prototype for the configuration
of multi-modal supply chains focused on rail freight traffic
along the Alps Transversal Rotterdam-Genoa –

Förderkennzeichen: 01IC10L20A
Preface to the ORFE context of the joint project OrGoLo

Rail freight traffic suffers from three characteristic constraints. Firstly, from a business point of view it often only pays off with a transportation distance over 300 km and with an amount of goods filling at least one wagon (single wagon traffics), but preferably larger groups of wagons and even block trains. Therefore rail freight traffic only puts itself forward for bigger, inter-regional distances within Germany, but especially for demanding logistics projects in trans-European freight traffic. Secondly, numerous consigners (“forwarders”) and recipients of goods to be transported do not have an own railway siding available. Rail freight traffic therefore exhibits the largest economical potential in the form of the so-called combined freight traffic. This means that goods are transported by rail with low costs and minor environmental pollution – especially with regard to the emission of climate-damaging greenhouse gases. On the contrary, the supply as well as the distribution traffic during pre-carriage and onward carriage is processed on roads by truck to a large extent. Freight traffic by means of inland waterway and of sea-going vessels frequently comes in addition with very large-scale “global” supply chains. By this multi-modal supply chains are created in which at least two, often even three carriers of traffic – railway, road and where required waterway, too – are combined. Thirdly, rail freight traffic in general as well as the combined traffic with freight traffic on railway in the main carriage in particular is marked by a wide range of bilateral contractual relationships and contract negotiations. These lead to high-grade non-transparency of the market for freight traffic services using rail freight traffic in the main carriage.

With this background a software prototype for an online freight exchange has been developed at the Institute of Production and Industrial Information Management (PIM) in Essen. Its main focus lies on rail freight traffic in the main carriage, but also refers to possible participation of the transport carriers road and waterway in pre-carriage and onward carriage. Transportations along the so-called Alps Transversal Rotterdam-Genoa – the trans-European “Corridor 24” for freight traffics – have been chosen as a “paradigmatic” example for demanding logistics projects. These transportations prove to be compatible on the waterway for even more complex logistics projects, which e.g. include transportations to or from the ports in Rotterdam or Genoa from over the Atlantic Ocean or the Mediterranean Sea in pre-carriage or onward carriage. The main goals of this prototypical development of an online freight exchange were, firstly, to strengthen the competitiveness of the rail freight traffic within the above outlined combined freight traffic, secondly, to transfer transportations from the road primarily on the railway and secondary on the waterway from an economic point of view and, thirdly, to increase the transparency of the market for freight traffic services concerning the rail freight traffic in the main carriage by means of an exchange.

By the development of the software prototype ORFE (Online Rail Freight Exchange) academic and even practical new ground has been broken because there are numerous online freight exchanges for road freight transport via truck, but only very few and in the business practice mostly rudimentary used online freight exchanges for rail freight traffic.

The project work began with an extensive requirement analysis, which has been comprehensively documented in Klippert/Kowalski/Bruns (2010)\(^1\). On the basis of this requirement analysis a first version of the software prototype was developed. The conception and implementation work based

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on a modern web application framework was decisively accomplished by a postgraduate of the PIM Institute, Mr. René Föhring. A large part of conceptualizing and implementing the software took place within the EU joint project CODE24 – Corridor 24 Development Rotterdam-Genoa – and was promoted until mid-January 2013 with funds from the European Union within the framework “Strategic Initiatives Framework” of the program INTERREG IVB NWE. Already some time ago an association application of the joint project CODE24 was filed with the “EffizienzCluster LogistikRuhr”, in which the joint project OrGoLo (“Organisatorische Innovationen mit Good Governance in Logistik-Netzwerken”) is rooted.

At the same time transportations along the so-called Alps Transversal Rotterdam-Genoa within the joint project OrGoLo function as a “paradigmatic” example for complex logistics projects, in which a configuration of multi-modal supply chains from two often competitive points of view is planned: On the one hand the efficiency of the rail freight traffic (“competiveness”) is to be strengthened sustainably and on the other hand the ecological burden due to freight transports is to be reduced as widely as possible. Therefore, the findings which were collected by the Institute PIM in the context of the now run out joint project CODE24 are realized in the currently implemented joint project OrGoLo in the manner of a “spill over”.

Within the joint project OrGoLo the software prototype ORFE is introduced to the business partners of the joint project in the environment of the Duisburger Hafen AG (“duisport”) in the form in which it was developed by the Institute PIM – especially by Mr. René Föhring – in order to test and to evaluate critically the practical suitability of the software prototype ORFE. The transfer agency DIALOGistik Duisburg will serve as a meeting place between science and practice. The transfer agency was initiated by three sister projects of the “EffizienzCluster LogistikRuhr” (CoReLo, OrGoLo and WiWeLo) with the goal to introduce results, like e.g. software tools that were developed by the three sister projects, to interested companies in the business practice of logistics and to refine them together with these companies according to their needs. The authors of this project report would be very pleased if there were interested parties in the joint project OrGoLo for the prototypical online rail freight exchange ORFE, who aspire a mutual advancement of this software prototype. This could happen e.g. by the means of a spin-out of the university or by “headhunting” excellent postgraduate students from the university team.

Essen, February the 8th 2013

Univ.-Prof. Dr. Stephan Zelewski

2) With the expiring of the financial promotion of the Institute PIM in the context of the joint project CODE24 mid-January 2013 the Institute PIM is no longer participating at the joint project CODE24. Though, within the joint project CODE24 a consortium under the direction of the regional association FrankfurtRheinMain is working on a professional reimplementation of the software prototype of the Institute PIM and on a corresponding operating concept. Companies that are interested in coming into touch with this development work within the joint project CODE24 (in which the Institute PIM is not involved anymore due to the lack of financial support) are cordially invited to contact the following reference persons: a) Mr. Peter Endemann, Regionalverband FrankfurtRheinMain, Poststraße 16, 60329 Frankfurt am Main, E-Mail: endemann@region-frankfurt.de; b) Mr. Thomas Kaspar, TransCare AG, Kreuzberger Ring 62, 65205 Wiesbaden, E-Mail: t.kaspar@transcare.de.
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1 Installation of the software prototype

1.1 Preliminary remarks

This instruction describes how to install RVM\(^3\), Ruby\(^4\), RubyGems\(^5\), SQLite\(^6\) and Bundler\(^7\) as well as Rails\(^8\) on a system with the Linux operating system Ubuntu\(^9\) in the version 12.04 so that the software prototype can be installed and started.

The shown steps can be performed analogously on a series of other operating systems as well as younger and older versions of the operating system Ubuntu. In this instruction, only Ubuntu 12.04 will be discussed exemplarily.

If the software prototype will be used only for demonstration purposes and if there is no computer with Ubuntu (or another Linux operating system) available, it is recommended to install the software prototype in a virtual machine. To that end, the freely available virtualization software Oracle VM VirtualBox lends itself.\(^10\)

It should be noted that the configuration discussed hereafter is applicable for the use of a development and demonstration server. For the productive application it is advisable to further install a sophisticated webserver system like Apache\(^11\) or nginx\(^12\) as well as the use of MySQL\(^13\) instead of SQLite. However, the configuration discussed below is absolutely sufficient for the application field of the present software prototype.

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3) RVM is a release manager for the deployment of several strictly separated Ruby installations. Further information can be found at https://rvm.io/.

4) Ruby is the underlying coding language of the software prototype. Further information can be found at http://www.ruby-lang.org/de/.

5) RubyGems is a package manager for Ruby. Further information can be found at http://rubygems.org/.

6) SQLite is a SQL-compatible database system which is especially suited for small and integrated databases. Further information can be found at http://www.sqlite.org/.

7) Bundler is a system for the management of Gem-dependencies. Further information can be found at http://gem-bundler.com/.

8) Rails is the web framework underlying the prototype. Further information can be found at http://rubyonrails.org/.

9) Ubuntu is a Linux operating system. Further information can be found at http://www.ubuntu.com/.

10) With the aid of virtualization software, virtual machines can be simulated on one’s own computer. On such virtual machines, Linux operating systems like Ubuntu can be installed. Further information can be found at https://www.virtualbox.org/.

