

Developer Manual

Version 7.2.2



Formcentric for FirstSpirit: Developer Manual

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1. Introduction

This manual describes how to install, configure and extend the Formcentric form manager extension. It is intended to be read by administrators and developers. To get the most out of this document, you will need knowledge of FirstSpirit from both an administrator and user perspective, as well as experience in developing Java software.

Chapter 4, *Installation and configuration* : describes the steps that you need to complete in order to install and configure Formcentric. The installation instructions assume that you have deployed Formcentric Analytics. If this isn't the case, then you can skip all of the sections that relate to Formcentric Analytics.

Chapter 5, *Extending the FirstSpirit project* : describes the extensions and modifications that you complete within a FirstSpirit project.

Chapter 6, *Programming and customisation* : shows how you can extend Formcentric to offer additional functionality.

1.1. Terminology

This manual makes use of the following terms:

Term	Description
Form author	The person that creates and edit forms.
User	The person that fills out a form.
Form	An HTML web form displayed in a web browser.
Form elements	All of the elements used when constructing a form (input fields, drop-down lists, check boxes, etc.).
Form Editor	Input component in FirstSpirit SiteArchitect or ContentCreator, used for creating and editing forms.
Form data	The data entered into the form by the user.
Editor	FirstSpirit SiteArchitect or ContentCreator
Formcentric client	React application for browser-based form presentation.

2. Overview

On the editing side, Formcentric extends the FirstSpirit system to provide an input component with which form authors can create and edit dynamic web-based forms.

Two additional web app modules are available for presenting the forms as well as processing the submitted form data. The first is a conventional web application with server-side generation of the HTML output (referred to in this manual as the *Spring MVC web app*) while the second is a modern headless application with client-side rendering. Both web applications include various Spring controllers for processing the data. A form controller validates the data it receives and forwards these to purpose-built actions, which then carry out the final processing. This approach permits the integration of various backend systems, such as mail servers, Formcentric Analytics or databases.

The Analytics component included with Formcentric provides storage and reporting functions for the form data submitted. Formcentric Analytics consists of two global web app modules. The Backend web app module is responsible for storing the data in a relational database. To do so, it provides a REST interface, which clients can use to communicate with the Backend. Alongside the actual form data, the Backend also stores form sessions if this feature has been activated for the form in question.

The Reporting web app module is a modern, single-page application with which the form data stored in the Backend can be displayed, deleted and exported.

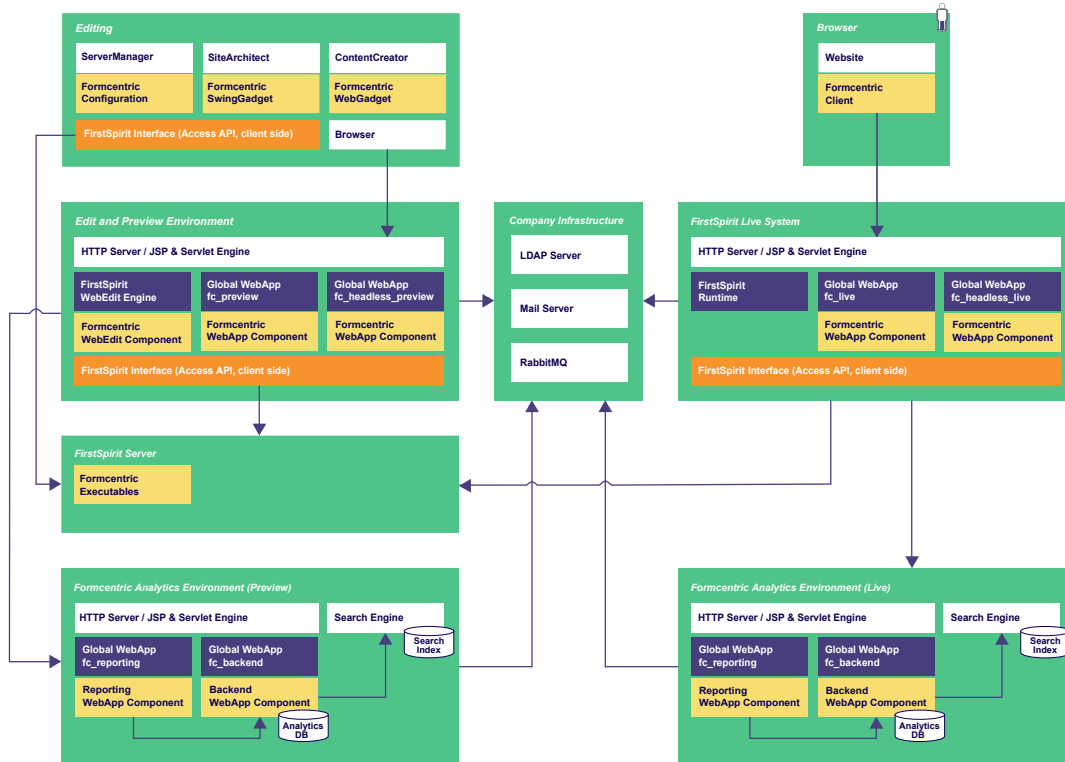


Figure 2.1. Architecture overview

3. System requirements

To be able to use Formcentric 7.2.2, you need to deploy FirstSpirit version 5.2.201209 or higher.

Formcentric requires the JavaScript framework “jQuery” from version 1.12.4.

If the PDF action loads the required PDF template documents from a local directory, then the external program *rsync* will be required on the FirstSpirit Server. For further information about installing and configuring “rsync” in conjunction with FirstSpirit, please see section 10 of the FirstSpirit “Administrator Documentation”.

3.1. Java

Formcentric can be used with the following Java versions. Formcentric must be executed within a servlet container that is compliant with the JSP 2.3 and Java Servlet 3.1 specifications.

Java	Status
OpenJDK 17	supported (<i>recommended</i>)

The requirements for the Java version are also always dependent on the FirstSpirit version deployed. Java 17 is the minimum requirement from FirstSpirit 2023-11 onwards.

3.2. FirstSpirit

You can use Formcentric with the following versions of FirstSpirit. If you are using a different version, then modifications may need to be made to the FirstSpirit Runtime Java-Library (see Section 4.1, “Installing the Formcentric module”). This will certainly be the case if you are using a more recent version.

FirstSpirit	Status
FirstSpirit 2402.11 - 2404.08 (Isolated Mode)	supported (<i>recommended</i>)

4. Installation and configuration

You install and configure Formcentric using FirstSpirit's *Server and Project Configuration*.

4.1. Installing the Formcentric module

To do so, go to *Server Properties* and select the menu option *Modules*. Then click the *Install* button. This opens a file selection pop-up, in which you need to select the *formcentric-7.2.2.fsm* archive file to be installed.

The Formcentric module contains a service for querying licence information. This service is required for both installing and running Formcentric. After loading the archive file, the system therefore asks you if you want the services included in the module to be started automatically. Answer this question with *Yes*.

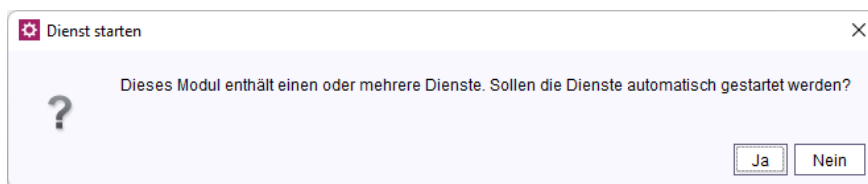


Figure 4.1. Starting services automatically

Once you have successfully installed the file, the system then displays the *Formcentric (I)* module with the components that it includes.

Now select the new *Formcentric (I)* entry, click *Configure*, check the check box *All rights* and confirm your change.

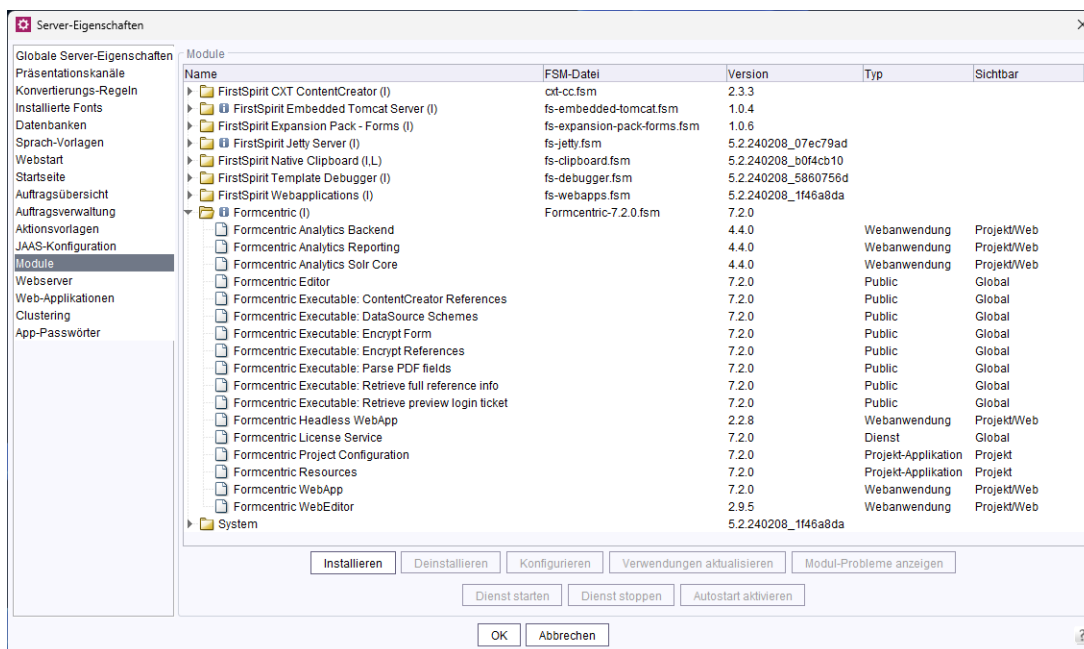


Figure 4.2. Module list under Server Properties

Module permissions become effective only once the FirstSpirit server has been restarted. Once restarted, continue the installation by following the instructions below.

4.2. Licence file

Double-click the *Formcentric License Service* entry in the module overview to open a configuration dialog. Here, upload the licence file that you have received from Formcentric. To do so, click the *Import licence file* button and select the licence file in the file selection pop-up that then appears.

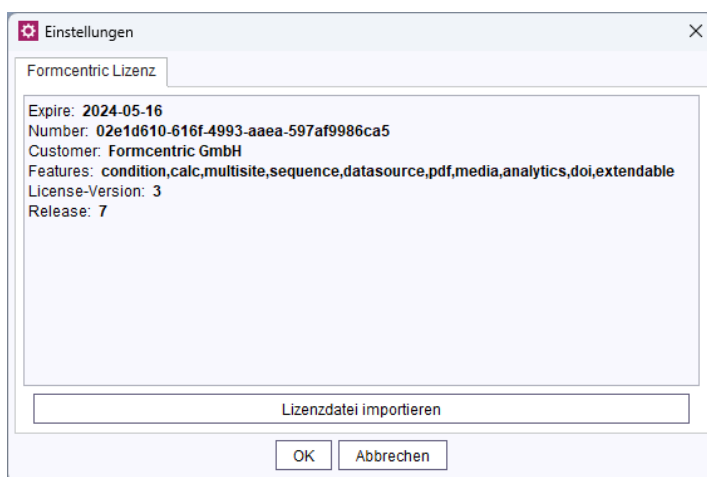


Figure 4.3. Configuring the licence file

Close the configuration dialog box by clicking *OK*.

To ensure that the licence file is also available in the Formcentric web applications, these applications must be updated after each licence update.

The licence file is typically valid for 12 months. During the last 30 days before the licence expires, a warning is output to the Formcentric web application log every six hours. **No other warning is given.** The execution of form actions stops instantly as soon as the licence expires. The forms will continue to be shown correctly on the website, however.

4.3. Installing the Formcentric web editor

For creating and editing forms in the FirstSpirit ContentCreator, Formcentric provides a ContentCreator extension.

To install this extension, switch to the *Web applications* section.

In this area, add the Formcentric web editor to the existing *ContentCreator* web application by clicking *Add*. In the following selection dialog, all of the available web components are displayed. Select the *Formcentric WebEditor* entry.

Close the selection dialog box by clicking *OK*.

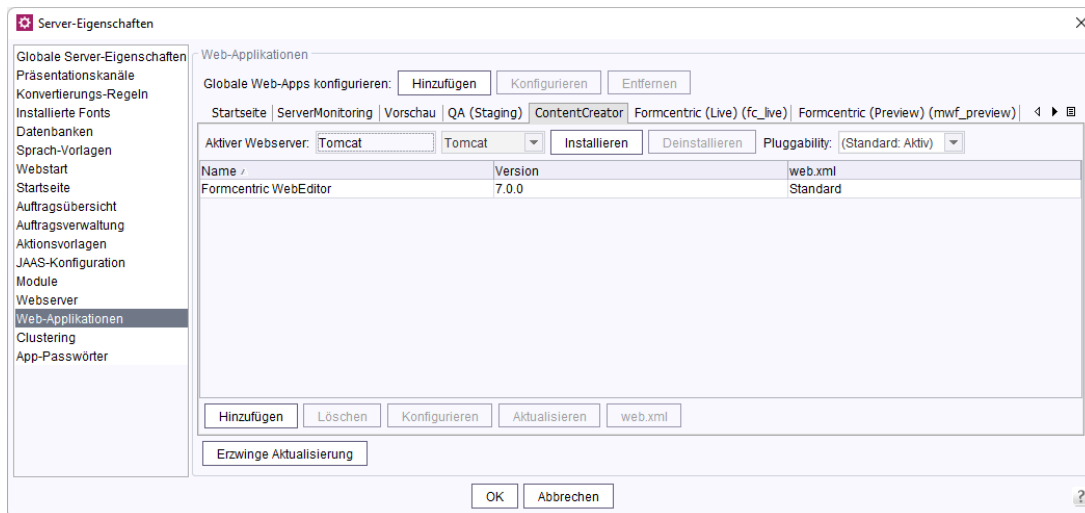


Figure 4.4. Installing the Formcentric web editor

You then need to update the ContentCreator web application on the web server.

4.4. Formcentric web applications

Formcentric provides two separate web app modules to handle form presentation and processing. One of these modules is a Spring MVC web application, while the other is a headless web application.

With the Spring MVC web application from Formcentric, data processing and rendering for forms is handled server-side based on Spring MVC plus JSP/FreeMarker templates. In contrast, the headless web application uses a modern, decentralised architecture that separates the backend (data processing) from the frontend (UI rendering). This application utilises Spring Boot for the backend and React for the frontend.

With the exception of the points discussed in section the section called “File upload tab (headless)”, configuration is the same for both web applications. The following section therefore describes configuration using the headless app as an example.

Typically, separate instances of the web applications are installed for the preview and live sites. For this reason, during the first installation of the module, the global web applications *fc_preview* for the Spring-MVC web application and *fc_preview_headless* for the headless application are automatically created. The web applications for the live sites are only automatically created if they are configured as described below.

To support automated deployment processes, it is possible to specify via system parameters whether and which global web applications should be created during the module installation, and on which web servers (e.g., Tomcat, InternalJetty) they should be installed. If a parameter is left empty, the corresponding web application will not be created.

The following system parameters are available for configuration: *fc.preview.webserver*, *fc.live.webserver*, *fc.preview.headless.webserver* and *fc.live.headless.webserver*.