11) Apache (actually Apache HTTP Server Project) is a popular web server. Further information can be found at http://httpd.apache.org/.

12) nginx is a web server. Further information can be found at http://nginx.org/.

13) MySQL is popular SQL-compatible database system. Further information can be found at http://www.mysql.com/.
First, the installation of RVM (Ruby Version Manager) will be covered below and after that the installation of Ruby (in the version 1.8.7) and also of Bundler. Among others, Git\textsuperscript{14}, Subversion\textsuperscript{15}, OpenSSL\textsuperscript{16} plus SQLite3 will be installed implicitly.

In what follows, it will be always assumed that the user has internet access from the local computer and that the user can access the system through the Linux command \textit{sudo}\textsuperscript{17}. Furthermore, basic comprehension of computer systems is presumed. The present instruction does not provide a basic course in the administration of Linux operating systems, but is yet to ensure an access as easy as possible to the use of the software prototype for interested users, even if they are not or are only to a minor degree well versed in the used technologies of the software prototype.

In the course of this instruction, various operations will be described that are necessary for the installation of the software prototype on a newly installed Ubuntu operating system and that require an input into a shell. The commands to be executed in this shell by the user will be displayed indented in this instruction.

\begin{center}
\textbf{# Example for a command to be executed}
\end{center}

These commands have to be entered and confirmed with the Enter key. Following these commands noted indented a screenshot will be featured regularly showing the successful execution of the command.\textsuperscript{18}

A final, technical remark: One should never install Ruby, RubyGems or any other Ruby relevant packages via the package manager \textit{apt}\textsuperscript{19}. The system is not up to date and can therefore lead to major problems in the long run. With the help of the application of the Ruby Version Manager demonstrated here, such problems can be avoided from the outset.

\begin{flushleft}
\textsuperscript{14} Git is a distributed version control system. Further information can be found at \url{http://git-scm.com/}.
\textsuperscript{15} Subversion is a centralized version control system. Further information can be found at \url{http://subversion.tigris.org/}.
\textsuperscript{16} OpenSSL is a free software for Transport Layer Security. Further information can be found at \url{http://www.open-ssl.org/}.
\textsuperscript{17} \textquotedblright sudo\textquotedblright \ stands for \textit{substitute user do} and is a unix command that serves the execution of processes with the rights of another user. In the case at hand, \textquotedblright sudo\textquotedblright \ is used for the execution of the specified commands with the rights of the super user \textit{root}.
\textsuperscript{18} It should be noted that the depicted screenshots are exemplary for the Linux operating system Ubuntu 12.04. An output that differs from the screenshots shown here does not necessarily mean the failure of a command.
\textsuperscript{19} Apt is a package manager for Linux. Further information can be found at \url{http://www.debian.org/doc/manuals/apthow-to/index.de.html}.
\end{flushleft}
1.2 System preparation

First of all, it should be ensured that the most recent sources for the package manager `apt` are available. For this purpose, a shell has to be launched (as to that, hit the “Windows key” on the keyboard or click on the Ubuntu symbol on the sidebar under Ubuntu 12.04, then enter “shell” and confirm with ENTER).

![Figure 1: Launching the shell](image-url)
From now on, commands will be entered into this shell to install the components necessary for launching the software prototype. Figure 2 shows the launched shell.

![Launched shell](image)

**Figure 2: Launched shell**

First, the prompt is displayed in the newly launched shell.²⁰ The following command has to be executed in order to update the sources of the package manager:

```
sudo apt-get update
```

Figure 3 shows the input of the command into the shell; Figure 4 shows the output after its execution. Hereafter, the entry of a command will not be accompanied by an additional figure, because of reasons of redundancy. From now on, only the output of the command will be displayed.

---

²⁰ The prompt is “code24@local:~$” in the shown figures. However, this indication is to be regarded as an example only, as the prompt of a shell indicates which user (“code24”) operates in the current shell on which computer (“local”) in which directory (“~”) and mode (“$”). Thus, the prompt will vary on a different computer if one of the before mentioned factors deviate even if the same Linux operating system is used.
Figure 3: Entry of the first command

code24@local:$ sudo apt-get update

Figure 4: Update of the package manager
Next, the version control system *git-core* as well as *curl* and a package named *build-essential* will be installed, which is necessary for the compiling of Ruby.

```
sudo apt-get install build-essential git-core curl
```

The question, if the software should be actually installed, must be confirmed with “Y”.

![Installation of required packages](image)

*Figure 5: Installation of required packages*
After the successful installation of **git-core** and **curl**, Ruby Version Manager can be installed with the following command:

```
curl -L get.rvm.io | bash -s stable
```

![Figure 6: Installation of Ruby Version Manager](image-url)
The advantage of this method is that it installs Ruby on the *home* directory and thus provides a *sandbox* environment for the software prototype.

Up next, a line has to be added to the file `~/.bashrc`. This can be achieved with the following command:

```bash
echo '[[ -s "$HOME/.rvm/scripts/rvm" ]] && source "$HOME/.rvm/scripts/rvm"' >> ~/.bashrc
```

Following this, the file `~/.bashrc` has to be reloaded:

```bash
. ~/.bashrc
```

Both commands do not produce an output as one can see in figure 7.

![Figure 7: Configuration of the RVM script](image-url)
After that, several packages have to be installed with the help of the package manager `apt`:

```
sudo apt-get install build-essential openssl libreadline6 libreadline6-dev

curl git-core zlib1g zlib1g-dev libssl-dev libyaml-dev libsqlite3-dev sqlite3

libxml2-dev libxslt-dev autoconf libc6-dev libssl-dev libyaml-dev

subversion libmysqlclient-dev
```

Here, too, the installation of the packages has to be confirmed by the additional input of “Y”.

![Installation of other required packages](image)

**Figure 8**: Installation of other required packages
1.3 Ruby

Since the Ruby Version Manager has been installed and loaded by now, the software Ruby can be installed in the next step in the required version 1.8.7 with the following command:

```
rvm install 1.8.7
```

An information page is displayed that must be closed with “q” before the installation of Ruby through compiling begins.

![Figure 9: Information on compiling of Ruby](image-url)
The execution of this command takes several minutes, as a version of Ruby 1.8.7 and RubyGems are now being downloaded, compiled and made available as a sandbox for the local computer.

![Figure 10: Compiling of Ruby](image-url)
Once the process is completed, Ruby 1.8.7 can be activated with the following command:

```
rvm use 1.8.7
```

An output informs about the fact that Ruby is now being used in the version 1.8.7.
1.4 Execution of the installation

Henceforth, it will be assumed that the software prototype has been extracted into a directory named `~/.freight-exchange` (if another path has been chosen, the following explanations apply analogously for this path).

```bash
cd ~/.freight-exchange
```

The question whether it should be trusted the local file `.rvmrc` is to be confirmed with “Y”.

![Figure 12: Confirmation of the confidentiality of RVM](image-url)
Next, the software Bundler has to be installed.

```
gem install bundler
```

![Installation of Bundler](image)

**Figure 13:** Installation of Bundler
Afterwards, Bundler resolves any other dependencies:

```
bundle
```

The software Bundler now installs all RubyGems required for running the software prototype.

---

**Figure 14: Execution of Bundler**

---
Before the database can be initialized, the database configuration has to be set up. The software prototype contains two configuration examples (one for SQLite3 and one for MySQL). Thus, for example, the SQLite3 template can be activated with the following command:

```
> cp config/database.yml.sqlite3 config/database.yml
```

![Database Configuration Example](image)

**Figure 15: Adopting of an exemplary database configuration**

At this point, the example of the SQLite3 template is used for the database configuration, as this configuration is less elaborate and is considered as being sufficient for the purpose of running a test and demonstration installation.

Alternatively, at this point, a template for the configuration of a MySQL database does also exist, in which, however, the data concerning the database name, the user name and the password have to be adapted in case of doubt.
Subsequently, the database is being generated:

```
rake db:setup
```

![Database Initialization](image)

**Figure 16: Initialization of the database**

The initialization of the database can take some time depending on the server hardware and the used database system, as in doing so, a great number (approx. 35,000) of stations are being loaded and validated into the database of the software prototype:
If the entry of the complete station list is not wanted, the initialization of the stations can be circumvented with the following chain of commands:

\[ rake db:create \]

\[ rake db:migrate \]

But since the highest possible number of examples of stations is on behalf of potential prototype users, it is advised against this step.
After the database is set up successfully, the web server has to be launched:

```
rails server
```

![Figure 18: Start of the application server](image)

Now, a Rails server is being started on port 3000 under the address of the computer (for the local computer 127.0.0.1 or `localhost`).
The system assistant can be found now under the URL of the server.