If you want to use different names for the web apps, please manually perform the steps listed in the section 4.4.1 for the respective web application.

4.4.1. Installation

Create a new global web application. This is required for form presentation within the web page.

You create a new web application by accessing the *Web applications* area and then clicking the *Add* button.

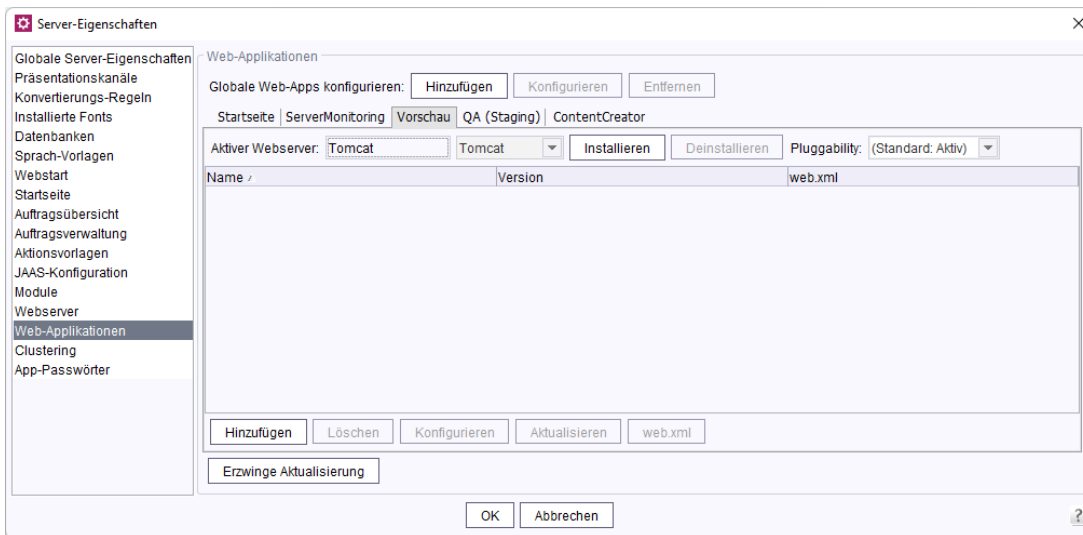


Figure 4.5. Adding a global web application

In the following dialog box, enter the web application's ID, name and context. Close the dialog box by clicking *OK*.

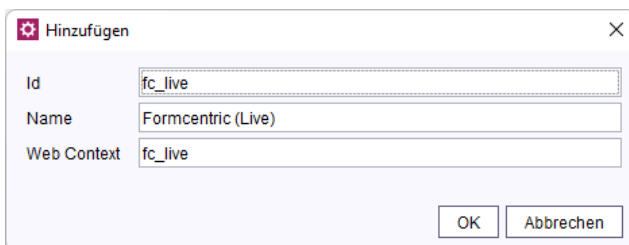


Figure 4.6. Adding a new web application



Typically, the following IDs are used: *fc_preview_headless* for the Preview application and *fc_live_headless* for the Live application. If you assign different IDs, you must also modify these in the script

`formcentric_headless_url` (see Section 5.2, “`formcentric_headless_url script`”).

In the next step, you add the Formcentric web app module to the web application just created. Click *Add* and then select *Formcentric Headless WebApp*.

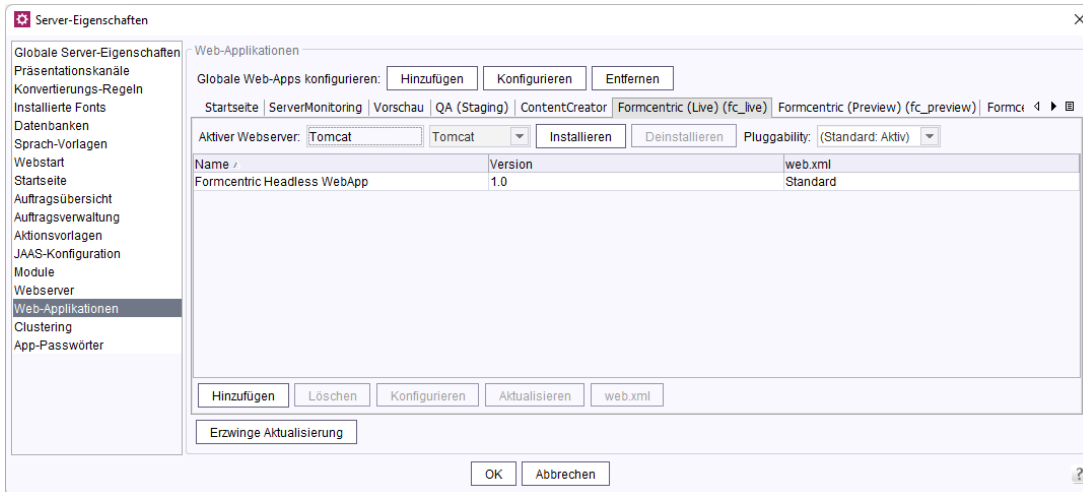


Figure 4.7. Global web application with installed web component

4.4.2. Configuration

Double-click the *Formcentric Headless WebApp* web component to open the configuration screen, which contains multiple tabs.

Mail server tab

You use the *Mail server* tab to configure the mail server used by the form extension to send its emails.

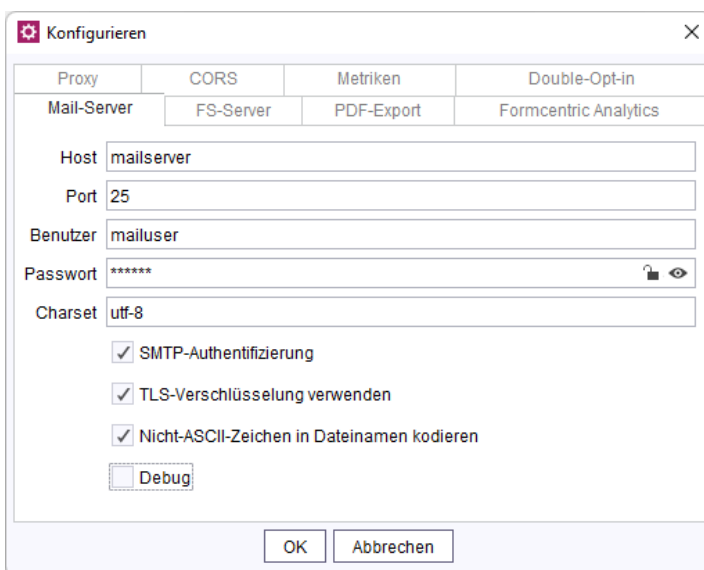


Figure 4.8. Configuring the web application on the “Mail server” tab

Host: Name or IP address of the SMTP mail server.

Port: Port number of the mail server.

User: The name used to log into the mail server.

Password: The password used to log into the mail server.

Charset: The character encoding in which emails are sent (such as utf-8, iso-8859-15, etc.).

SMTP authentication: By activating this check box, you specify that the login data (user, password) will be used when negotiating with the SMTP server.

Use TLS encryption: Configure this property if STARTTLS must be used.

Encode non-ASCII characters in filename: Check this box to encode all non-ASCII characters in the filename. Please note that this encoding does not comply with the MIME specification but is useful to maintain compatibility with some email clients that utilise this convention. The default value is TRUE.

Debug: By checking this check box, you specify that a detailed set of status information will be written to the log for every email sent. This information includes all of the body content, metadata and headers, which could contain personal data.

PDF export tab

The *PDF export* tab is used to configure global settings for the PDF action.

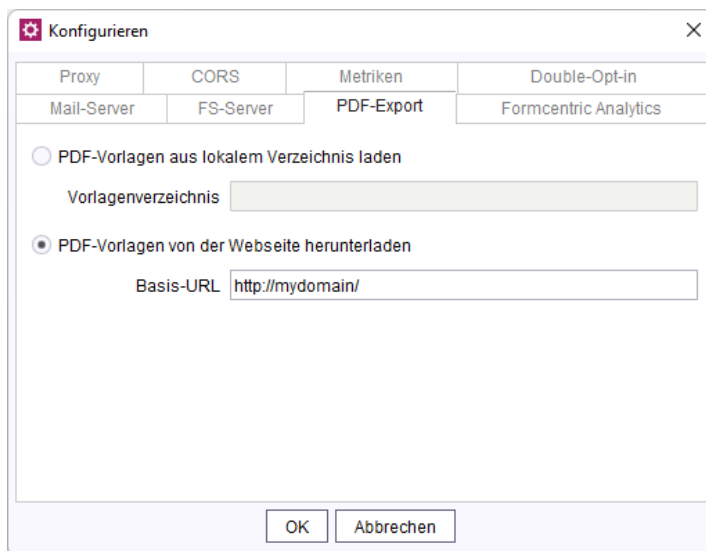


Figure 4.9. Configuring the web application on the “PDF export” tab

Load PDF templates from local directory: From version 5.5.0 of Formcentric, the PDF template documents are loaded by default directly from the Preview or Live web app. Select this option if you want to load the template documents from a local directory, as previously. In this case, you must publish the templates beforehand.

Template directory: In this field, you specify the path to the directory to which the PDF template documents are copied on publication (see also Section 4.9, “Configuring the publication tasks”). The web application must have access to this directory. The user account under which the web server runs also requires read permissions for the specified directory.

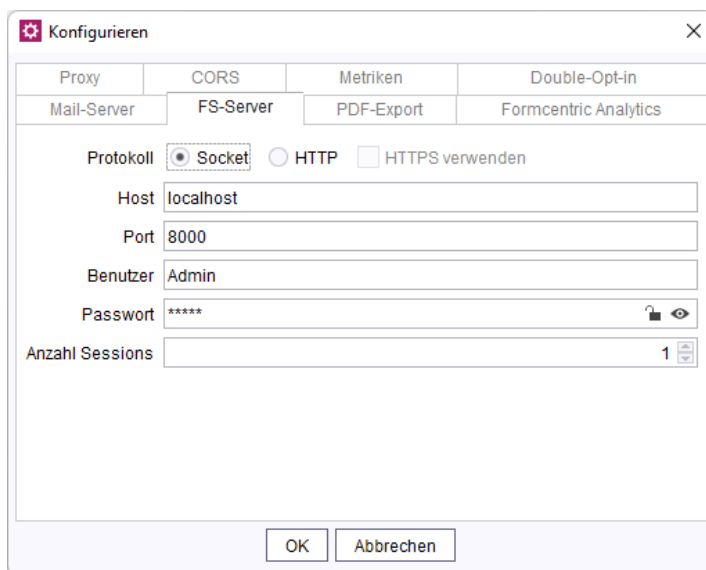
You can specify the template directory either as relative to the web app directory (for example *WEB-INF/pdf*) or as an absolute directory (for example */var/pdf* or *c:/var/pdf*). If the directory does not exist, then it is created when the application is started. In this case, the user must also have write permissions for the parent directory.

Download PDF templates from the website: Select this option if PDF template documents should be loaded from the Preview or Live web app. In this case, just as for other content, the documents must be published in the corresponding website.

Base URL: Enter the external address here at which the website is accessible.

FS server tab

On the *FS server* tab, you enter the connection data to your FirstSpirit server. These details are required for the *Data source* and *Media Management* actions.



Proxy	CORS	Metriken	Double-Opt-in
Mail-Server	FS-Server	PDF-Export	Formcentric Analytics

Protokoll Socket HTTP HTTPS verwenden

Host localhost

Port 8000

Benutzer Admin

Passwort *****

Anzahl Sessions 1

OK Abbrechen

Figure 4.10. Configuring the web application on the “FS server” tab

Protocol: Here you select the communication protocol (HTTP or socket) used to communicate with the FirstSpirit server.

Use HTTPS: When using HTTP as the communication protocol, checking this check box activates encryption for all communication with the server.

Host: Name or IP address of the FirstSpirit server.

Port: Port number of the FirstSpirit server.

User: The name used to log into the FirstSpirit server.

Password: The password used to log into the FirstSpirit server.

No. of sessions: The maximum number of sessions that can be open simultaneously on the FirstSpirit server.



To establish a connection to the FirstSpirit server, the system needs the name of the host (hostname) from which the web app can access the server. The web app must also be capable of establishing a connection to the port on the FirstSpirit server. In some circumstances, it may be necessary to configure access to this port if a firewall is used.



The maximum number of sessions will depend on your FirstSpirit licence. Please note that in some circumstances, the number of sessions specified on the tab page may no longer be available to your form authors.

Formcentric Analytics tab

You use the *Formcentric Analytics* tab to configure the connection parameters to the Formcentric Analytics Backend.

Konfigurieren

Proxy	CORS	Metriken	Double-Opt-in
Mail-Server	FS-Server	PDF-Export	Formcentric Analytics

Analytics-Backend-URL:

Backend Authentication:

Personenbezogene Metadaten erfassen

OK Abbrechen

Figure 4.11. Web application configuration on the “Formcentric Analytics” tab

Analytics Backend URL: URL at which the Formcentric Analytics Backend can be reached.

Backend authentication: Enter the secret used to log into the Analytics Backend here. This must match the *Backend client secret* that you issued during the configuration of the Analytics Backend (see the section called “Security tab”).

Collect personal metadata: Check this box to store the following metadata in addition to the form data entered: information about the browser being used (*User-Agent*), the configured browser language (*Language*) and the page visited before this page (*Referer*). In some cases, this metadata can be used to associate separate and self-contained data records with a specific individual.



Instead of the client secret, a pre-generated *access token* can also be used. To do so, you will need to modify the Spring configuration, however (see the section called “formcentric-analytics.xml”).

Proxy tab

PDF template documents are loaded by default directly from the Preview or Live web app. If access to the web applications should be made via a web proxy, you must configure this proxy on the *Proxy* tab.

The screenshot shows a configuration window titled 'Konfigurieren' with a close button (X) in the top right. It features four tabs: 'Mail-Server', 'FS-Server', 'PDF-Export', and 'Formcentric Analytics'. The 'Proxy' sub-tab is selected, showing three radio button options: 'Kein Proxy', 'Manuelle Proxy-Konfiguration' (which is selected), and 'Automatische Proxy-Konfiguration'. Under 'Manuelle Proxy-Konfiguration', there are four input fields: 'HTTP-Proxy' with the value 'proxyhost', 'Port' with '80', 'Benutzername' with 'myuser', and 'Passwort' with '*****' and a visibility toggle. Under 'Automatische Proxy-Konfiguration', there is a 'URL' input field. At the bottom of the dialog are 'OK' and 'Abbrechen' buttons.

Figure 4.12. Configuring a web proxy on the “Proxy” tab

No proxy: Activate this setting if you do not want to use a proxy.

Manual proxy configuration: Select this setting if you want to enter the proxy settings manually.

HTTP proxy: Host name of the proxy server that is to be used.

Port: The proxy server port.

Username: The username used to log into the proxy server.