![Image: URL of the server](URL)

**Figure 19: URL of the server**

With the help of the system assistant, the administration account for the online freight exchange (the so called “admin user”) can be created, a demo company can be managed and the settings of the prototype installation can be conveniently adjusted within a graphical interface.

![Image: System assistant](URL)

**Figure 20: System assistant**

As a first measure in every new installation of the software prototype, the automatically created user (“admin user”) provided with administrator rights should be edited and the login data should be changed. A click on “Editing your admin user” opens up a view in which the default user/password combination (admin/admin) as well as the default e-mail address can be edited.
Because of safety reasons it is advisable to choose a safe username/password combination at this point. Also, an existing e-mail address should be entered so that the password can be reset in case of doubt.

After the admin user has been edited, one gets back to the administrator interface through the link “Administration” on the navigation bar. With this, the basic configuration of the software prototype is completed.

---

21) Longer user names and passwords are generally safer than shorter ones. An application of numbers and special characters alongside normal characters further increases the safety.
2 Features for end-users of the software prototype

2.1 Preliminary remarks

All following views of the software prototype depicted with the help of screenshots, have been created with the aid of the demo company which can be established with the system assistant (see installation of the software prototype).

The figures have been added to the project report as exemplary depictions and reflect the state of the software prototype at the time of drafting the project report. In some cases, the figures do not reflect the whole website (see for example Figure 22), but only an enlarged section of the respective view (see for example Figure 226).

![Figure 22: Full side view](image)

Due to the redundancy of the navigation and search bar at the top of the screen, they will be removed in most cases on behalf of better legibility of the content in the figures of the software prototype (see for example Figure 25).
2.2 Access to the online freight exchange

2.2.1 Registration of a new company

Before an initial business contact can take place via the online freight exchange all future participating actors have to register at first with the online freight exchange. To that end, the potential user selects the corresponding input mask and follows the steps depicted in Figure 23.

![Figure 23: Registration of a new company](image)

Is the data entered by the user valid, his company will be registered with the system and the potential user will be an active end-user. In the context of this report, “end-users” are the users of the online freight exchange and differ from “operators” in that the latter has advanced administration rights within the system of the online freight exchange.

Below, it will be demonstrated with the help of screenshots how an end-user can register with the system of the online freight exchange. If a potential end-user calls up the website of the online freight exchange, he sees a welcome screen.
At this point, the end-user can choose if he already has a user account at the online freight exchange at his disposal and wants to login or if he – for want of a user account – wants to register his company with the system of the online freight exchange.
If the end-user wants to set up a new user account for his company, he clicks on “register” and is being directed to the input mask for the registration of a new company.

**Create company account**

**CREATE YOUR COMPANY ACCOUNT**

You are just 60 seconds away from your own account

<table>
<thead>
<tr>
<th>Company information</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Personal information</th>
<th>Gender*</th>
<th>Forename*</th>
<th>Surname*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mr.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Login credentials</th>
<th>Username</th>
<th>E-Mail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Choose a username to log in to the service

Enter your e-mail address here

<table>
<thead>
<tr>
<th>Password</th>
<th>Password (again)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Choose your password carefully

Please repeat your password

<table>
<thead>
<tr>
<th>Notifications (optional)</th>
<th>Notify by e-mail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Create User

**Figure 25: Registration form**

In the displayed form, information concerning the company as well as personal details of the primary user of this company is being recorded. Moreover, the end-user chooses a user name, a password and enters an e-mail address. He can decide optionally whether he wants to receive notifications about new advertisements within the online freight exchange only in the system of the online freight exchange or if he wants to be informed via e-mail as well.

The primary user of a company is automatically being endowed with the necessary rights in order to be able to create other users later on.
2.2.2 Login as an existing company

If the end-user already has a user account, he clicks on “Login” and is directed to the input mask for the login procedure. Here, he can login with his username/password combination or he can get a new password with a click on “password forgotten”.

Figure 26: Input mask for the login procedure

Alternatively, the user can login as a user of the demo company by clicking on one of the buttons on the right side if the relevant instance of the software prototype is run in demo mode.

Figure 27: Input mask for the login procedure with demo users

The option to login as a member of the demo company is only given if the demo company exists.
2.3 Advertisements for transport offers

2.3.1 Overview

Subsequent to the registration or login procedure the end-user is presented with the user interface of the online freight exchange with a view of all advertisements for transport offers.

![All transport offers](image)

Figure 28: Overview of all advertisements for transport offers

2.3.2 Creating a new advertisement for a transport offer

If a user wants to create an advertisement, he thereby wants to send a signal that he is ready for an initial business contact. He is ready to offer a service (the transport of freight) and, concerning this, has to describe the service exactly.

Figure 29 depicts schematically the necessary steps concerning this.
If all mandatory data are valid, the advertisement is stored within the system and released from the date of its validity.

If the end-user wants to create a new advertisement for a transport offer within the software prototype, he clicks on the button “New transport offer” at the top right.

Afterwards he gets to the input mask for creating a new advertisement for a transport offer.
**New transport offer**

**NEW TRANSPORT OFFER**

The fields with an asterix (*) are mandatory:

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contractor</td>
<td>Demontage Sprenger AG</td>
</tr>
<tr>
<td>Posting valid from*</td>
<td>2012-11-05</td>
</tr>
<tr>
<td>Posting valid until*</td>
<td>2012-11-12</td>
</tr>
</tbody>
</table>

**Time frame:**

<table>
<thead>
<tr>
<th>Frequency*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

**Loading site:**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sidetrack available?</td>
<td>Yes</td>
</tr>
<tr>
<td>Loading station</td>
<td></td>
</tr>
<tr>
<td>Search by number or name</td>
<td></td>
</tr>
<tr>
<td>Contractor</td>
<td></td>
</tr>
<tr>
<td>Street</td>
<td></td>
</tr>
<tr>
<td>(continued)</td>
<td></td>
</tr>
<tr>
<td>ZIP</td>
<td></td>
</tr>
<tr>
<td>Origin city</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Germany</td>
</tr>
</tbody>
</table>

**Unloading site:**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sidetrack available?</td>
<td>Yes</td>
</tr>
<tr>
<td>Unloading station</td>
<td></td>
</tr>
<tr>
<td>Search by number or name</td>
<td></td>
</tr>
<tr>
<td>Contractor</td>
<td></td>
</tr>
<tr>
<td>Street</td>
<td></td>
</tr>
<tr>
<td>(continued)</td>
<td></td>
</tr>
<tr>
<td>ZIP</td>
<td></td>
</tr>
<tr>
<td>Destination city</td>
<td></td>
</tr>
<tr>
<td>Country</td>
<td>Germany</td>
</tr>
</tbody>
</table>

**Transports**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Own means of transport present?*</td>
<td>No</td>
</tr>
</tbody>
</table>

**Additional information:**

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact Person</td>
<td></td>
</tr>
</tbody>
</table>

**Company categories:**

<table>
<thead>
<tr>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railway undertakings</td>
</tr>
<tr>
<td>Forwarding agents</td>
</tr>
<tr>
<td>Operators of combined cargo</td>
</tr>
<tr>
<td>Loading agents</td>
</tr>
</tbody>
</table>

**Create posting**

---

Figure 31: Form for creating new advertisements for transport offers
In the section “basic data” the name of the offering company as well as the start and end point of the validity of the advertisements are being entered.

![Figure 32: Basic data](image1)

The field “company name” is already pre-filled with the name of the company. The advertisement will not be visible for other end-users of the online freight exchange before the date entered in “advertisement valid from”. After that, the advertisement is visible for the companies specified in the subsequent course of creating it until the date entered in “advertisement valid until”.

In the section “Timeframe” it can be decided on the frequency of the offered transports. At this, the end-user can select from a number of intervals.