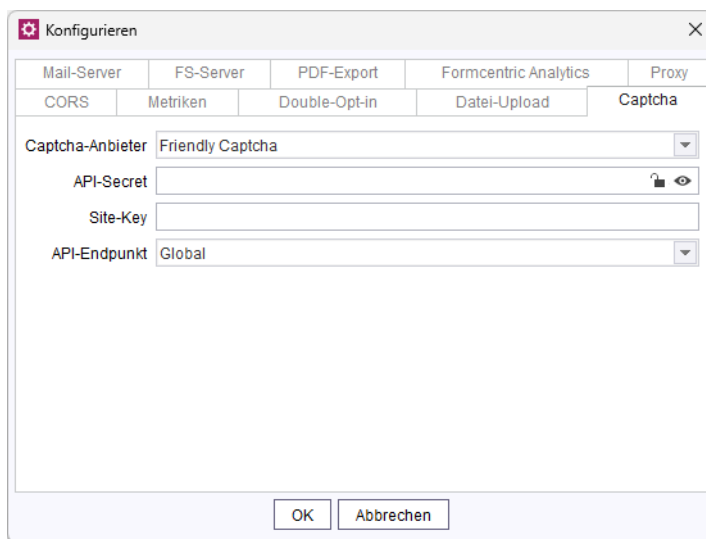
Password: The password used to log into the proxy server.

Automatic proxy configuration: Select this option if you want to use a proxy configuration file (.pac) instead of configuring the proxy manually.

URL: Enter the address (URL) here from which the configuration file should be loaded.

Captcha tab

For the captcha element, you can either use jCaptcha as provided by Formcentric or other services like Google's *reCAPTCHA* or *Friendly Captcha*. For these services, you will always need an account and login credentials. These details are not provided by Formcentric. You use the *Captcha* tab to configure the service used and the corresponding login credentials.



The screenshot shows a configuration window titled 'Konfigurieren' with a close button (X) in the top right corner. Below the title bar is a tabbed interface with the following tabs: Mail-Server, FS-Server, PDF-Export, Formcentric Analytics, Proxy, CORS, Metriken, Double-Opt-in, Datei-Upload, and Captcha. The 'Captcha' tab is active. It contains the following fields:

- 'Captcha-Anbieter': A dropdown menu with 'Friendly Captcha' selected.
- 'API-Secret': An empty text input field with a lock icon and an eye icon to its right.
- 'Site-Key': An empty text input field.
- 'API-Endpunkt': A dropdown menu with 'Global' selected.

At the bottom of the dialog are two buttons: 'OK' and 'Abbrechen'.

Figure 4.13. Configuring the captcha service on the “Captcha” tab

Captcha service: Select the captcha service you want to use.

API secret: Enter the API secret provided by your captcha service.

Site key: Enter the site key provided by your captcha service.

API endpoint: For Friendly Captcha, the API endpoint allows the optional use of the EU endpoint. To do so, the value needs to be set to `EU`. For more information, please see <https://developer.friendlycaptcha.com/docs/v2/guides/eu-endpoint>.

CORS tab

As explained elsewhere, the forms are generated by a dedicated web app component and embedded dynamically into the surrounding web page. This web app is accessed by using an asynchronous JavaScript request (AJAX).

In a scenario where the forms web app is hosted on a separate (sub)domain (e.g. `http://forms.mydomain.com`), access requests to the form will be viewed as ‘cross-origin requests’. These kinds of requests are normally prohibited by the ‘same-origin policy’ (SOP) and therefore blocked by modern browsers. However, these restrictions can be removed by setting access control headers for certain clients.

The *CORS* tab gives you the option of configuring these access control headers to suit your individual requirements.

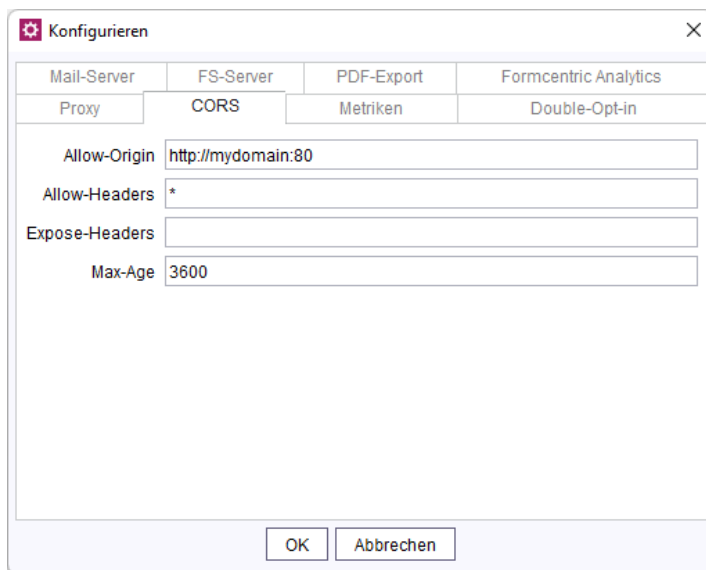


Figure 4.14. Configuring cross-origin resource sharing (CORS)

Allow-Origin: Enter a comma-separated list of domains here from which access to the form web app will be permitted (e.g. `www.mydomain.com`, `www.another-domain.com`). You can specify that access is permitted from any domain by entering an asterisk `"*"`. This is the default setting.

Allow-Headers: You use this parameter to specify the HTTP headers that are permitted to be passed across domain boundaries. You can specify that all HTTP headers are permitted by entering an asterisk `"*"`. This is the default setting.

Expose-Headers: You use this parameter to specify the HTTP headers that are permitted to be included in the server reply. The HTTP headers *X-Redirect-Location* and *X-Redirect-Delay* are evaluated by the Formcentric jQuery plugin and are therefore always permitted.

Max-Age: You use this parameter to specify the period of validity for the information from a pre-flight request.

If you operate the form web app under a separate domain, as described, then the application generates fully-qualified URLs in the HTML output automatically. The base URL that is used here is the base URL accessed by the browser, e.g. `https://forms.mydomain.com/`.

If the form application is accessed via an intervening load balancer or reverse proxy, the HTTP request will only receive information about the connection from the load balancer to the application. The load balancer must set additional HTTP request headers in order to forward the connection data originally used by the accessing browser – such as host, port, etc. – to the application. Among other things, the application needs these headers in order to generate fully-qualified URLs.

The following headers must be added:

HTTP request header	Description
X-Forwarded-Proto	Protocol (HTTP or HTTPS) that the browser has used to make the connection to your load balancer.
X-Forwarded-Host	Host that the browser has used to make the connection to the load balancer.
X-Forwarded-Port	Port that the browser has used to make the connection to the load balancer.
X-Forwarded-For	IP address of the accessing browser

Metrics tab (Spring-MVC)

To monitor operationally relevant system metrics such as memory usage or CPU load of the Spring MVC web application, Formcentric provides various metrics. You can access them via the following URL:

```
/fc_live/servlet/secure/health
```

By default, the metrics are delivered in a text format compatible with the monitoring system *Prometheus*.

Information about the usage of the forms can be found at the following URL:

```
/fc_live/servlet/secure/usage
```

Access to the metrics is secured with a login (basic authentication). You specify the associated login credentials on the *Metrics* tab.

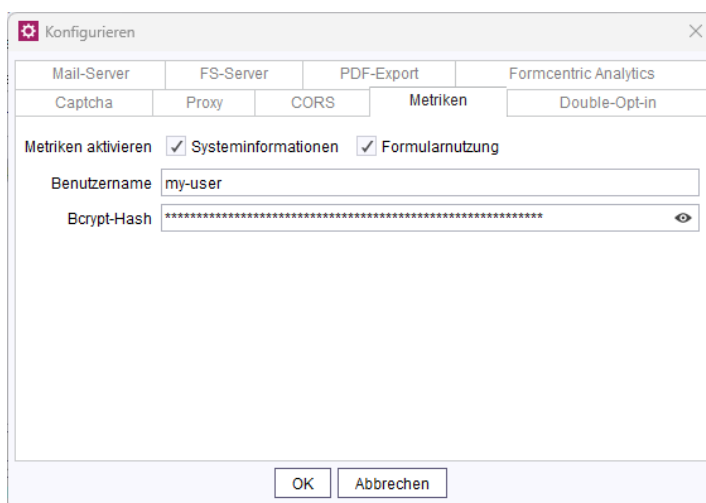


Figure 4.15. Configuring the credentials for displaying the metrics

User: Name of the user who will be granted access to the metrics.

Bcrypt hash: Enter the bcrypt hash of your password here. To generate a bcrypt hash, you can use the online service <https://bcrypt-generator.com>, for example.

System metrics activated: Activates or deactivates the endpoint for system metrics.

Usage metrics activated: Activates or deactivates the endpoint for usage metrics.

Monitoring tab (headless)

Formcentric provides you with a range of metrics for monitoring system values that have relevance for operations like storage usage or processor load for the headless web app. You can access these by using the following endpoint:

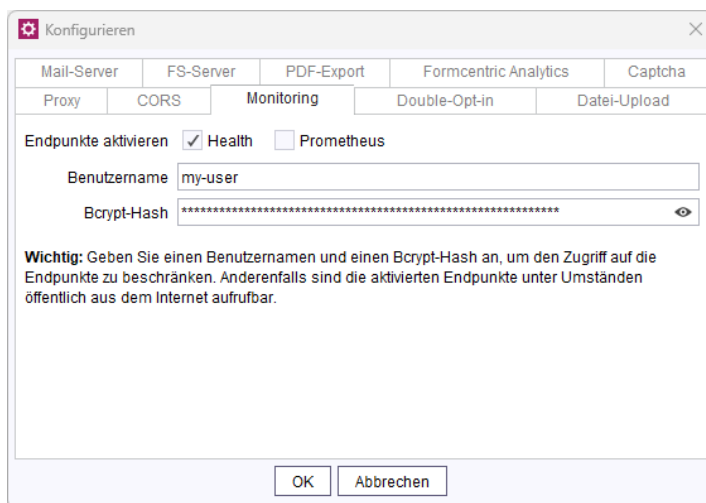
```
/fc_headless_live/actuator/prometheus
```

The metrics are supplied in a standardised text format that can be processed by the *Prometheus* monitoring system.

You can access information about the application status by using this endpoint:

```
/fc_headless_live/actuator/health
```

Access to the metrics is secured with a login (basic authentication). You specify the associated login credentials on the *Monitoring* tab.



Konfigurieren

Mail-Server	FS-Server	PDF-Export	Formcentric Analytics	Captcha
Proxy	CORS	Monitoring	Double-Opt-in	Datei-Upload

Endpunkte aktivieren Health Prometheus

Benutzername

Bcrypt-Hash

Wichtig: Geben Sie einen Benutzernamen und einen Bcrypt-Hash an, um den Zugriff auf die Endpunkte zu beschränken. Anderenfalls sind die aktivierten Endpunkte unter Umständen öffentlich aus dem Internet aufrufbar.

OK Abbrechen

Figure 4.16. Configuring the credentials for displaying the metrics

Health: Activates or deactivates the actuator endpoint that allows querying the application's operational status.

Prometheus: Activates or deactivates the actuator endpoint for usage and system metrics.

User: Name of the user who will be granted access to the endpoints.

Bcrypt hash: Enter the bcrypt hash of your password here. To generate a bcrypt hash, you can use the online service <https://bcrypt-generator.com>, for example.

Double opt-in tab

When the double opt-in option is used, the user is sent a mail with a confirmation link. The link directs the user to the website on which this user completed and submitted the form. To prevent a situation where the link could be manipulated to redirect the user to a phishing or spam site, the URL entered must be verified. Link verification is completed using the URL pattern as configured in this dialog.

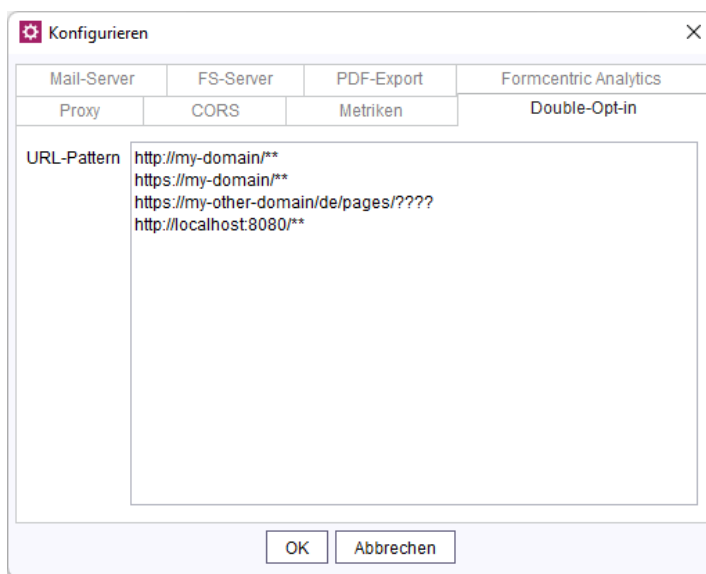


Figure 4.17. Configuration of the double opt-in URL pattern

URL pattern: In this input field, enter a URL pattern for each web page on which a Formcentric form can be embedded. Within the URL pattern, you can use the following wildcards:

1. ? stands for one character
2. * stands for one or more characters

File upload tab (headless)

Files that a user uploads in a form are cached temporarily on the server until form submission is complete. You use this configuration dialog to specify the storage location and maximum permitted size for file uploads.

For the cached storage, you can either use a local directory or MinIO, or an S3-compatible object storage service. MinIO is specially designed for the storage of large, unstructured data and optimised to handle high I/O loads. MinIO also offers strong security features, including server-side and client-side encryption, and can be

operated both on-prem as well as in the cloud. Deploying MinIO is especially recommended for installations using multiple instances of the headless web application.



You can only use this configuration dialog for configuring the headless web application.

Mail-Server	FS-Server	PDF-Export	Formcentric Analytics	Proxy
CORS	Metriken	Double-Opt-in	Datei-Upload	

Größenbeschränkungen

Maximale Dateigröße: 50MB

Maximale Request-Größe: 50MB

Zwischenspeicher

Dateisystem

Verzeichnis:

MinIO Object Storage

MinIO-URL:

MinIO-Bucket:

Access-Key:

Secret-Key:

OK Abbrechen

Figure 4.18. Configuring file uploads

Maximum file size: This parameter specifies the maximum size that an uploaded file can have. This is used as a security precaution to avoid large files overloading available server capacity. This setting is a technical limit, so it cannot be overridden by any editorial rules that apply to uploaded content.



For the Spring MVC web application, the maximum file size can be specified in the *web.xml* file.

Maximum request size: This parameter specifies the maximum size that an HTTP request can have. This applies to the size of the uploaded file(s) as well as all associated metadata and headers. As with the maximum file size, this parameter is also intended to reduce server load and improve performance.

File system: This parameter specifies that the uploaded files are cached on a local file system or connected network drive.

Directory: If you have selected *file system* as the cache location, you must specify the exact storage location here. This should be a path to a directory to which the web application has read and write access. You can also use the environment variable

`{java.io.tmpdir}` in this field if you want to use the temporary directory from the Java VM.

MinIO Object Storage: This parameter activates the use of MinIO for the cache. Once activated, the corresponding MinIO parameters must also be configured.

MinIO URL: This parameter specifies the URL at which your MinIO storage service is reachable. The URL must include the protocol, hostname and port (if applicable).

MinIO Bucket: The *MinIO Bucket* parameter states the name of the specific container in your MinIO storage that is used to store the uploaded files. In MinIO, a *bucket* is essentially the equivalent of a folder in a conventional file system.

Access Key: The *Access Key* forms part of your login credentials for the MinIO storage. This is used together with the *Secret Key* for MinIO authentication. The access key should be stored securely and must not be generally accessible.

Secret Key: The *Secret Key* is the counterpart to the *Access Key* and is used together with this key for MinIO authentication. As with the access key, the secret key must be handled as strictly confidential and kept in a secure location.