![Figure 33: Selection of the frequency of the transport offer to be created](image2)

If he selects, for example, “weekly” the input mask expands.

![Figure 34: An exemplary selection of a weekly frequency](image3)

Now, the end-user can enter in what time frame the offered transports will be available and how often the transports will take place within the entered interval.
In the sections “loading site of the freight” (and “unloading site of the freight”) the track and address data of the loading site (and unloading site) are entered.

If a railway siding is available, stations with a railway siding from a wide range of Europe can be chosen through the station search. Once the beginning of the name of one or more stations is entered into the field loading station (or unloading station), the software prototype shows a selection of stations containing the entered part of the name in their description.
Alternative to the search by name, the station number can be entered as well. Here, too, do suggestions for possible stations appear from the database of the online freight exchange after entering the first positions.

In the section “transport data” the end-user selects whether his transport offer contains only traction or if freight cars are offered too.

If the transport offer also contains freight cars, they can be chosen from a list.

If the concerning type of wagon cannot be found in the list, the end-user can chose the option “other” and enter specifications of his wagon type as a free text.
In the section “other information” the end-user can select a contact person for the advertisement from the registered users of the company. Later on, the contact details of this person will be displayed clearly visible beside the advertisement, so that potentially interested parties can quickly see who will answer further questions regarding the advertisement.

![Figure 40: Selection of the contact person](image)

Finally, the end-user chooses in which company categories the advertisement should be displayed. If he does not make a choice, the advertisement will be visible for all companies registered with the online freight exchange. Otherwise, it is only visible for those belonging to the specified company categories. Additionally, there is the possibility of specifying an individual company category by using a free text field.

![Figure 41: Selection of the company categories](image)

With a click on “create advertisement for a transport offer” the end-user finalizes the creation of the advertisement.

### 2.3.3 Viewing advertisements

After an advertisement has been created, it is given a unique advertisement number and will be published for the time of its validity.

In the detail view of the transport offer all details entered previously into the input mask are displayed.
Figure 42: Detail view of a transport offer

On the right side, the contact details of the advertising company as well as optionally the contact details of the individually selected contact person are listed.

Figure 43: e-mail to the provider

The navigation below the unique advertisement number gives the user the opportunity to write a direct e-mail to the advertising user. With a click on “e-mail to the provider”, the e-mail software of the user opens up with a pre-filled e-mail that refers to the advertisement within the software prototype.

2.3.4 Answering advertisements

Advertisements for transport requests can be answered with a corresponding advertisement for a transport offer. Thus, it is possible to advertise a transport offer semantically linked to the initial request.

Figure 44: Answering advertisements
When the user views an advertisement for a transport request and clicks on “answer with an offer”, an input mask for creating a new transport offer opens up.

**New transport offer**

![Input mask for an advertisement as a reply to a transport request](image)

Unlike normal input masks, a note highlighted in green points out the fact that the advertisement to be created is semantically linked to the answered advertisement for a transport request and that only employees of the advertising company can view the new advertisement.
Transport offer

When the new advertisement is published, a note highlighted in green in the detail view also points out the connection to the original advertisement for a transport request.

2.3.5 Negotiating advertisements

Another option in the detail view of an advertisement is the negotiation.

Transport offer

With a click on “negotiating advertisement” an input mask for creating a new transport offer opens up.
# New transport offer

<table>
<thead>
<tr>
<th>Contractor</th>
<th>Comadingen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Posting valid from</td>
<td>2011-05-02</td>
</tr>
<tr>
<td>(Format: MM/DD/YYYY)</td>
<td></td>
</tr>
<tr>
<td>Posting valid until</td>
<td>2012-11-17</td>
</tr>
<tr>
<td>(Format: MM/DD/YYYY)</td>
<td></td>
</tr>
</tbody>
</table>

**Time frame:**
- **Frequency:** weekly
- **First transport at:** 2012-12-05
  (Format: MM/DD/YYYY)
- **Available until:**
- **Frequency for repeated transports:** 1
  (within the provided timeframe, e.g. per week)

**Figure 48: Input mask of the advertisement to be negotiated**

The input mask is – as can be seen in figure 48 – pre-filled with the specifications of the advertisement to be negotiated. The user has now the possibility to change individual attributes of the advertisement and thus submit a proposal in the negotiation.

<table>
<thead>
<tr>
<th>Time frame:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency:</strong> weekly</td>
</tr>
<tr>
<td><strong>First transport at:</strong> 2013-01-01</td>
</tr>
<tr>
<td>(Format: MM/DD/YYYY)</td>
</tr>
</tbody>
</table>

**Figure 49: Change of the transport period**

For example, the user can change the transport period to signalize that the offer would come into question if the start point of the transports could be at a later date. Afterwards, he saves his step in the negotiation.
The step in the negotiation is now saved in the system of the online freight exchange. Both, the user and the originally advertising user see the advertisement as displayed in the view of Figure 50. Other users cannot track the steps in the negotiation.

The initially advertising user receives a notification about the negotiation in progress from the system of the online freight exchange. With a click on the notification, the user is directed to the nego-
tion view of the advertisement. Contrary to the view depicted in figure 50, the initially advertising user has now the option to answer for his part with a negotiating offer.

**Transport offer**

![Image of Transport Offer](image)

**Figure 52**: Detail view of the negotiated advertisement for the initially advertising user

With a click on “negotiating advertisement”, an input mask opens up for him, too, to negotiate the transport offer.

![Image of Negotiating Advertisement](image)

**Figure 53**: Repeated change of the transport period

Here, the initially advertising user could change the transport period again to signalize that he cannot offer the suggested time point, but that the offer would be realizable if the transports would start at a little earlier start point. Afterwards, he saves is steps in the negotiation.
Figure 54: Detail view of the negotiated advertisement after two steps in the negotiation

Now, the next step in the negotiation is depicted in the detail view of the negotiated advertisement. The negotiations between the parties can be continued for any length of time and every single step in the negotiation is highlighted in clearly distinguishable colors. As with other advertisements, the establishing of the final contact and the transaction processing take place outside of the system of the online freight exchange.

2.3.6 Browsing through advertisements

The simple locating of advertisements belongs to the main tasks of an online freight exchange. To achieve this goal, the software prototype provides the possibility of filtering the overview of all advertisements concerning transport offers according to different criteria.

The (combinable) filters for advertisements regarding transport offers are:

1. advertising company
2. zip code area of the loading and unloading site
3. location of the loading and unloading site
4. station of the loading and unloading site
5. full-text search
6. offer includes “mere traction” or “traction and freight car”
The listed filter options make a simple connection of criteria possible so that all advertisements, that qualify, for example, for the requirement “all transport offers that include only traction and that are to be loaded in the zip code area 44”, can be displayed with just a few clicks.

### Demontage Sprendler AG

**Figure 55: Filtering according to the advertising companies**

Filtering according to advertising companies provides a simple possibility for the end-users to obtain an overview of all advertisements of a company registered with a system of the online freight exchange.

### ALL TRANSPORT OFFERS

**Figure 56: Filtering according to the zip code area**

Filtering according to the zip code area enables the end-users to view all advertisements that, for example, are to be loaded in the zip code area “38”. The more digits of the zip code are entered by the end-user, the more precise will be his search.
Figure 57: Filtering according to loading sites

Filtering according to loading sites enables the end-users to list all advertisements that are to be loaded in a certain place.

Figure 58: Filtering according to unloading sites
Filtering according to unloading sites enables the end-users analogously to list all advertisements that are to be unloaded in a certain location.

**Figure 59: Filtering according to loading and unloading sites**

Like mentioned at the beginning, the filtering can be also combined, as shown in Figure 59.

Filtering according to loading and unloading stations runs analogously to the filtering according to loading and unloading sites.

**Figure 60: Filtering according to search items**

The full-text search provides the possibility of browsing through all advertisements within the system of the online freight exchange according to certain keywords. Furthermore, it provides the options “upper- and lower case” as well as “whole word” in order to further filter the resulting search results.
Figure 61: Filtering with compliance to the upper- and lower case of the search item

The option “upper- and lower case” demands of the search results an exact match with the search keyword so that, for example, no advertisements from “Wiesbaden” are listed for the search item “Baden”.

The option “whole word” requires of the search results that the keyword searched for occurs as a whole word in the advertisement. At this, search items like “Essen” would admittedly list advertisements for “Essen Hbf.”, but not ones for “Essen-West”.

Figure 62: Options for filtering according to the desired means of transportation

Filtering according to “mere traction” as well as “traction and freight car” enables the end-users to list specifically only those advertisements which offer contain the chosen services.
### Figure 63: Filtering according to “mere traction”

<table>
<thead>
<tr>
<th>NUMERIC ID</th>
<th>ORIGIN</th>
<th>DESTINATION</th>
<th>FIRST TRANSPORT</th>
<th>FREQUENCY</th>
<th>COMPANY</th>
</tr>
</thead>
<tbody>
<tr>
<td>#A.000.454</td>
<td>Augsburg</td>
<td>Bremen</td>
<td>08/11/2012</td>
<td>once</td>
<td>Demontage Spremberg AG</td>
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<tr>
<td>#A.000.446</td>
<td>Hagen</td>
<td>Weselbogen</td>
<td>09/20/2013</td>
<td>once</td>
<td>Schmitz AG</td>
</tr>
<tr>
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<td>Paderborn</td>
<td>03/09/2013</td>
<td>once</td>
<td>Enders GmbH</td>
</tr>
<tr>
<td>#A.000.442</td>
<td>Essen</td>
<td>Augsburg</td>
<td>03/09/2013</td>
<td>weekly</td>
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</tr>
<tr>
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<td>Karlsruhe</td>
<td>06/08/2013</td>
<td>monthly</td>
<td>Glocke GmbH</td>
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<td>Hagen</td>
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<td>06/08/2013</td>
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<td>#A.000.428</td>
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<td>Hagen</td>
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<td>Essen</td>
<td>12/24/2013</td>
<td>once</td>
<td>Schell AG</td>
</tr>
</tbody>
</table>

### Figure 64: Filtering according to “traction and freight car”

<table>
<thead>
<tr>
<th>NUMERIC ID</th>
<th>ORIGIN</th>
<th>DESTINATION</th>
<th>FIRST TRANSPORT</th>
<th>FREQUENCY</th>
<th>COMPANY</th>
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<td>11/07/2013</td>
<td>yearly</td>
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<td>Hagen</td>
<td>01/18/2013</td>
<td>yearly</td>
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<td>Essen</td>
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<td>weekly</td>
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<td>Essen</td>
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<td>once</td>
<td>Zink GmbH</td>
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</tbody>
</table>
2.4 Advertisements for transport requests

2.4.1 Overview

Apart from advertisements for transport offers, advertisements for transport requests can also be created.

![Overview of all advertisements for transport requests](image)

Figure 65: Overview of all advertisements for transport requests

2.4.2 New advertisement for a transport request

If a user wants to create an advertisement for a transport request, he wants to send a signal thereby that he is ready for an initial business contact. He is ready to buy a service (the transport of freight) and, to that end, has to describe exactly the freight to be transported.

Figure 66 depicts schematically the necessary steps for this.
Figure 66: Creating a new advertisement for a transport request

The input happens analogously to the creation of an advertisement for transport offers. The main difference lies in the input of the freight description. If all mandatory data is valid, the advertisement is saved in the system and published from the date of its validity.

If the end-user wants to create a new advertisement for a transport request within the software prototype, he clicks on the button “new transport request” at the top right.

Figure 67: Buttons for creating an advertisement

Afterwards, he is directed to the input mask for creating a new advertisement for a transport request.
New transport request

### NEW TRANSPORT REQUEST

The fields with an asterisk (*) are mandatory:

**Contractor**
- Contractor: [Demontage Sprenkler AG]

**Posting valid from**
- 2012-11-06
  (Format: MM/DD/YYYY)

**Posting valid until**
- 2012-11-13
  (Format: MM/DD/YYYY)

**Time frame:**
**Frequency:**

**Loading site:**
- Sidetrack available: [Yes, No]
- Loading station: [Search by number or name]

**Unloading site:**
- Sidetrack available: [Yes, No]
- Unloading station: [Search by number or name]

- Contractor
- Street
- (continued)
- ZIP
- Origin city
- Country: Germany

- Contractor
- Street
- (continued)
- ZIP
- Destination city
- Country: Germany

**Freight description:**
- Product name
- State of product
- Hazardous material: [Yes, No]
- NNM-No.
- Total weight (t): [ ]
- Weight per transport (in t): [ ]
Figure 68: Form for creating new advertisements for transport requests

The entries in the sections “basic data”, “time period” and “loading site of the freight” as well as “unloading site of the freight” happen analogously to the creation of a new advertisement for transport offers.

In the section “freight description” the end-user first enters the name of the freight as a free text and then selects the type of goods.

Figure 69: Selection of the type of goods
Following this, the end-user specifies whether the freight to be transported appertains to dangerous goods. If this is the case, the input mask expands and he is asked to name the dangerous goods class and the UN number of the freight.

![Image](image70)

**Figure 70: Selection of “dangerous goods”**

In addition to it, the end-user can name the NHM number. The end-user has to state the total weight of the freight in tons as well as the weight per transport (also in tons).

In the section “transport specifics” the end-user decides at first whether he wishes for a means of transportation for his transport request or whether he only needs a traction (as own means of transportation are available).

![Image](image71)

**Figure 71: Selection of “means of transportation wished”**

If the end-user wants a means of transportation, he is asked to name what kind of means of transportation he wants and what requirements are being put on the means of transportation.
If the wanted means of transportation are not listed in the list box, the end-user can select “other” and describe his wanted means of transportation in a free text field.

If no means of transportation is desired, the end-user is asked to state what kind of means of transportation is available. Analogously to the process for “wanted means of transportation” described above, the end-user can select the option “other” if his means of transportation is not listed in the list box.
Additionally, the end-user can provide information on the requirements for the loading and unloading of the means of transportation in two free text fields.

In the section “additional information” the end-user can choose whether he wants an offer with the indication “price per ton” or “price per transport unit” for his request or if a price mark is not necessary.

![Figure 75: Selection of the type of the requested offer](image)

The information on the “contact person” and “company category” happens analogously to the creation of an advertisement for transport offers.

With a click on “create an advertisement for a transport request” the end-user finalizes the creation of the advertisement.

### 2.4.3 Uploading advertisements via Excel chart

Apart from the manual entry of advertisements, the software prototype also provides the possibility to upload several advertisements for transport requests with the help of an Excel chart.

![Figure 76: Input mask for uploading several advertisements for transport requests](image)

A click on “download a sample file” directs the user to an exemplary Excel file that describes how advertisements have to be described for uploading.
When the file containing own advertisements has been created, it has to be selected in the input mask for uploading advertisements for transport requests.

**Upload postings**

You can create multiple postings at once by uploading an excel spreadsheet.

You can download a sample excel file (in german).

Choose the file on your computer:

```
/home/code24/freight-exchange/.../Browse...
```

**Figure 78: Selection of the Excel file**

A click on “upload new advertisements for a transport requests” launches the process.
2.4.4 Browsing through advertisements

Just as with advertisements for transport offers, the software prototype makes it possible to filter the advertisements according to transport requests.

The (combinable) filters for advertisements for transport requests are:

1. advertising company
2. postcode area of the loading and unloading site
3. place of the loading and unloading site
4. station of the loading and unloading site
5. full-text search

The features of the listed filters operate analogously to the ones for advertisements for transport offers.

2.5 Companies

2.5.1 Company profile

Every company registered with the system of the online freight exchange has a profile that is accessible for all other end-users of the software prototype. The company profile is to give other end-users that are interested in the company the possibility to get a quick overview of its advertisements.

Figure 79: Successful upload of several advertisements

After the process is finalized, the newly created advertisements are being highlighted in yellow in the advertisement overview.
In the detail view the interested user is firstly presented with the contact information of each employee. On the sidebar, the general contact information of the company (address, phone, fax, e-mail and internet address) as well as information on the entry in the Commercial Register and the sales tax identification number is situated. The button “show advertisements” directs the end-user to the offers of the company (alternatively, the corresponding sub-navigation point “offers” at the top left side can be used).