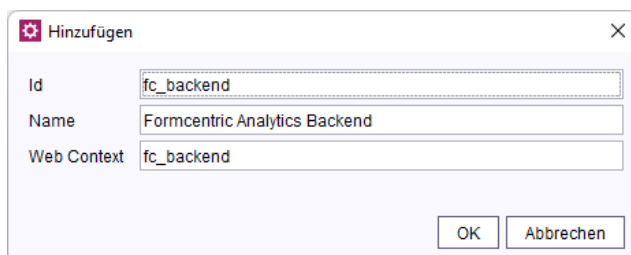
Repeat the steps in sections 4.4.1 and 4.4.2 for the Preview web application.

4.5. Analytics Backend web application

4.5.1. Installation

Create another global web application. This is required to store and process your forms with Formcentric Analytics.

Enter the ID, the name and the context for the web application. Typically, the ID *fc_backend* is used for the Analytics Backend application. Close the dialog box by clicking *OK*.



Id	fc_backend
Name	Formcentric Analytics Backend
Web Context	fc_backend

OK Abbrechen

Figure 4.19. Adding a new web application

Add a web component to the web application that you have just created by clicking *Add*. In the following selection dialog, all of the available web components are displayed. Select the *Formcentric Analytics Backend* entry.

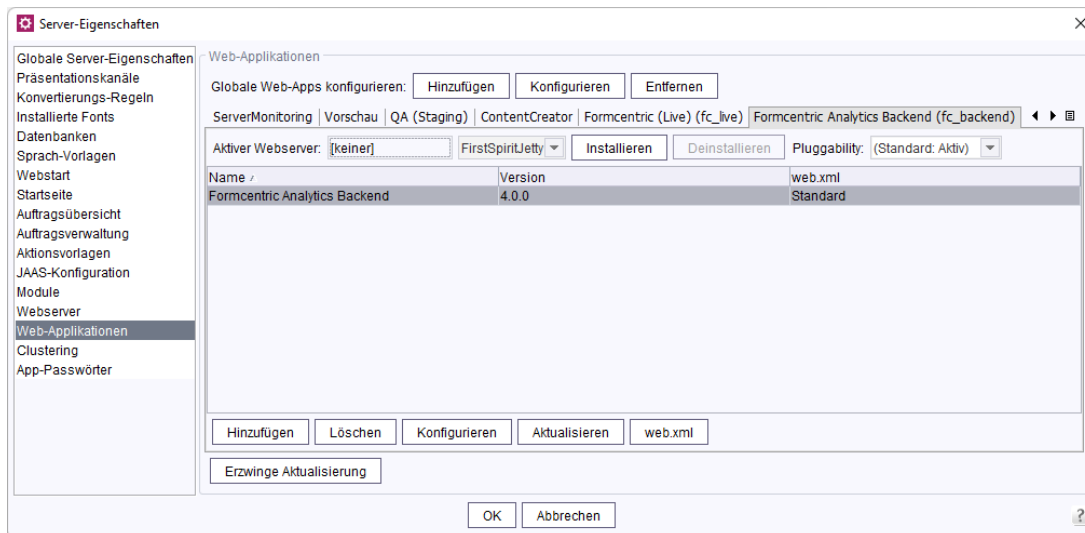


Figure 4.20. Global web application with installed web component

4.5.2. Configuration

Double-click the *Formcentric Analytics Backend* web component to open the configuration dialog, which contains multiple tabs.

General tab

You use the 'General' tab to configure general settings.

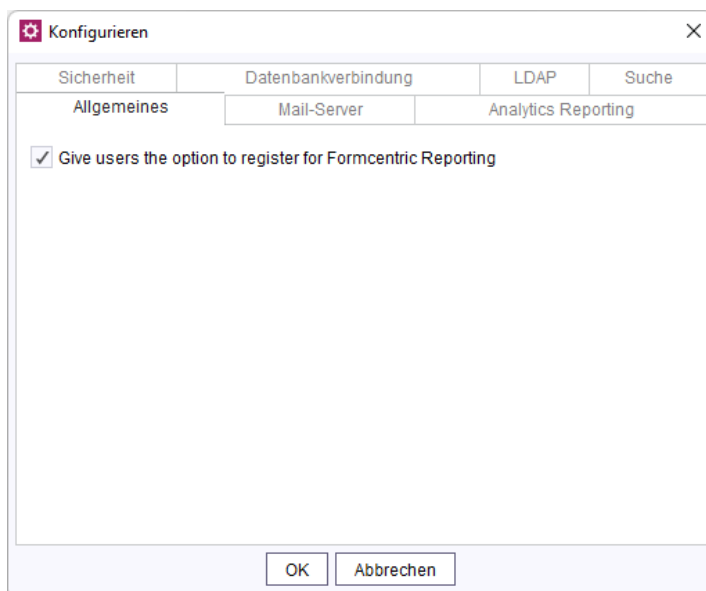


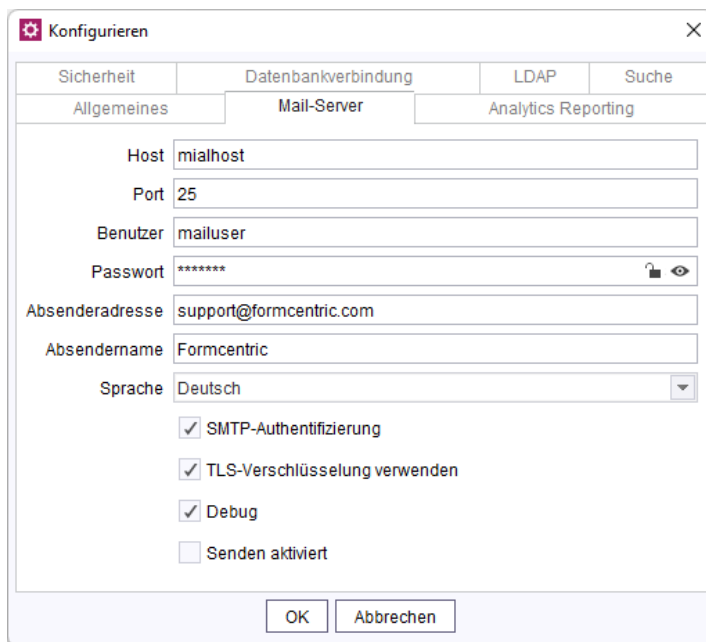
Figure 4.21. Configuring the Analytics Backend web application on the "General" tab

Giving users the opportunity to register for Reporting: Check this check box to specify that a link to the registration screen should be shown on the Formcentric

Reporting interface login screen. On the registration screen, users can register for access to Formcentric Analytics (see also section 2, „Login and registration”, in the Formcentric Analytics User Manual).

Mail server tab

You use the ‘Mail server’ tab to configure the mail server that the Analytics Backend uses to send emails to users.



The image shows a configuration window titled 'Konfigurieren' with a close button (X) in the top right corner. The window has several tabs: 'Sicherheit', 'Datenbankverbindung', 'LDAP', and 'Suche'. The 'Mail-Server' tab is selected. Below the tabs are three sub-sections: 'Allgemeines', 'Mail-Server', and 'Analytics Reporting'. The 'Mail-Server' section contains the following fields and options:

- Host: mialhost
- Port: 25
- Benutzer: mailuser
- Passwort: ***** (with a lock and eye icon)
- Absenderadresse: support@formcentric.com
- Absendername: Formcentric
- Sprache: Deutsch (dropdown menu)
- SMTP-Authentifizierung
- TLS-Verschlüsselung verwenden
- Debug
- Senden aktiviert

At the bottom of the window are two buttons: 'OK' and 'Abbrechen'.

Figure 4.22. Configuring the Analytics Backend web application on the “Mail server” tab

Host: Name or IP address of the SMTP mail server.

Port: Port number of the mail server.

User: The account used by Formcentric Analytics to authenticate with the SMTP server.

Password: Password for the SMTP user.

Sender address: The email address that Formcentric Analytics uses as the sender when sending email.

Sender name: This property is used to set the name that is shown as the sender for all mail sent by Formcentric Analytics.

Language: Configure this property to set the language used for sending email.

SMTP authentication: Use this property to activate/deactivate use of the AUTH command by the mail user.

Use TLS encryption: Configure this property if STARTTLS must be used.

Debug: Use this property to activate/deactivate extra debugging output while mail is being sent. This information includes all of the body content, metadata and headers, which could contain personal data.

Send activated: Use this property to activate or deactivate the sending of email from Formcentric Analytics.

Analytics Reporting tab

On the *Analytics Reporting* tab, you configure the external URL from which the Reporting interface can be accessed.

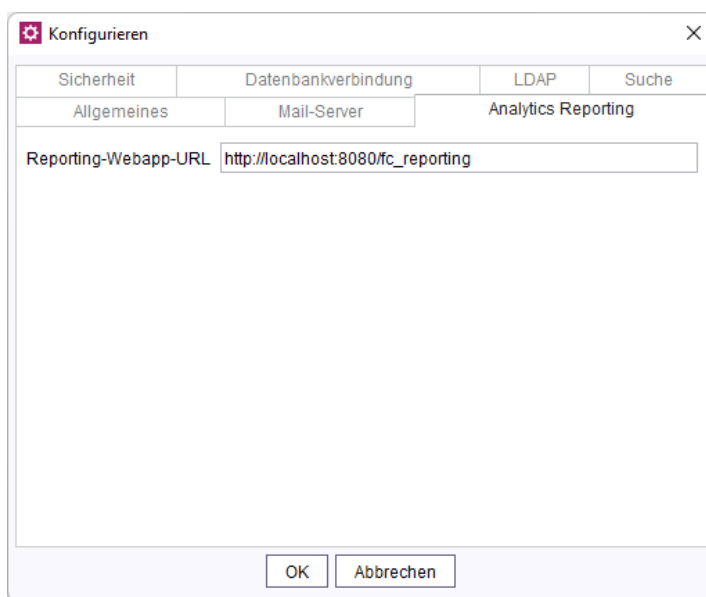


Figure 4.23. Configuring the Analytics Backend web application on the “Analytics Reporting” tab

Reporting web app URL: External URL from which the Reporting web application is reachable.

Security tab

You use the ‘Security’ tab to enter the login credentials for logging into the Analytics Backend.

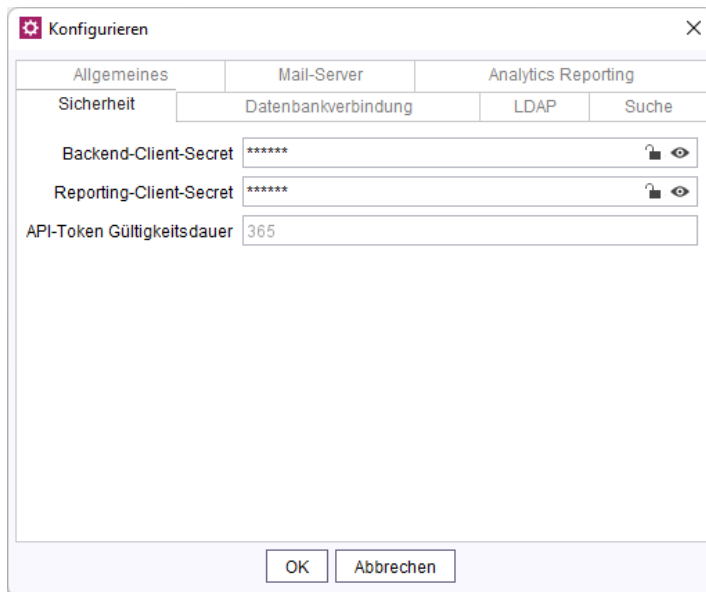


Figure 4.24. Configuring the Analytics Backend web application on the “Security” tab

Backend client secret: Enter your chosen secret here. This will be used by the Formcentric web application to generate an *access token* for the Analytics Backend. The value chosen should be as secure as possible.

Reporting client secret: Enter your chosen password here. This is used for Reporting application authorisation on the Analytics Backend.

API token validity period: Here, enter the number of days for which a REST API token will be valid.

Database connection tab

The database connection tab is used to configure the database connection for the Analytics Backend database. The necessary database tables and indexes are either automatically created or updated when the application is started.

Formcentric uses the Java Database Connectivity API (JDBC) for accessing the Backend database. The JDBC drivers required are not included in the Formcentric FSM module. You therefore need to copy the JDBC driver for the database system used onto the web server, so that the driver is found in the application's classpath. A detailed guide to installing and configuring the Backend web application can be found in the Installation Manual (*formcentric_backend_install_en.pdf*).

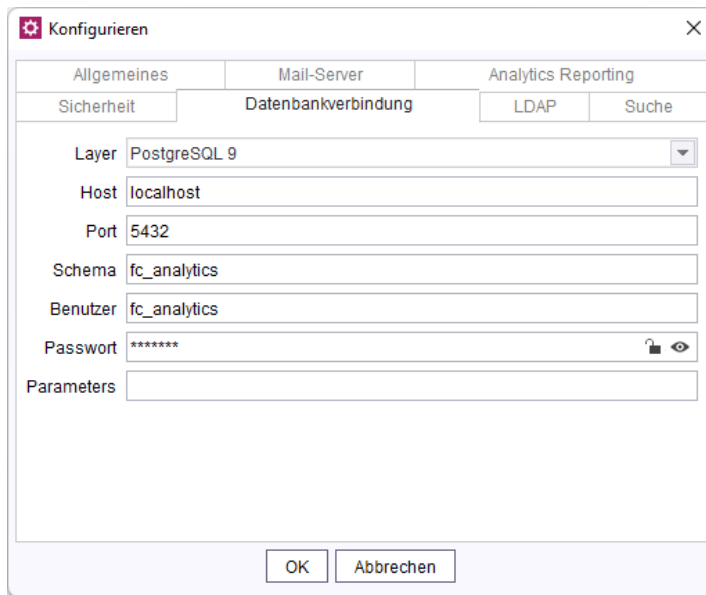


Figure 4.25. Configuring the Analytics Backend web application on the “Database connection” tab

Layer: Select the appropriate driver for your database here.

Host: Enter the name or the IP address of your database server.

Port: Enter the port that the client should use to connect to your database server.

Schema: Enter the database schema that will be used.

User: Enter the username that the Formcentric Analytics Backend uses to log into your database.

Password: Enter the password for the user here.

Parameters: This field gives you the option of specifying additional connection parameters specific to your database. These will be added to the connection URL exactly as you have entered them. The parameter string must begin with the separator that is used by the database system deployed (e.g. `?ssl=true`).

LDAP tab

In addition to the internal user management functionality offered by Formcentric Analytics, you can also integrate an external user directory such as LDAP or Active Directory. You configure the connection and filter settings for your user directory on the ‘LDAP’ tab.

Figure 4.26. Configuring the Analytics Backend web application on the “LDAP” tab

Directory type: Select the type of external user directory that you want to connect to here. Formcentric supports LDAP and Active Directory.

URL: URL of the LDAP server.

Username: Username for access to the LDAP server.

Password: Password for access to the LDAP server.

Base DN: The Distinguished Name (DN) of the base directory that is used to hold the user and group objects (e.g. *dc=mydomain,dc=com*).

Subdomain DNs: Optional specification of subdomains that hold additional user and group objects (e.g. *dc=subdomain1,dc=my-domain,dc=com*). For each additional subdomain, enter a new row with the fully-qualified DN of the subdomain.

Domain name: Human-readable name of the domain used as a default for the user during registration.

Search base for users: Specifies an object in the directory tree under which the user search is executed (e.g. *ou=people* for LDAP or *cn=users* for Active Directory).

Search filter for users: Specifies an LDAP search filter to apply to the user search (which is run using the specified search base) (e.g. *(uid={0})* for LDAP or *(samaccountname={0})* for Active Directory).

The placeholder *{0}* is replaced with the username entered before executing the search.

A general description of the search filter syntax is available from the following link:<http://www.faqs.org/rfcs/rfc2254.html>.

User DN pattern: Pattern that is used to generate the distinguished name (DN) for a user (e.g. *uid={0},ou=people*).

User email: Name of the user object attribute field in which the email address can be found. The email address is saved in the Analytics database.

Search base for groups: Specifies an object in the directory tree under which the group search is executed (e.g. *DC=company,DC=com* for LDAP or *cn=users* for Active Directory).

Search filter for groups: Specifies an LDAP search filter to apply to the group search (which is run using the specified search base) (e.g. *(&(objectclass=groupOfUniqueNames))* for LDAP or *(&(objectclass=group))* for Active Directory).

Groups import filter: All of the groups for which specific permissions will be granted within Formcentric Analytics must first be imported into the internal user directory used by Formcentric Analytics. You can use the *group import filter* field to specify an LDAP search filter that will be applied in order to select the LDAP groups to import from the list of available groups (e.g. *(cn=*AnalyticsUsers*)*). If you do not enter anything into this field, then all of the groups identified by the LDAP search filter field *search filter for groups* will be imported.

Search filter for user groups: This LDAP search filter is used to identify the groups in which a user is a member. You only need to specify this parameter if you have selected the *LDAP* directory type (e.g. *(memberUid={0})*). The placeholder *{0}* is replaced with the username entered before executing the search.

If you want to install the Analytics Backend web application on the *FirstSpirit Jetty Server*, you need to extend the *web.xml* for the web application to include the context parameter *webAppRootKey*. Enter the web application ID as the value.

```
<context-param>
  <param-name>webAppRootKey</param-name>
  <param-value>mwf_backend</param-value>
</context-param>
```

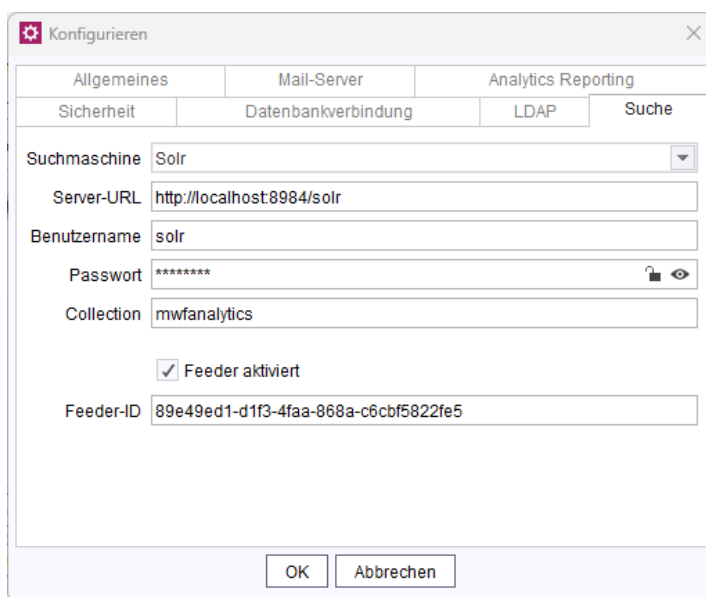
Search tab

Formcentric Analytics uses an external search engine to provide search functionality for form submissions and a full-text search across all forms. Solr or *Elasticsearch* can be used as the search engine. Both search engines are standalone applications that need to be installed in addition to the Backend application. For search engine installation and configuration, please consult the documentation for the respective search engine.

This dialog is used to configure a connection to one of the two search engines.

Please note that Solr and Elasticsearch use different sets of configuration parameters. The following section describes the specific settings used for each system.

The following configuration is required to use Solr.



The screenshot shows a configuration dialog titled 'Konfigurieren' with a close button (X) in the top right corner. The dialog has several tabs: 'Allgemeines', 'Mail-Server', 'Analytics Reporting', 'Sicherheit', 'Datenbankverbindung', 'LDAP', and 'Suche'. The 'Suche' tab is selected. Inside the 'Suche' tab, there are the following fields and controls:

- 'Suchmaschine': A dropdown menu with 'Solr' selected.
- 'Server-URL': A text input field containing 'http://localhost:8984/solr'.
- 'Benutzername': A text input field containing 'solr'.
- 'Passwort': A password input field with '*****' and a toggle icon for visibility.
- 'Collection': A text input field containing 'mwfanalytics'.
- 'Feeder aktiviert': A checked checkbox.
- 'Feeder-ID': A text input field containing '89e49ed1-d1f3-4faa-868a-c6cbf5822fe5'.

At the bottom of the dialog are 'OK' and 'Abbrechen' buttons.

Figure 4.27. Configuring the Solr search engine on the “Search” tab

Search engine: Select *Solr* to activate the configuration for this search engine.

Server URL: Enter the Solr server URL here.

Username: Enter the username that will be used to access Solr. Leave this field empty if your Solr installation does not require a username.

Password: Enter the password that will be used to access Solr. Leave this field empty if your Solr installation does not require a password.

Collection: Enter the name of the collection you have set up here.

Feeder activated: Activate or deactivate the feeder that is used to populate the search index. Typically, you will only need to have the search index populated by one Backend application instance.

Feeder ID: Assign a unique ID to the feeder here. This ID can be an arbitrary character string. If multiple Backend applications are being run in parallel, the feeder IDs for the various Backend applications must be unique.



Instead of running Solr as a standalone application, you also have the option of installing Solr as a global FirstSpirit web app. Formcentric will provide you with a separate FirstSpirit module for this purpose. To install this module, please see the installation guide at Section 4.7, “Solr web application”.

In this scenario, enter the URL of the global web app into the *Server URL* field.

For production environments, we recommend operating the search engine outside FirstSpirit.

Configure the following settings when using Elasticsearch.

The screenshot shows a configuration window titled 'Konfigurieren' with a close button (X) in the top right corner. The window has several tabs: 'Allgemeines', 'Mail-Server', 'Analytics Reporting', 'Sicherheit', 'Datenbankverbindung', 'LDAP', and 'Suche'. The 'Suche' tab is active. The configuration fields are as follows:

- Suchmaschine:** A dropdown menu with 'Elasticsearch' selected.
- Server-URIs:** A text input field containing 'http://localhost:9300'.
- Benutzername:** A text input field containing 'elastic'.
- Passwort:** A text input field containing '*****' with a lock icon and an eye icon to the right.
- Index:** A text input field containing 'analytics'.
- Feeder aktiviert:** A checkbox that is checked.
- Feeder-ID:** A text input field containing '89e49ed1-d1f3-4faa-868a-c6cbf5822fe5'.

At the bottom of the window are two buttons: 'OK' and 'Abbrechen'.

Figure 4.28. Configuring the Elasticsearch search engine on the “Search” tab

Search engine: Select *Elasticsearch* to activate the configuration for this search engine.

Server URIs: Enter the URIs for the Elasticsearch server here. If you are using multiple Elasticsearch instances, the Formcentric Analytics Backend can also communicate with multiple instances. In this case, enter the URIs separated by commas (,).

Username: Enter the username that will be used to access Elasticsearch here. Leave this field empty if your Elasticsearch installation does not require a username.

Password: Enter the password that will be used to access Elasticsearch. Leave this field empty if your Elasticsearch installation does not require a password.

Index: Enter the name of the index you have set up here.

Feeder activated: Activate or deactivate the feeder that is used to populate the search index. Typically, you will only need to have the search index populated by one Backend application instance.

Feeder ID: Assign a unique ID to the feeder here. This ID can be an arbitrary character string. If multiple Backend applications are being run in parallel, the feeder IDs for the various Backend applications must be unique.



Repeat the steps in sections 4.5.1 and 4.5.2 if you want to use separate instances of the Analytics Backend for the Preview and Live environments.

4.6. Analytics Reporting web application

4.6.1. Installation

Create another global web application for the Formcentric Analytics Reporting application.

Enter the ID, the name and the context for the web application. Typically, the ID *fc_reporting* is used for the Reporting web application. Close the dialog box by clicking *OK*.

The 'Hinzufügen' dialog box contains three input fields: 'Id' with the value 'fc_reporting', 'Name' with the value 'Formcentric Analytics Reporting', and 'Web Context' with the value 'fc_reporting'. At the bottom right, there are two buttons: 'OK' and 'Abbrechen'.

Figure 4.29. Adding the Reporting web application

Add a web component to the web application that you have just created by clicking *Add*. In the following selection dialog, all of the available web components are displayed. Now select the *Formcentric Analytics Reporting* entry.

The 'Server-Eigenschaften' dialog box shows a list of installed web components. The 'Formcentric Analytics Reporting' entry is selected. The table below shows the details of the installed components:

Name	Version	web.xml
Formcentric Analytics Reporting	4.0.0	Standard

At the bottom of the dialog, there are buttons for 'Hinzufügen', 'Löschen', 'Konfigurieren', 'Aktualisieren', and 'web.xml'. There is also an 'Erzwingte Aktualisierung' button and 'OK' and 'Abbrechen' buttons at the very bottom.

Figure 4.30. Global web application with installed web component

4.6.2. Configuration

Double-click the *Formcentric Analytics Reporting* web component to open the configuration dialog.

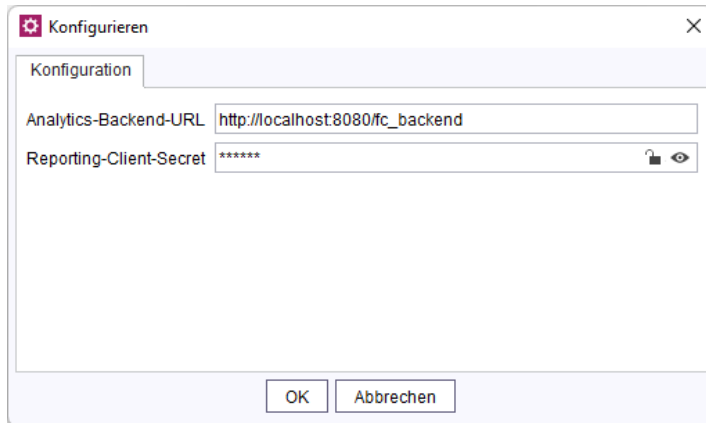


Figure 4.31. Configuring the web application on the “Configuration” tab

Analytics Backend URL: URL for accessing the Formcentric Analytics Backend. If you are using a separate Backend for Live and Preview in your environment, then take care to ensure that you specify the correct URL here.

Reporting client secret: Enter the password used to log into the Analytics Backend here. This must match the *Reporting client secret* that you issued during the configuration of the Analytics Backend (see the section called “Security tab”).

If you want to install the Reporting web application on the *FirstSpirit Jetty Server*, you need to extend the *web.xml* for the web application to include the context parameter *webAppRootKey*. Enter the web application ID as the value.

```
<context-param>
  <param-name>webAppRootKey</param-name>
  <param-value>fc_reporting</param-value>
</context-param>
```

Repeat the steps in sections 4.6.1 and 4.6.2 if you want to use separate instances of the Reporting application for the Preview and Live environments.

4.7. Solr web application

Formcentric provides the Solr search engine as a separate FirstSpirit module for test and development purposes. This can be downloaded from our FTP server.

You install the *solr-module-1.4.0.fsm* module file using FirstSpirit's Server and Project Configuration.

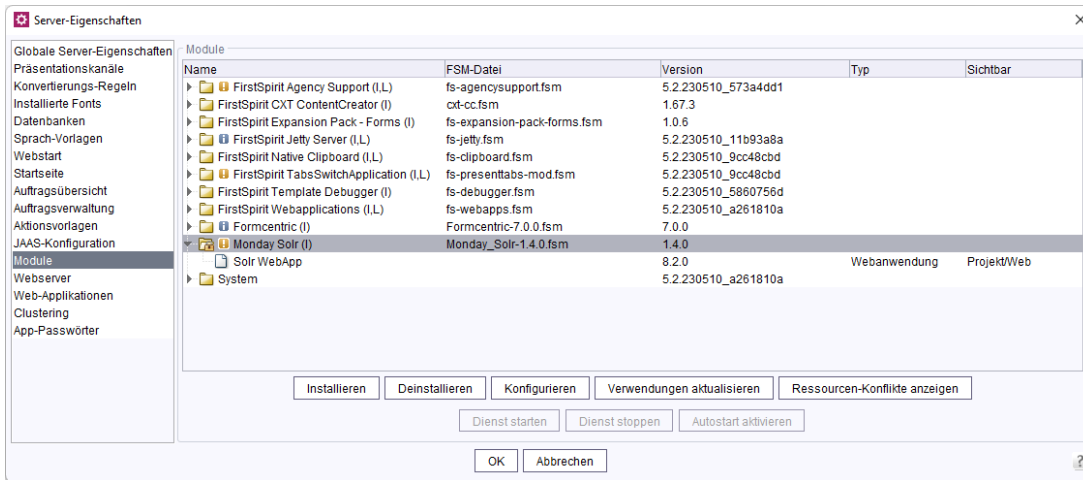


Figure 4.32. Module overview

As a final step, create another global web application.

Enter the ID, the name and the context for the web application. Typically, the ID *fc_solr* is used for the Solr application. Close the dialog box by clicking *OK*.

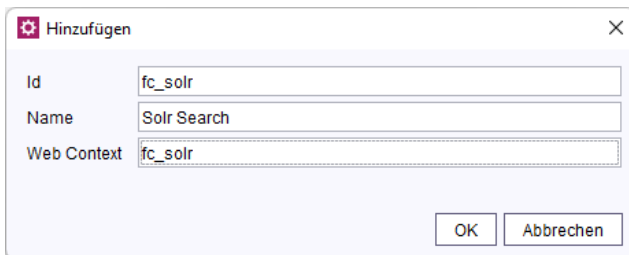


Figure 4.33. Adding a new web application

Add the following web components to the web application that you have just created by clicking *Add*. In the following selection dialog, all of the available web components are displayed. Select the entries *Solr WebApp* and *Formcentric Webforms Analytics Solr Core*.

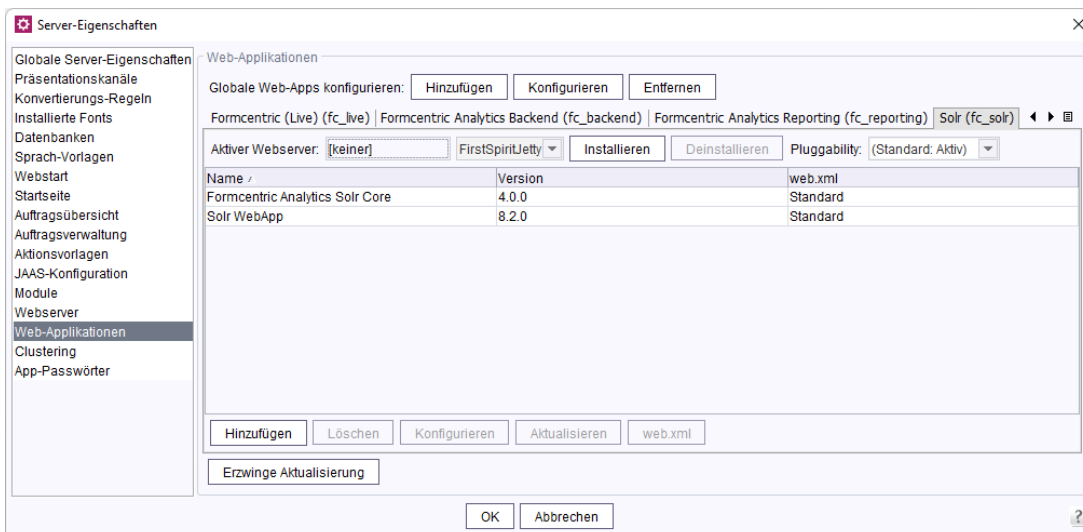


Figure 4.34. Solr web application with installed web components

Install the web application on the web server.