### 2.5.2 Offers

Under the sub-navigation point “offers”, all advertisements for transport offers of the current company can be found.
2.5.3 Requests

Under the sub-navigation point “requests”, the advertisements for transport requests of the current company are located.

Demontage Sprenkler AG

<table>
<thead>
<tr>
<th>NUMERIC ID</th>
<th>ORIGIN</th>
<th>DESTINATION</th>
<th>FIRST TRANSPORT</th>
<th>FREQUENCY</th>
<th>COMPANY</th>
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</thead>
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</tbody>
</table>

Figure 82: Transport requests of a company

2.5.4 Reviews

Under the sub-navigation point “reviews”, the reviews of the company are situated.

All reviews

<table>
<thead>
<tr>
<th>Approved Reviews</th>
<th>Unapproved Reviews</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>REVIEW</th>
<th>DATE</th>
<th>REVIEWER</th>
<th>TEXT</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 Jul 10:30</td>
<td>Review by Deborah Baker (Schütte GmbH)</td>
<td>Abwicklung war sehr gut, schneller Versand der Fracht, klar strukturierte Homepage incl. Angaben...</td>
<td></td>
</tr>
<tr>
<td>30 Jun 11:22</td>
<td>Review by Richard Robinson (Salazar AG)</td>
<td>Leider nicht zufrieden!</td>
<td></td>
</tr>
<tr>
<td>18 May 11:01</td>
<td>Review by Ruth Jefferson (Hentschel AG)</td>
<td>Freundliche Mitarbeiter, guter Preis, alles wunderbar geklappt</td>
<td></td>
</tr>
<tr>
<td>15 Apr 20:14</td>
<td>Review by Hugh Kirk (Berger GmbH)</td>
<td>Sehr guter Service, gerne wieder!</td>
<td></td>
</tr>
</tbody>
</table>

Figure 83: Overview of all reviews of a company

Already published reviews are highlighted in green, whereas still not surveyed reviews are highlighted in red. A click on a still not checked review directs the user to its detail view.
In the detail view, the checking user can see the text of the review, the reviewing person and its company. On the navigation bar, he has the possibility to publish or delete the review.

**Figure 84: Detail view of a review**

**Figure 85: Detail view of the review just published**
If the user decides to publish the review, a green notice appears saying that the review has been published on the company’s profile.

### All reviews

<table>
<thead>
<tr>
<th>Date</th>
<th>Reviewer</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>31 Jul 10:36</td>
<td>Deborah Baker (Schütte GmbH)</td>
<td>Abwicklung war sehr gut, schneller Versand der Fracht, klar strukturierte Homepage incl. Angaben...</td>
</tr>
<tr>
<td>30 Jun 11:22</td>
<td>Richard Robinson (Salazar AG)</td>
<td>Leider nicht zufrieden!</td>
</tr>
<tr>
<td>10 May 11:01</td>
<td>Ruth Jefferson (Hentschel AG)</td>
<td>Freundliche Mitarbeiter, guter Preis, alles wunderbar geklappt</td>
</tr>
<tr>
<td>15 Apr 20:14</td>
<td>Hugh Kirk (Berger GmbH)</td>
<td>Sehr guter Service, gerne wieder!</td>
</tr>
</tbody>
</table>

#### Figure 86: Overview of all reviews of a company including the newly published review

In the overview of all reviews the just published review appears also highlighted in green.

### 2.5.5 Users

Under the sub-navigation point “users”, the users of the company are situated.

#### Overview: People

<table>
<thead>
<tr>
<th>Name</th>
<th>Job Description</th>
<th>Edit Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mrs. Caroline Ampel</td>
<td>Logistics Trainee</td>
<td></td>
</tr>
<tr>
<td>Mrs. Anette Baumann</td>
<td>Junior Logistics Manager</td>
<td></td>
</tr>
<tr>
<td>Mr. Bernhard Baumann</td>
<td>Junior Logistics Manager</td>
<td></td>
</tr>
<tr>
<td>Mr. Jan Eitterich</td>
<td>Junior Logistics Manager</td>
<td></td>
</tr>
<tr>
<td>Mrs. Kerstin Fischer</td>
<td>Logistics Trainee</td>
<td></td>
</tr>
<tr>
<td>Mr. Martin Kowalla</td>
<td>Senior Logistics Manager</td>
<td></td>
</tr>
<tr>
<td>Mr. Peter Krause</td>
<td>Senior Logistics Manager</td>
<td></td>
</tr>
<tr>
<td>Mr. Markus Müller</td>
<td>Logistics Trainee</td>
<td></td>
</tr>
<tr>
<td>Mr. Martin Sprendler</td>
<td>Chief Executive Officer</td>
<td></td>
</tr>
<tr>
<td>Mrs. Bettina Sprendler</td>
<td>Chief Financial Officer</td>
<td></td>
</tr>
</tbody>
</table>

#### Figure 87: User overview
End-users issued with the corresponding privileges can edit the user accounts and the personal data of other users and create new users.

The data of the users of the software prototype is divided into the core data, like the user name and the password, as well as the personal data, like the first name and surname. Every user can change his data at any time within the system of the online freight exchange.

**Edit User**

![Input mask for editing the core data of a user](image)

**Figure 88: Input mask for editing the core data of a user**

The core data of a user is divided into his login data, his preferences concerning notifications and his privileges.

![Input mask for the login credentials of a user](image)

**Figure 89: Input mask for the login credentials of a user**
The user name and the e-mail address serve within the core data as an authentication of the user in the system of the online freight exchange. The user name functions as an identification of the user when logging in while the e-mail address serves the sending of notifications or of a new password. Contrary to the e-mail address entered within the personal data, the e-mail address entered here is not visible to the public.

![Figure 90: Input fields for changing the password of a user](image)

The password of a user can be changed optionally with every editing process. For this, the new password has to be entered two times into the input fields depicted in figure 90. If these input fields are skipped, the password of the user stays unchanged.

![Figure 91: Input field for the notification settings](image)

Every user can decide whether he wants to check the notifications send by the software prototype only within the system of the online freight exchange or if he wants to subscribe them via e-mail as well. In the second case, all generated notifications are sent to the e-mail address entered in the core data.

![Figure 92: Input field for the privileges of a user](image)

All users of the online freight exchange are subjected to a rights management that is based on individual privileges. End-users issued with the corresponding privileges can edit the notifications of other users of the relevant company. The more privileges a user has, the more authority has he in the system of the online freight exchange.

In the implementation at hand, the following restrictions apply to the users:

- Holders of the authorization “Executive/board member” are authorized to create new users within their company and to edit or delete existing users. Only these especially authorized users see the control elements depicted in figure 92 when editing a user account.

- Holders of the authorization “dispatcher” are authorized to create advertisements and reviews on behalf of their company.
• Holders of the authorization “other employee” are only authorized to log in to the system of the online freight exchange and to sift advertisements, profiles as well as reviews of other companies – for example for research purposes – on behalf of their company.

As described at the beginning, each user is equipped with personal data in addition to the core data. In the following, it will be shown which personal data a user can supply via the software prototype.

**Edit person**

![Input mask for editing the personal data of a user](image)

**Figure 93: Input mask for editing the personal data of a user**

The personal data of a user is divided into his personal information (name, job description) as well as his contact information.

![Personal data of a user](image)

**Figure 94: Personal data of a user**

Beyond that, all users can provide comprehensive contact information.
The entered contact information of a user is then visible on the company profile. The user interface of the online freight exchange appears to the user in the language chosen under “user language” (in the implementation at hand German and English).

2.5.6 Expired and future advertisements

Under the sub-navigation point “expired & future advertisements”, those advertisements of the company are situated whose validity period defined by the company has elapsed or whose validity period has not yet begun.

![Figure 96: Expired and future advertisements of a company](image)

The navigation point “expired & future advertisements” is only available when viewing the own company. Expired and future advertisements of other companies cannot be viewed.

2.5.7 Subscribed companies

All end-users of the online freight exchange have the possibility to specifically highlight the advertisements of other companies. The advertisements of a subscribed company are highlighted in all overviews. This feature can be used, for example, to specifically highlight advertisements of companies whose business branch is in accord with the own one and whose advertisements are consistently of interest for the own company.
After the user has subscribed to the company via the button “highlight advertisements”, the advertisements of this company are being highlighted in color in the overviews.