4.8. Formcentric project components

Formcentric includes two project components, which you can install and configure as described below.

4.8.1. Project resources

To integrate the form extension into a new or existing project, you will need some additional resources (JavaScripts, paragraph style sheets and CSS). These are bundled together as a separate project component, which you can add to your project with the help of the Project Configuration screen.

To do so, open the Project Configuration screen by double-clicking your project in the Project Overview, and select the *Project components* option from the menu on the left. Click the *Add* button to open up a selection dialog box that displays all of the project components installed on the server. Select the *Formcentric resources* entry.

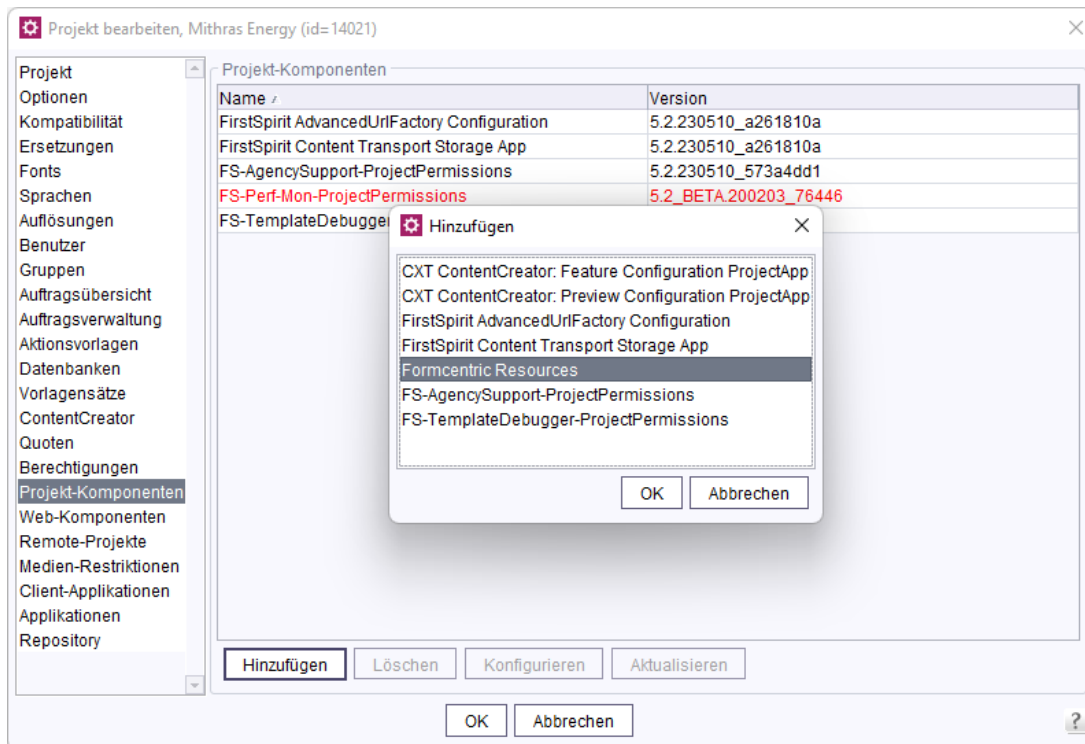


Figure 4.35. Project components in the project properties

Following a successful installation, the project is now extended by the following elements:

- **Paragraph style sheets:** The new style sheets *Form* and *Headless form* have been created in the project's paragraph style sheets.



The paragraph style sheets use the default HTML output channel to embed the form into the page. If your project does not use this output channel, then you must make the changes described in Section 5.1.3, “Internet (HTML) tab” manually in the output channel that you are using.

- **Scripts:** The *Scripts* area in Template Management has now been extended by the *Formcentric* folder, which contains various generation scripts.
- **Media:** Media Management now contains the *Formcentric* folder. This folder contains the required JavaScripts and style sheets in their original and minified forms.



When the module is updated to a new version, the project component also updates itself automatically. In the process, the system must also replace the section templates (see Section 5.1, “Paragraph style sheet”) with new versions. This leads to a situation where you can no longer edit existing forms following the update, since the system can no longer find the associated section templates. To avoid this problem, you should work with copies of the section templates contained in the project component.

Please note: You can use the *fix_ReferenceNotFoundException* script to repair forms whose paragraph style sheet has been deleted.

4.8.2. Project configuration

To create URLs for FirstSpirit content that is referenced from forms, Formcentric uses the URL creator provided in the generation context by default. If you want to use a different URL creator for this purpose, then you can specify this creator in the Formcentric project configuration.

To do this, install the *Formcentric Project Configuration* project component. Then open the configuration dialog for the installed component and select the URL factory that you want to use from the *URL factory* or *Preview URL factory* selection field. As a last step, enter the address of the web server from where the respective application can be reached externally in *Prefix for absolute paths* or *Prefix for absolute preview paths*.

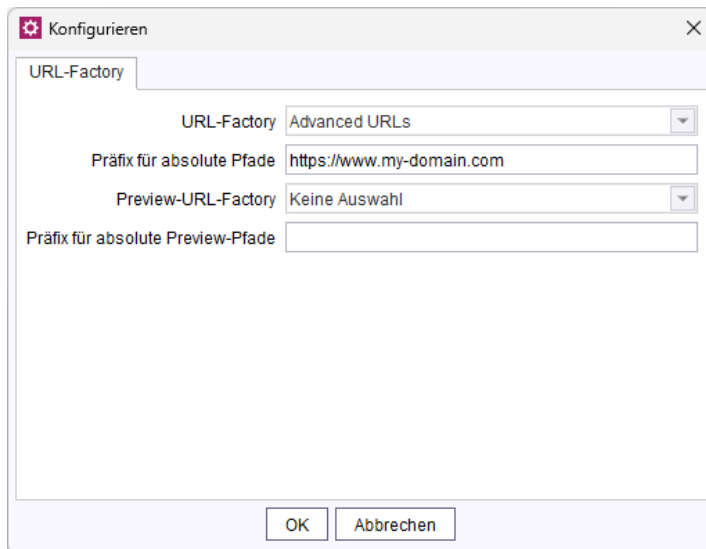


Figure 4.36. Configuring the URL factory



If this project component is not installed or the URL creator has not been configured, then the URL creator from the generation context will continue to be used.

4.9. Configuring the publication tasks

You need to perform the configuration of the publication tasks as described below only if the PDF template documents should be loaded from a local directory within the Formcentric web app (see also the section called “PDF export tab”).

For the PDF action to work properly, you need to publish your PDF templates to the Formcentric web application. This publication is necessary both for the production web application and for the Preview. The external program *rsync* is used for the publication.

For information about installing and configuring *rsync* in conjunction with FirstSpirit, please see section 10 of the FirstSpirit “Administrator Documentation”.

A BeanShell script is provided for publishing the PDF template. The script is supplied to you as part of the Formcentric scope of delivery.

Open the Project Configuration screen by double-clicking your project in the Project Overview, and select the *Action templates* option from the menu on the left. Click the *Add* button to open up a selection dialog box that displays various activities. Select the *Execute script* entry.

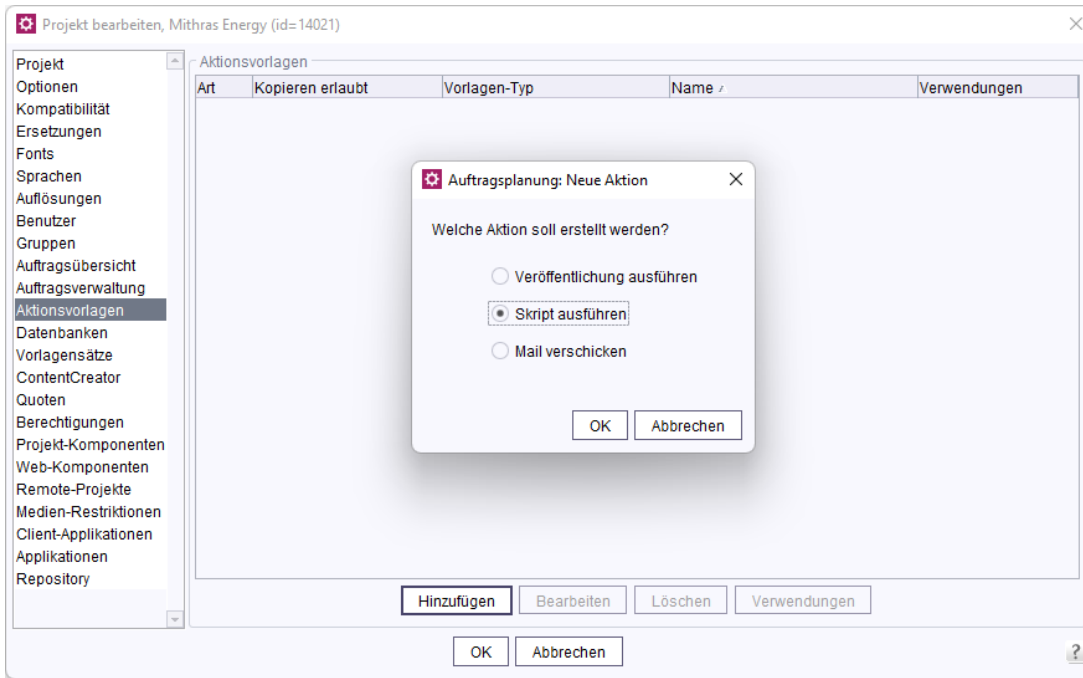


Figure 4.37. Creating a schedule template in Server Manager

In the *Script* dialog box that then appears, enter the name “Formcentric RSync Deployment”.



You can use a different name, but you will then have to modify the script in the Java client.

Copy the contents of the script provided (*ext-rsync-ssh.bsh*) into the input field below.

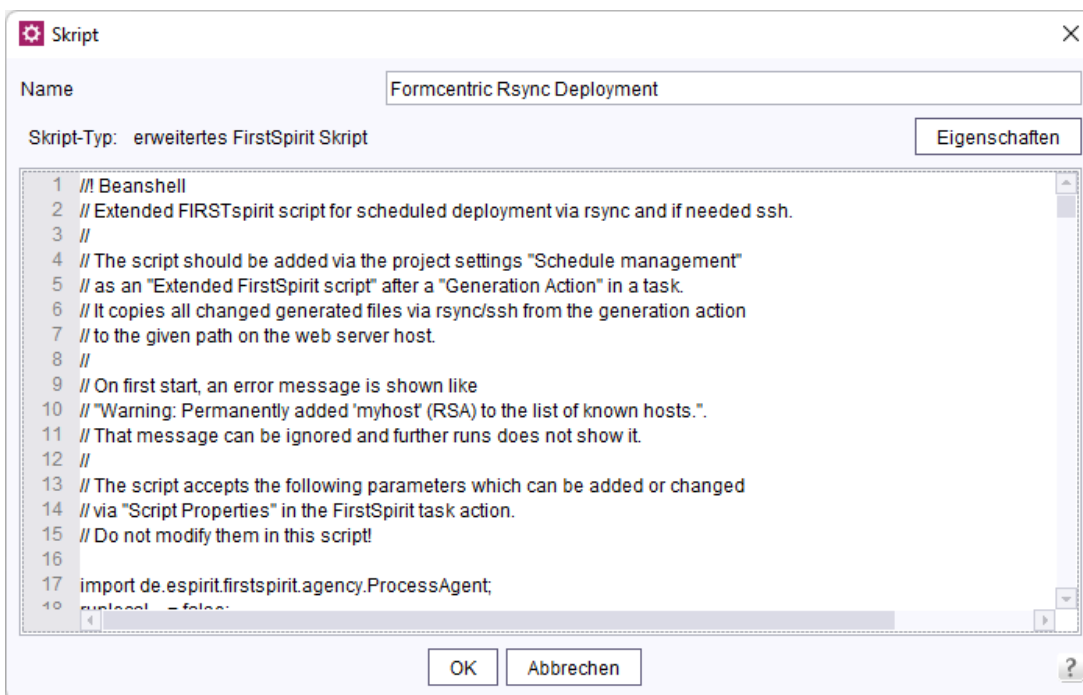


Figure 4.38. PDF action deployment script

As a next step, now configure the following parameters for your Preview or Delivery server, as described in section 10.5 of the FirstSpirit “Administrator Documentation”.

Parameter	Description
rsync	Path to the rsync program (only necessary on Windows systems). Example: <i>C:\cygwin\bin\rsync.exe</i>
runlocal	This parameter is used to specify whether publication is made to a local directory (<i>true</i>) or to a remote server (<i>false</i>).
subfolder	Path to a directory in Media Management in which the PDF templates are to be found. Example: <i>media/pdf</i>
webpath	Path to the directory in which the PDF templates should be stored following publication. Example: <i>/opt/firstspirit5/web/fc_preview/WEB-INF/pdf</i> Ensure that this directory is identical to that specified in the module configuration for the PDF action. The default value is <i>WEB-INF/pdf</i> .

The following parameters only need to be specified if publication is to take place to a remote server (*runlocal=false*).

Parameter	Description
webuser	Username that the system uses to log in to the remote server.
webhost	Hostname or IP address of the remote server.
ssh	Path to the ssh program. Example: <i>C:\cygwin\bin\ssh.exe</i>
privkey	On Windows systems, this parameter can be used to specify the full path to the SSH key file for the user configured by the <i>webuser</i> parameter. Example: <i>c:\User\fs5\.ssh\id_rsa</i>



Figure 4.39. Sample configuration for the PDF action deployment script on a Windows server

As a final step, save the schedule template.

Use the new schedule template to create a new publication schedule that the editorial staff can use to transfer the PDF templates to the Preview web app (*fc_preview*) (see also section 3.4.3 in the Formcentric User Manual).

In order for the PDF templates to also be transferred with each deployment, you should include the schedule template in all relevant publication schedules. For further details of schedules and FirstSpirit schedule management, please consult section 7.5 of the FirstSpirit “Administrator Documentation”.

4.10. Password encryption

In the default configuration, login credentials for databases, mail servers, etc. are stored in various configuration files in plaintext. In the event of a security breach affecting the server, attackers would gain access to valid login credentials. For this reason, you are given the option of storing passwords in an encrypted format. In this case, passwords are decrypted only when the application starts, using the stored encryption password. You must ensure the password used for the encryption is stored in an environment variable before the Formcentric web applications start. The default environment variable used by Formcentric for this is *MWF_ENCRYPTION_PASSWORD*.

```
export MWF_ENCRYPTION_PASSWORD=my-encryption-password
```

Within the Formcentric configuration interface, you have the option of encrypting the password that is entered for each password input field.



Figure 4.40. Password field with encryption functionality

To do so, click the lock symbol within the field. This opens a dialog box in which you enter an encryption password with which the password is then encrypted. Please note: you must use the encryption password stored in the system for all of the passwords that are to be encrypted. No check is made to confirm that the password entered in the dialog matches the stored password.