The graphic highlighting of the advertisements of a subscribed company ranges over all views, i.e. overviews, full-text searches as well as filtered lists.

### 2.5.8 Ignored companies

All end-users of the online freight exchange have the possibility to purposefully ignore advertisements of other companies. The advertisements of an ignored company are being hidden in all overviews. This feature can be used, for example, to specifically hide advertisements of companies
whose business branch is not in accord with the own one and whose advertisements are of no interest to the own company.

Schütte GmbH

Who works here?

CONTACT INFORMATION
Deborah Baker
Phone 011-36-67-2672
E-Mail dbaker@schuette.dev
Web http://www.schuette.dev/team

Figure 99: Company profile – advertisements are being hidden

After the user has ignored the company via the button “ignore advertisements”, the advertisements of this company are being hidden in the overviews.

All transport requests Switch to transport offers

Figure 100: Overview – specific advertisements are being hidden

To get a list of all subscribed and ignored companies, the users can call up the business directory.

2.5.9 Business directory

With the business directory a catalogue of all registered companies exists within the software prototype. The company list can be filtered according to name and registration point as well as to subscribed and ignored companies via the buttons on the navigation.
**Figure 101: Business directory sorted by name**

<table>
<thead>
<tr>
<th>NAME</th>
<th>ZIP</th>
<th>CITY</th>
<th>COUNTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alexandra Kwee</td>
<td>47508</td>
<td>Neustadt</td>
<td>Deutschland</td>
</tr>
<tr>
<td>ap genova</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bargellink GmbH</td>
<td>45509</td>
<td>Xanten</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Barnett GmbH</td>
<td>54619</td>
<td>Reiff</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Berger GmbH</td>
<td>82380</td>
<td>Passau</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Breit GmbH</td>
<td>70192</td>
<td>Stuttgart</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Burghardt AG</td>
<td>27321</td>
<td>Morsum</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Cargo-Trans</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dementage Spiekier AG</td>
<td>44567</td>
<td>Bochum</td>
<td>Deutschland</td>
</tr>
<tr>
<td>DPD GeoPost (Deutschland) GmbH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emons</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enders GmbH</td>
<td>49762</td>
<td>Freisenburg</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Ferstl AG</td>
<td>96528</td>
<td>Suhl</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Filog</td>
<td>21079</td>
<td>Hamburg</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Filog 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freight Exchange Service Provider</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frohlich GmbH</td>
<td>34355</td>
<td>Staufenberg</td>
<td>Deutschland</td>
</tr>
</tbody>
</table>

**Figure 102: Business directory sorted by registration point**

<table>
<thead>
<tr>
<th>NAME</th>
<th>ZIP</th>
<th>CITY</th>
<th>COUNTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>HSL Logistik GmbH</td>
<td>12345</td>
<td></td>
<td>Deutschland</td>
</tr>
<tr>
<td>ap genova</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emons</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MWP GmbH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Filog</td>
<td>21079</td>
<td>Hamburg</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Filog 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suppenkasper</td>
<td>80002</td>
<td>München</td>
<td>Deutschland</td>
</tr>
<tr>
<td>DPD GeoPost (Deutschland) GmbH</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>RV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mwp gmbh</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alexandra Kwee</td>
<td>47598</td>
<td>Neustadt</td>
<td>Deutschland</td>
</tr>
<tr>
<td>SpiritusoniSpA</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glocke GmbH</td>
<td>6309</td>
<td>Großpösnaßen</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Ullrich GmbH</td>
<td>58099</td>
<td>Hagen</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Vogler AG</td>
<td>91474</td>
<td>Langenscheidt</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Fröhlich GmbH</td>
<td>34355</td>
<td>Staufenberg</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Jacelle GmbH</td>
<td>55566</td>
<td>Bad Sodenheim</td>
<td>Deutschland</td>
</tr>
</tbody>
</table>
Companies

Here you can see all companies.

<table>
<thead>
<tr>
<th>NAME</th>
<th>ZIP</th>
<th>CITY</th>
<th>COUNTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breit GmbH</td>
<td>70192</td>
<td>Stuttgart</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Burghardt AG</td>
<td>27321</td>
<td>Morsum</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Enders GmbH</td>
<td>49752</td>
<td>Fresenburg</td>
<td>Deutschland</td>
</tr>
</tbody>
</table>

Figure 103: Subscribed companies

Companies

Here you can see all companies.

<table>
<thead>
<tr>
<th>NAME</th>
<th>ZIP</th>
<th>CITY</th>
<th>COUNTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brockhaus AG</td>
<td>71717</td>
<td>Beilstein</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Salazar AG</td>
<td>65484</td>
<td>Kleinheimen</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Schaub AG</td>
<td>47226</td>
<td>Düsseldorf</td>
<td>Deutschland</td>
</tr>
<tr>
<td>Schütte GmbH</td>
<td>2681</td>
<td>Wittgen</td>
<td>Deutschland</td>
</tr>
</tbody>
</table>

Figure 104: Ignored companies
2.6 Additional features

2.6.1 Notifications

Through conversations with practice partners in the course of the development of the software prototype it has become clear that end-users would appreciate it to be informed about new advertisements in the system of the online freight exchange. Also, it became clear that they would prefer to receive the information about new advertisements via e-mail so that they would not have to log in the system of the online freight exchange.

Therefore, a module has been designed and implemented that permits to define settings that decide if, for example, a new advertisement for a transport request is attractive to a specific end-user or not. It has been decided that the settings underlying these decisions have to be defined by the end-users themselves and that they should be individually configurable.

The notifications are generated within the system of the online freight exchange and can be optionally subscribed by the end-users via e-mail.

At the top right of the navigation bar a number appears that is highlighted in red in case of unread notifications and that states how many notifications have arrived for the user.

With a click on the number, the end-user is directed to an overview of the notifications generated for him.

Notifications are being sent for three kinds of actions:

1. the creation of advertisements for transport offers,
2. the creation of advertisements for transport requests and
3. the creation of reviews of the own company.
Navigation makes it possible to filter the present notifications according to three categories. Thus, only those notifications can be specifically viewed that, for example, deal with relevant advertisements for transport requests.

**Figure 107: Overview of all notifications concerning advertisements for transport requests**

**Figure 108: Overview of all notifications concerning advertisements for transport offers**

**Figure 109: Overview of all notifications concerning the reviews of the company**

If there are no notifications in a category, the view concerned is empty as Figure 109 shows.

In order to determine about which advertisements one wants to be informed in this way, the end-users have to define settings. These settings stipulate under which circumstances they want to be informed about a new advertisement. A click on “notification settings” directs the users to these settings.
Figure 110: Notification settings

In Figure 110 one condition concerning advertisements for transport requests as well as a condition regarding advertisements for transport offers are depicted. The shown end-user receives notifications for all transport requests that specified “Rotterdam” as their loading site and “liquid” as their cargo type. Besides, he receives notifications concerning all advertisements for transport offers that specified “Frankfurt” as their loading site and “weekly” as their frequency and whose transports are available from 24.12.2012.

Such conditions can be added by clicking on the buttons “new condition for offers” as well as “new condition for requests”. Existing conditions can be deleted via “delete condition”. The modification of settings is possible by deleting or adding particular conditions.

Thus, for example, the first setting in Figure 110 can be extended by the condition that the advertisements for transport requests coming into question should be available from 01.12.2012. For this, the end-user first clicks on “add condition…” in order to create a new condition.
Afterwards, the end-user can choose for which attribute of the advertisement the condition should apply. He chooses “available from:“.

Next, a text field appears in which the end-user enters his specification for the value of the attribute „Available from:“.

---

**Figure 111: Adding a new condition**

**Figure 112: Selection of a comparative attribute**

**Figure 113: Input of a reference value**
With a click on “save settings”, the end-user saves the additional condition for the extended setting.

![Figure 114: New condition saved for the first setting](image)

Now, the altered setting is active and only notifications concerning advertisements for transports request are being created that fulfill all conditions.

### 2.6.2 Station directory

The station directory shows all stations registered in the system of the online freight exchange.