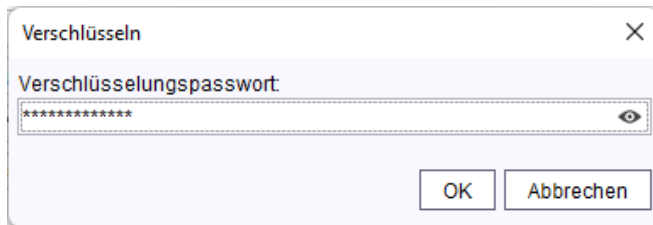


Figure 4.41. Dialog for password encryption/decryption

If you are not using the FirstSpirit administration interface to install Formcentric, you also have the alternative option of using a command line program to encrypt and decrypt your passwords. After encrypting passwords in this way, they must then be entered manually into the corresponding configuration file.

Download the program from the Formcentric Maven repository by executing the following command at the command line. You can obtain the necessary login credentials by contacting our Helpdesk (support@formcentric.com).

```
mvn org.apache.maven.plugins:maven-dependency-plugin:3.0.2:copy \
-Dartifact=com.monday.webforms:encryption-cli:1.0:jar \
-DoutputDirectory=.
```

To encrypt a password, enter the following command at the command line:

```
java -jar encryption-cli-1.0.jar \
-p '<encryption-password>' -e '<password>'
```

Please note that the parameters must be entered in single quotation marks. You can enter the following command line parameters when starting:

Parameter	Description
<i>-p encryption-password</i>	The password to be used for encryption or decryption.
<i>-d</i>	Decrypt password
<i>-e</i>	Encrypt password
<i>-?</i>	Show help

5. Extending the FirstSpirit project

After installing the project component, you need to make a number of manual changes to the imported resources and to existing page templates.

5.1. Paragraph style sheet

At the content level, the system uses a paragraph style sheet to display forms. You can modify this to suit your precise requirements as described below. Out of the box, Formcentric ships with two paragraph style sheets – the paragraph style sheet *Headless form* is envisaged for use with the headless web application, while the paragraph style sheet *Form* is envisaged for use with the Spring MVC web application. In the default setup, the only difference between the two paragraph style sheets is the *Internet (HTML)* section.

5.1.1. Properties tab

One of the configuration options on the *Properties* tab is the option to set default values for new forms. Click the *Default values* button to open the Form Editor in a new window. Here, you can create a form for each project language: from now on, the system uses this form as the template for newly-created forms.

5.1.2. Form tab

For forms, you use the input component *FORMCENTRIC_FORMEDITOR*. You configure this on the *Form* tab. For a detailed description of the component, please consult the user manuals (*formcentric_contencreator_en.pdf* and *formcentric_sitearchitect_en.pdf*).

```
<?xml version="1.0" encoding="UTF-8"?>
<FORMCENTRIC_FORMEDITOR name="form" expandOnStartup="yes" hFill="yes"
  useLanguages="yes">
  <DATASOURCES>
    <DATASOURCE name="Countries" type="comboBox">
      <LANGINFOS>
        <LANGINFO lang="*" label="English country names"/>
        <LANGINFO lang="DE" label="Englische Ländernamen"/>
      </LANGINFOS>
    </DATASOURCE>
    <DATASOURCE name="Laender" type="comboBox">
      <LANGINFOS>
        <LANGINFO lang="*" label="German country names"/>
        <LANGINFO lang="DE" label="Deutsche Ländernamen"/>
      </LANGINFOS>
    </DATASOURCE>
    <DATASOURCE name="Countries" type="inputField">
      <LANGINFOS>
        <LANGINFO lang="*" label="English country names"/>
        <LANGINFO lang="DE" label="Englische Ländernamen"/>
      </LANGINFOS>
  </DATASOURCES>
</FORMCENTRIC_FORMEDITOR>
```

```

</DATASOURCE>
<DATASOURCE name="Laender" type="inputField">
  <LANGINFOS>
    <LANGINFO lang="*" label="German country names"/>
    <LANGINFO lang="DE" label="Deutsche Ländernamen"/>
  </LANGINFOS>
</DATASOURCE>
...
</DATASOURCES>
<FILE_TYPES>
  <FILE_TYPE name="bmp">
    <LANGINFOS>
      <LANGINFO lang="*" label="Windows-Bitmap (*.bmp)"/>
    </LANGINFOS>
  </FILE_TYPE>
  <FILE_TYPE name="gif">
    <LANGINFOS>
      <LANGINFO lang="*" label="CompuServe-Bitmap (*.gif)"/>
    </LANGINFOS>
  </FILE_TYPE>
  <FILE_TYPE name="jpeg">
    <LANGINFOS>
      <LANGINFO lang="*" label="JPEG Image (*.jpeg)"/>
      <LANGINFO lang="DE" label="JPEG Bild (*.jpeg)"/>
    </LANGINFOS>
  </FILE_TYPE>
  ...
</FILE_TYPES>
<FORM_LAYOUTS>
  <FORM_LAYOUT name="mwf-separator">
    <LANGINFOS>
      <LANGINFO lang="*" label="Horizontaal seperator"/>
      <LANGINFO lang="DE" label="Horizontale Trennlinie"/>
    </LANGINFOS>
  </FORM_LAYOUT>
</FORM_LAYOUTS>
<FORM_VARIABLES>
  <FORM_VARIABLE name="date"/>
  <FORM_VARIABLE name="time"/>
  <FORM_VARIABLE name="url"/>
  <FORM_VARIABLE name="language"/>
  <FORM_VARIABLE name="ip"/>
  <FORM_VARIABLE name="userAgent"/>
  <FORM_VARIABLE name="referer"/>
</FORM_VARIABLES>
<INPUT_STYLE_CLASSES>
  <INPUT_STYLE_CLASS name="mwf-s" type="inputField">
    <LANGINFOS>
      <LANGINFO lang="*" label="Small width (mwf-s)"/>
      <LANGINFO lang="DE" label="Kleine Breite (mwf-s)"/>
    </LANGINFOS>
  </INPUT_STYLE_CLASS>
  <INPUT_STYLE_CLASS name="mwf-m" type="inputField">
    <LANGINFOS>
      <LANGINFO lang="*" label="Medium width (mwf-m)"/>
      <LANGINFO lang="DE" label="Mittlere Breite (mwf-m)"/>
    </LANGINFOS>
  </INPUT_STYLE_CLASS>

```

```

    </LANGINFOS>
</INPUT_STYLE_CLASS>
<INPUT_STYLE_CLASS name="mwf-l" type="inputField">
  <LANGINFOS>
    <LANGINFO lang="*" label="Large width (mwf-l)"/>
    <LANGINFO lang="DE" label="Große Breite (mwf-l)"/>
  </LANGINFOS>
</INPUT_STYLE_CLASS>
<INPUT_STYLE_CLASS name="mwf-s" type="checkboxGroup">
  <LANGINFOS>
    <LANGINFO lang="*" label="Small width (mwf-s)"/>
    <LANGINFO lang="DE" label="Kleine Breite (mwf-s)"/>
  </LANGINFOS>
</INPUT_STYLE_CLASS>
<INPUT_STYLE_CLASS name="mwf-m" type="checkboxGroup">
  <LANGINFOS>
    <LANGINFO lang="*" label="Medium width (mwf-m)"/>
    <LANGINFO lang="DE" label="Mittlere Breite (mwf-m)"/>
  </LANGINFOS>
</INPUT_STYLE_CLASS>
  ...
</INPUT_STYLE_CLASSES>
<LANGINFOS>
  <LANGINFO lang="*" label="Form"/>
  <LANGINFO lang="DE" label="Formular"/>
</LANGINFOS>
<MAIL_ACTION>
  <MAIL_FORMATS>
    <MAIL_FORMAT name="text">
      <LANGINFOS>
        <LANGINFO lang="*" label="Plain Text"/>
        <LANGINFO lang="DE" label="Text" />
      </LANGINFOS>
    </MAIL_FORMAT>
    <MAIL_FORMAT name="html">
      <LANGINFOS>
        <LANGINFO lang="*" label="HTML"/>
        <LANGINFO lang="DE" label="HTML"/>
      </LANGINFOS>
    </MAIL_FORMAT>
    <MAIL_FORMAT name="freetext">
      <LANGINFOS>
        <LANGINFO lang="*" label="Freemarker (Plain Text)"/>
        <LANGINFO lang="DE" label="Freemarker (Text)"/>
      </LANGINFOS>
    </MAIL_FORMAT>
    <MAIL_FORMAT name="freehtml">
      <LANGINFOS>
        <LANGINFO lang="*" label="Freemarker (HTML)"/>
        <LANGINFO lang="DE" label="Freemarker (HTML)"/>
      </LANGINFOS>
    </MAIL_FORMAT>
  </MAIL_FORMATS>
</MAIL_ACTION>
<PDF_ACTION templateFolder="pdf,pdf2"/>
<PHONE_NUMBER_TYPES>

```

```

<PHONE_NUMBER_TYPE name="FIXED_LINE">
  <LANGINFOS>
    <LANGINFO lang="*" label="Fixed-line"/>
    <LANGINFO lang="DE" label="Festnetz"/>
  </LANGINFOS>
</PHONE_NUMBER_TYPE>
<PHONE_NUMBER_TYPE name="MOBILE">
  <LANGINFOS>
    <LANGINFO lang="*" label="Mobile"/>
    <LANGINFO lang="DE" label="Mobil"/>
  </LANGINFOS>
</PHONE_NUMBER_TYPE>
<PHONE_NUMBER_TYPE name="FIXED_LINE_OR_MOBILE">
  <LANGINFOS>
    <LANGINFO lang="*" label="Fixed-line or Mobile"/>
    <LANGINFO lang="DE" label="Festnetz oder Mobil"/>
  </LANGINFOS>
</PHONE_NUMBER_TYPE>
<PHONE_NUMBER_TYPE name="TOLL_FREE">
  <LANGINFOS>
    <LANGINFO lang="*" label="Toll-free"/>
    <LANGINFO lang="DE" label="Gebührenfrei"/>
  </LANGINFOS>
</PHONE_NUMBER_TYPE>
<PHONE_NUMBER_TYPE name="PREMIUM_RATE">
  <LANGINFOS>
    <LANGINFO lang="*" label="Premium Rate"/>
    <LANGINFO lang="DE" label="Premium-Tarif"/>
  </LANGINFOS>
</PHONE_NUMBER_TYPE>
<PHONE_NUMBER_TYPE name="SHARED_COST">
  <LANGINFOS>
    <LANGINFO lang="*" label="Shared Cost"/>
    <LANGINFO lang="DE" label="geteilte Kosten"/>
  </LANGINFOS>
</PHONE_NUMBER_TYPE>
<PHONE_NUMBER_TYPE name="VOIP">
  <LANGINFOS>
    <LANGINFO lang="*" label="Voice over IP"/>
    <LANGINFO lang="DE" label="Voice-over-IP"/>
  </LANGINFOS>
</PHONE_NUMBER_TYPE>
<PHONE_NUMBER_TYPE name="PERSONAL_NUMBER">
  <LANGINFOS>
    <LANGINFO lang="*" label="Personal Numbers"/>
    <LANGINFO lang="DE" label="Persönliche Nummer"/>
  </LANGINFOS>
</PHONE_NUMBER_TYPE>
...
</PHONE_NUMBER_TYPES>
<REDIRECT_ACTION httpsOnly="no" supportDynamicUrls="yes">
  <ALLOWED_HOSTS>
    <ALLOWED_HOST name="*" />
  </ALLOWED_HOSTS>
</REDIRECT_ACTION>
<REGEX_PATTERNS>

```

```

<REGEX_PATTERN name="^[0-9]*$" >
  <LANGINFOS>
    <LANGINFO lang="*" label="Ciphers"/>
    <LANGINFO lang="DE" label="Nummern"/>
  </LANGINFOS>
</REGEX_PATTERN>
<REGEX_PATTERN name="^[0-9]{3,7}$" >
  <LANGINFOS>
    <LANGINFO lang="*" label="3-7 ciphers"/>
    <LANGINFO lang="DE" label="3-7 Nummern"/>
  </LANGINFOS>
</REGEX_PATTERN>
<WEBEDIT_MACROS>
  <WEBEDIT_MACRO>{"name":"File upload", ... }</WEBEDIT_MACRO>
</WEBEDIT_MACROS>

...
</REGEX_PATTERNS>
</FORMCENTRIC_FORMEDITOR>

```

Consult the following section for a description of the various tags and attributes that you can use when configuring the Form Editor.

FORMCENTRIC_FORMEDITOR

Input component for forms (Form Editor)

Attribute	Description
name	You use the <i>name</i> attribute to give the Form Editor a variable name. You can then use this name in the templates in order to output the encrypted presentation text with the help of <code>\$CMS_VALUE()</code> (see Section 5.1.3, "Internet (HTML) tab").
expandOnStartup	You use the <i>expandOnStartup</i> parameter to specify whether or not the form elements are expanded in the tree view when the Editor is opened or the form is saved.
excludeElements	<p>You use the <i>excludeElements</i> parameter to hide form element types completely in the Form Editor. For the parameter value, enter a comma-separated list containing the names of the element types to hide. If the use of captchas and page breaks should be prohibited, for example, then you would enter the value <i>captcha,pageBreak</i>.</p> <p>You can select from the following element types:</p> <p><i>button, checkBoxGroup, comboBox, condition, fileUpload, hiddenField, shortText, emailField, numberField, dateField, phoneField, inputField, layout, fieldSet, pageBreak, paragraph, passwordField, radioGroup, calculatedValue, pageCondition, summary, textArea, captcha, sequenceAction, mailAction,</i></p>

Attribute	Description
	<i>dataSourceAction, datastoreAction, redirectAction, mediaStoreAction, pdfAction, webhookAction</i>
hFill	The Form Editor is displayed with a predefined width. If you want to use the full width available to you from your display, configure the <i>hFill</i> parameter with the value <i>YES</i> . Due to the large amount of space required by this input component, the setting <i>YES</i> is recommended.
useLanguages	You use the <i>useLanguages</i> parameter to specify whether or not the Form Editor should save different form definitions for the various languages (multilingual content management).

You can also specify the standard parameters *hidden*, *label*, *noBreak*, *preset*, *convertEntities* and *allowEmpty*. For a detailed description of this parameter, please consult the FirstSpirit documentation.

FORM_VARIABLES

You use the *FORM_VARIABLES* tag to define variables that a form author can then use when pre-setting values for input fields in the *Default value* field for single- and multi-line text input boxes. For example, the form author can set the current date (variable *date*) as the default value for an input field.

The standard variables *date*, *time*, *serverDate*, *serverTime*, *clientDate*, *clientTime*, *timezone*, *url*, *language*, *ip*, *userAgent* and *referer* are defined and can be used. In addition, you can also define your own, custom variables. For further details, see Section 6.5.8, “Adding variables for pre-filling form fields”.

The image shows a form editor interface with a dropdown menu for variable selection. The dropdown is open, showing a list of variables: \$, \${date}, \${time}, \${url}, \${language} (which is highlighted), \${ip}, \${userAgent}, and \${referer}. To the left of the dropdown, there are labels for 'Wert:', 'Maximale Länge:', 'CSS Klasse:', and 'Validierung:'. Below the dropdown, there is a 'Readonly' checkbox.

Figure 5.1. Autocomplete list with variables for a single-line text field

FORM_VARIABLE

You use the *FORM_VARIABLE* tag to enter the name of a form variable.

Attribute	Description
name	Name of the form variable.

FORM_LAYOUTS

The *FORM_LAYOUTS* tag enables the definition of a list of layout names that the form author can then later select via the layout element.