**Stations**

![Figure 115: Overview of all stations](image)

To each listed rail station, an overview of all advertisements for transport offers and transport requests can be called up.
2.6.3 Contact form

The end-users of the software prototype have the possibility to address themselves at any time to the operator of the online freight exchange via a contact form.

Contact

![Contact form](image)

Figure 116: Contact form

A free text field for suggestions and criticism is available for end-users. Its content is being sent with a click on “submit” via e-mail to an e-mail address defined in the operator interface.
3 Features for the operators of the software prototype

3.1 Preliminary remark und registration

In what follows, it will be demonstrated how operators can manage the system of the online freight exchange. It should be noted that the deployment of features for the operators of the software prototype had less priority when developing the software than those features for the potential end-users of the software prototype.

Nevertheless, basic features had been implemented that demonstrate which requirements have to be met by the administration interface in order to serve as a useful instrument to the operators of an online freight exchange.

Figure 117: Link to the administration interface

The operators of the online freight exchange see an additional navigation point in the main navigation of the software prototype. With a click on “administration” the operators are directed to the user interface of the software prototype accessible only by them.
3.2 System assistant

3.2.1 Homepage

When starting the application server for the first time, the system assistant helps the operators to configure the software prototype. However, the system assistant can be also called up anytime in the course of the operation in order to run the tasks bound to it anew.

Welcome

The features of the system assistant encompass the editing of the Admin user, the settings, the translations as well as the demo company.
3.2.2 Editing the Admin-user

By means of the system assistant, the core data of the administrator (Admin user) logged in the system can be edited.

**Edit User**

![Input mask for editing the core data of the Admin user](image)

Figure 119: Input mask for editing the core data of the Admin user

The input fields of the input mask for editing the core data of the Admin user depicted partially in Figure 119 is identically equal to the standard input mask for the user core data and, therefore, will not be discussed elaborately again at this point. Its special attribute is merely that it enables the operator to easily edit the core data of the Admin user.
3.2.3 Managing the demo company

Furthermore, the software prototype allows the easy creation and management of a “demo company”, i.e. a company for demonstration purposes that is registered with the system of the software prototype along with fictive employees and advertisements.

**Demo Company**

![Figure 120: Overview of the demo company](image)

The purpose of the demo company is to be able to present an exemplary company within the online freight exchange to potential end-users of the software prototype. The end-users can log in as employees of the demo company and change the company itself as well as its advertised transport offers and transport requests. Moreover, they can make use of all features of the software prototype provided for end-users (e.g. creating new advertisements or writing reviews).

After the completion of the demonstration an administrator can reset the demo company by means of the features described above and, thus, undo all effected changes. The demo company (then initiated anew) can thus be demonstrated to another group of potential end-users.
3.2.4 Managing the settings

All settings registered in the system of the online freight exchange can be listed by means of the navigation point “company”. Preferences are being used by the software prototype to make installation-specific configurations possible without adapting the source code of the software prototype. Thus, for example, the standard language of the software prototype can be changed to “German”.22

All Settings

<table>
<thead>
<tr>
<th>NAME</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>just set up</td>
<td>1</td>
</tr>
<tr>
<td>name</td>
<td>Freight Exchange</td>
</tr>
<tr>
<td>reviews.highlight_above</td>
<td>5</td>
</tr>
<tr>
<td>demo_mode</td>
<td>0</td>
</tr>
<tr>
<td>support.email</td>
<td><a href="mailto:contact@example.org">contact@example.org</a></td>
</tr>
<tr>
<td>language</td>
<td>de</td>
</tr>
<tr>
<td>domain</td>
<td>pim-code24.wmna.uni-due.de</td>
</tr>
<tr>
<td>contact_info.complete_percentage</td>
<td>0.5</td>
</tr>
<tr>
<td>default.country_code</td>
<td>49</td>
</tr>
</tbody>
</table>

Figure 121: Overview of all configuration variables

The operators have the possibility to sort the list by ID (identification number) or by name in ascending order and by registration point in descending order as well as to browse the list by means of a full text search for individual words.

---

22) To that end, set the variable “language” under “settings” to the value “de”.
Figure 122: Editing the configuration variables

In Figure 122 it is shown exemplary how the value of the configuration variable “support e-mail” is changed. This configuration variable determines the e-mail address to which the software prototype sends the Feedback gathered within the contact form.

3.3 Monitoring

It will be of decisive importance for the operators of the software prototype to be able to capture reliable data on user behavior of the end-users. Because of the focus on end-user directed features, no requirements have been specified for the monitoring by the practice partners. That is why a few exemplary views of data have been implemented that has already been collected by the software prototype.
Monitoring

Figure 123: Monitoring
The operators of the online freight exchange can survey the following information:

- new advertisements,
- interactions within the online freight exchange,
- new companies and
- new users.

This data is being edited and displayed in graphics.

The number of newly submitted advertisements per day is being captured for each day and displayed in a graphic. When the administrator moves the mouse over the graph, he sees the exact values for each day.

![Figure 124: New advertisements per day](image)
Moreover, the activity of the users is being recorded in the system of the online freight exchange. For example, it can be summarized in pie charts according to the distribution of the activity on the different software modules.

**STATISTICS**

Here you can the activity inside the spot exchange system.

![Pie chart showing activity distribution](image)

**Figure 125: Activity within the online freight exchange**

Similar to the graphic concerning new advertisements per day depicted in Figure 124, newly registered companies and users are also being displayed exactly to the day.

![Graph showing new companies per day](image)

**Figure 126: New companies and users per day**
All shown graphics are being generated dynamically out of the existing statistical data of the software prototype. It is conceivable to implement additional and narrower defined diagrams like, e.g. the cumulative development of newly registered companies in a specific country for reviewing the effectiveness of specifically applied marketing operations.

### 3.4 Companies

All companies registered with the system of the online freight exchange can be listed by means of the navigation point “companies“.

**Companies**

![Image of companies table]

*Figure 127: Overview of all companies*

The operators have the possibility to sort the list by ID or name in ascending order and by registration point in descending order as well as to browse the list by use of a full text search.
In the detail view of an individual company, the contact information of the company as well as its registered user accounts are displayed for the operators.
Edit company

Figure 129: Editing a company

All registered companies can be edited by administrators.
3.5 Users

All users registered with the system of the online freight exchange can be listed by use of the navigation point “company”.

All Users

![User List](image)

**Figure 130: Overview of all users**

The operators have the possibility to sort the list by ID or name in ascending order and by registration point in descending order as well as to browse through the list by means of the full text search.
In the detail view of a user the operators see the activities of the user, his contact information and the contact information of his company.
Just like company profiles, the user can also be edited by administrators. Here, the core data and the contact data can be edited separately just like in the end-user surface.
3.6 Stations

All stations registered in the system of the online freight exchange can be listed by use of the navigation point “company”.

The stations serve as a foundation for the selection box “station” situated in the input masks for creating and editing advertisements for transport offers and transport requests. In these input masks only those stations can be chosen that have been fed to the system by the operators.

![Administration](image)

**Figure 133: Overview of all stations**

The operators have the possibility to sort the list by ID or name in ascending order and by registration point in descending order as well as to browse the list by use of a full text search.
Figure 134: Full text search in stations

Just as with advertisements, the full text search on the administration interface provides the possibility to browse individual views for individual words. Also analogously to the normal end-user interface, the options “use of capital and small initial letters” as well as “whole word” are provided to further filter the resulting search results.

Edit station

Figure 135: Editing a station

All registered stations can be edited by the administrators.
4 Conclusion

As has been shown, the developed software prototype is a fully operative software. Through its modular way of programming and its technical infrastructure it provides a solid fundament for further developments and can serve as an example to the impending professional reimplementation in many areas. Above all, the fast and gradual trial of individual features makes a specific evaluation of these features before their elaborated reimplementation in a subsequent online freight exchange possible.

Nevertheless, the software prototype at hand has been conceptualized under other aspects than demanded by professional business software. The development of the software prototype served, like other feasibility studies, predominantly the initiation of a dialogue between university and practice partners. During the development, higher priority has been given to the modularity, the easy adaptability and the expandability than to reflections on security, maintenance and speed of execution. Therefore, the software prototype at hand cannot meet the strict criteria of professional business software.
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