FORM_LAYOUT

You use the *FORM_LAYOUT* tag to enter the name of a layout.

Attribute	Description
name	Name of the layout.

An optional, language-dependent label for the layout can be configured by specifying a subordinate *<LANGINFOS>* tag (see the section called “LANGINFOS”).

FIELD_WIDTHS

The *FIELD_WIDTHS* tag lets you define a list of CSS classes from which the form author can make a selection later when creating a form element, so as to specify the width of the form element.

Out of the box, the CSS classes *mwf-s*, *mwf-m* and *mwf-l* are already included: these can be used to influence the width of input elements on the form page.

FIELD_WIDTH

Attribute	Description
name	Name of the CSS class.
type	Form element type for which the CSS class should be selectable by the form author. As standard, you can configure CSS classes for the following element types: <i>inputField, textArea, passwordField, checkBoxGroup, comboBox, paragraph, radioGroup, shortText, emailField, numberField, dateField, phoneField, fileUpload, pageBreak.</i>

An optional, language-dependent label for the CSS class can be configured by specifying a subordinate *<LANGINFOS>* tag (see the section called “LANGINFOS”).

INPUT_STYLE_CLASSES

The *INPUT_STYLE_CLASSES* tag lets you define a list of CSS classes, from which the form author can make a selection later when creating a form element.

INPUT_STYLE_CLASS

Attribute	Description
name	Name of the CSS class.

Attribute	Description
type	Form element type for which the CSS class should be selectable by the form author. As standard, you can configure CSS classes for the following element types: <i>form, inputField, textArea, passwordField, checkBoxGroup, comboBox, paragraph, radioGroup, shortText, emailField, numberField, dateField, phoneField, summary, fieldSet fileUpload, pageBreak.</i>

An optional, language-dependent label for the CSS class can be configured by specifying a subordinate <LANGINFOS> tag (see the section called “LANGINFOS”).

DATASOURCES

You use the *DATASOURCES* tag to define dynamic data sources (REST services), which the form author can then select in order to fill a form element with values (see Section 6.5.9, “Implementing a REST service”).

DATASOURCE

Attribute	Description
name	Name of the REST service, as you entered it in the service mapping for the REST controller.
type	Form element type that the form author can use to select the data source. As standard, you can configure data sources only for drop-down lists of the types <i>comboBox, radioGroup, checkBoxGroup, inputField</i> and <i>hiddenField</i> .

An optional, language-dependent label for the data source can be configured by specifying a subordinate <LANGINFOS> tag (see the section called “LANGINFOS”).

FILE_TYPES

You use the *FILE_TYPES* tag to define file types that the form author can select for the file validator.

FILE_TYPE

Attribute	Description
name	Name of the file type, as entered into the MIME type mapping for the file validator. As standard, you can define the following file types: <i>bmp, gif, jpeg, png, wmf, tif, mp3, wav, mp4, avi, mpg, wma, mov, asf, wmv, zip, gz, tar, gtar, 7z, rar, arj, bz, bz2, doc, ppt, pptx, xls, xlsx, docx, mpx, wps, pdf, rtf, flv, txt, dvi, xml, js, css, xhtml, html, svg, psd, rpm, indd, inx</i>

An optional, language-dependent label for the file type can be configured by specifying a subordinate `<LANGINFOS>` tag (see the section called “LANGINFOS”).

PHONE_NUMBER_TYPES

You use the `PHONE_NUMBER_TYPES` tag to define phone number types that the form author can select when using the phone number validator.

PHONE_NUMBER_TYPE

Attribute	Description
name	Name of the phone number type, as entered into the MIME type mapping for the phone number validator. In the default setup, you can configure the following phone number types: <i>FIXED_LINE, MOBILE, FIXED_LINE_OR_MOBILE, TOLL_FREE, PREMIUM_RATE, SHARED_COST, VOIP, PERSONAL_NUMBER, UAN, VOICEMAIL, UNKNOWN.</i>

An optional, language-dependent label for the phone number type can be configured by specifying a subordinate `<LANGINFOS>` tag (see the section called “LANGINFOS”).

REGEX_PATTERNS

You use the `REGEX_PATTERNS` tag to define regular expressions that the form author can select when using the regular expression validator.

REGEX_PATTERN

Attribute	Description
name	The regular expression that you are now adding to the list of examples in the regular expression validator.

An optional, language-dependent label for the regular expression can be configured by specifying a subordinate `<LANGINFOS>` tag (see the section called “LANGINFOS”).

MAIL_ACTION

You use this tag to configure the mail action dialog for editorial staff.

MAIL_FORMATS

The `MAIL_FORMATS` tag enables you to define a list of format identifiers that the form author can subsequently use within the mail action in order to specify the format of the email sent by the system. If you do not specify any format identifiers, then the default formats of *html* and *text* are offered for selection.

MAIL_FORMAT

Attribute	Description
name	Name of the email format, identical to the entry in <i>bodyRendererMapping</i> that you have made for the mail action (see also the section called “formcentric-actions.xml”).

An optional, language-dependent label for the email format can be configured by specifying a subordinate `<LANGINFOS>` tag (see the section called “LANGINFOS”).

PDF_ACTION

You use this tag to configure the PDF action dialog for editorial staff.

Attribute	Description
templateFolder	All PDF documents that are to be used as a template for the PDF action must be stored in a master folder within Media Management. Enter the reference name of the folder here or use a comma-separated list for multiple folders. In the PDF action dialog for editorial staff, selection is restricted to PDF documents in these folders.

REDIRECT_ACTION

You use this tag to configure the redirect action dialog for editorial staff.

Attribute	Description
httpsOnly	You use the <i>httpsOnly</i> parameter to specify that only secure URLs can be entered as the redirection target.
supportDynamicUrls	You use the <i>supportDynamicUrls</i> parameter to specify whether or not the redirect URL variables can use the <i>\${field name}</i> format.

ALLOWED_HOSTS

This tag gives you the option of restricting the possible redirection targets to certain addresses (hosts).

ALLOWED_HOST

Specification of an allowed host.

If, for example, you want to ensure that only your own company webpages can be entered as the redirection target, then you should enter your company’s domain name here. You may use wildcards such as **.your-domain.com* to allow all subdomains (e.g., *shop.your-domain.com* or *login.your-domain.com*).

Important: The pattern `*.your-domain.com` will only match subdomains. The root domain `your-domain.com` itself is not included. If both the root domain and its subdomains should be allowed, you must add `your-domain.com` and `*.your-domain.com` as separate entries.

Attribute	Description
name	Name of an allowed host.

LANGINFOS

You use this tag to specify language-dependent labels for the attribute `name` in the parent tag; these labels are displayed in the form editing interface. This applies to the tags `DATASOURCE`, `FILE_TYPE`, `INPUT_STYLE_CLASS`, `MAIL_FORMAT`, `FORM_LAYOUT`, `PHONE_NUMBER_TYPE` and `REGEX_PATTERN`.

LANGINFO

This tag is used to set the label for a specific language.

Attribute	Description
lang	Language code for the display language (e.g. <code>DE</code> for German, <code>EN</code> for English).
label	Text of the label in the specified language
description	You can use the <code>description</code> parameter to specify an optional description that is used to show a tooltip (on mouseover).

5.1.3. Internet (HTML) tab

Form presentation is normally dynamic. As a result – and depending on the input made by the user, for example – individual form pages or form fields can be shown or hidden on the fly. For this reason, the HTML form output is created either server-side by the web application or browser-side by a React application (Formcentric client) and is then dynamically embedded into the respective page. For the server-side approach, the web app component is accessed by using an asynchronous JavaScript request (AJAX). The paragraph style sheet generates only the JavaScript for embedding the AJAX response. With the browser-side approach, however, the Formcentric Client is executed in the browser itself. In this case, the paragraph style sheet generates the JavaScript for embedding the client.

When using the Spring MVC web application, the required JavaScript libraries and CSS styles must be loaded in the page template (see Section 5.6, “Page template”). When using the headless web application, these are referenced in the paragraph style sheet and loaded by the Formcentric client.

The following example shows the output template for use with the Spring MVC web application:

```

$CMS_RENDER(script: "formcentric_encrypted_form",
            form: form.XML)$
$CMS_RENDER(script: "formcentric_encrypted_refs",
            ids: form.internalReferences)$
$CMS_RENDER(script: "formcentric_login_ticket")$

<!-- Formcentric -->
<div class="clearfix module"$CMS_VALUE(editorId())$>
  <div class="mwf-form">
    <div id="ajaxreplace$CMS_VALUE(form.oid)"$>
      <script type="text/javascript">
        jQuery(function() {
          jQuery.mwfAjaxReplace({
            uid: '$CMS_VALUE(form.oid)$',
            selector: '#ajaxreplace$CMS_VALUE(form.oid)$',
            url: '$CMS_RENDER(script:"formcentric_url")$/servlet/form',
            appendUrlVars: true,
            data: {
              _view: 'webform',
              _fd: '$CMS_VALUE(fc_encryptedForm)$',
              _refs: '$CMS_VALUE(fc_encryptedRefs)$',
              _lang: '$CMS_VALUE(form.lang())$',
              _ticket: '$CMS_VALUE(fc_loginTicket)$'
            }
          });
        });
      </script>
    </div>
  </div>
</div>

```

On each form submit, the DIV tag with the ID *ajaxreplace<form ID>* is replaced by the AJAX response.

For the headless web application, the output template is presented as follows:

```

$CMS_RENDER(script: "formcentric_encrypted_form",
            form: form.XML)$
$CMS_RENDER(script: "formcentric_encrypted_refs",
            ids: form.internalReferences)$
$CMS_RENDER(script: "formcentric_login_ticket")$

<!-- Formcentric -->
<div class="clearfix module"$CMS_VALUE(editorId())$>
  <div data-fc-id="$CMS_VALUE(form.oid)"$
    data-fc-formapp-url="$CMS_REF(media:"formapp")$"
    data-fc-theme-url="$CMS_REF(media:"formcentric_headless_css")$"
    data-fc-template-url="$CMS_REF(media:"formcentric_templates_js")$"
    data-fc-theme-variable-url="$CMS_REF(media:"formcentric_json")$"
    data-fc-form-definition="$CMS_VALUE(fc_encryptedForm)"$
    data-fc-refs="$CMS_VALUE(fc_encryptedRefs)"$
    data-fc-params='{"ticket": "$CMS_VALUE(fc_loginTicket)}'$
    data-fc-data-url='$CMS_RENDER(script:"formcentric_url")'$
  ></div>
</div>

```

The Formcentric client is configured using data attributes:

data-fc-id: Specifies the form ID.

data-fc-formapp-url: Specifies the URL for the Formcentric client's JavaScript file.

data-fc-theme-url: The URL to the application's CSS styles.

data-fc-template-url: The URL to the JavaScript file for the form templates.

data-fc-theme-variable-url: The URL to the JSON file with the theme variables.

data-fc-form-definition: The encrypted form definition.

data-fc-refs: The form's encrypted references.

data-fc-params: Additional parameters that will be passed to the headless application as a JSON object. For the headless application's login to the Preview, a login ticket is usually passed here.

data-fc-data-url: The URL of the headless web application.

5.2. formcentric_headless_url script

The system uses the generation script *formcentric_headless_url* within the paragraph style sheet to output the context paths of the global headless web applications (see Section 4.1, "Installing the Formcentric module").

Take care to ensure that the values of the script variables *previewWebAppId* and *liveWebAppId* contain the IDs of the global web applications. If necessary, adjust these to match.

```
#!/Beanshell
previewWebAppId = "fc_headless_preview";
liveWebAppId = "fc_headless_live";

agent = context.requestSpecialist(
    de.espirit.firstspirit.agency.LegacyModuleAgent.TYPE);

url = context.isPreview() ? agent.getGlobalWebAppUrl(previewWebAppId) :
    agent.getGlobalWebAppUrl(liveWebAppId);

return url;
```



For the context path output of the Spring MVC web application, please use the generation script *formcentric_url*, which uses the same structure.

5.3. formcentric_encrypted_form script

The form definition must be encrypted before being passed to the Formcentric web app. The *formcentric_encrypted_form* script calls an executable that encrypts the form definition and stores it in the variable *fc_encryptedForm* in the page context. When

the script is called, the unencrypted form definition must be passed in the *form* script parameter.

```
$CMS_RENDER(script: "formcentric_encrypted_form", form: form.XML)$
```

5.4. formcentric_encrypted_refs script

References within the form definition to FirstSpirit objects such as images or PDF template documents must, like the form definition, be passed to the Formcentric web app in an encrypted format. You use the *formcentric_encrypted_refs* script to do this. The script calls an executable that identifies the external URLs to the FirstSpirit objects and encrypts these URLs. The encrypted URLs are saved in the *fc_encryptedRefs* variable in the page context. When this script is called, all of the internal references must be passed to the script in the *ids* parameter.

You can use the optional parameter *resolutions* to specify a comma-separated list of resolutions: the image URLs will then be generated at these resolutions. If you do not specify the *resolutions* parameter, the image URLs are generated for all resolutions.

```
$CMS_RENDER(script: "formcentric_encrypted_refs", ids: form.allReferences,  
  resolutions: "47x47, 60x40")$
```

5.5. formcentric_login_ticket script

A FirstSpirit login ticket is required in order to access the Preview web app content. This ticket is passed when the Formcentric web app is called, together with the encrypted form definition and the encrypted internal references. The *formcentric_login_ticket* script generates a login ticket and saves it in the *fc_loginTicket* variable in the page context. If the context is not the Preview context, the variable contains an empty string.

```
$CMS_RENDER(script:"formcentric_login_ticket")$
```

5.6. Page template

To display the forms correctly, additional JavaScripts and CSS styles are required. These will have been imported during the installation of the Formcentric project component.

When using the Spring MVC web application, extend the output of the HTML header in your page templates to include the imported CSS (*formcentric_css*) and the imported JavaScripts. Please take care to ensure that the JavaScripts are loaded in the order as given, since some have dependencies on others.

Alternatively, you can also use the minified version of the scripts (**_min*).


```

...
<link rel="stylesheet" type="text/css"
      href="$CMS_REF(media:"formcentric_flex_css_min")$" />
...
$CMS_FOR(_script, [
  "json2_js_min",
  "jquery_3_6_0_js_min",
  "select2_4_0_13_js_min",
  "jquery_autocomplete_js_min",
  "jquery_format_1_3_js_min",
  "jquery_ui_widget_1_13_2_js_min",
  "load_image_all_js_min",
  "canvas_to_blob_js_min",
  "jquery_xdr_transport_js_min",
  "jquery_iframe_transport_js_min",
  "jquery_fileupload_10_31_0_js_min",
  "jquery_fileupload_process_10_31_0_js_min",
  "jquery_fileupload_image_10_31_0_js_min",
  "jquery_formcentric_1_9_js_min"
])$

<script type="text/javascript" src="$CMS_REF(media:_script)$"></script>
$CMS_END_FOR$
...

```



Please note that the actual reference names may differ from the names as specified here. During content item import, FirstSpirit appends a sequential number to the item's reference name if a content item with this name already exists. In this case, ensure that you use the extended reference name.

For the headless web application, only one JavaScript needs to be loaded in the page template. All other JavaScripts and CSS styles required are referenced in the corresponding *Headless Form* paragraph style sheet and loaded when a form is accessed by the Formcentric Client (see Section 5.1.3, "Internet (HTML) tab").

```

...
<script type="text/javascript"
      src="$CMS_REF(media:"formcentric")$" defer></script>

$CMS_IF(isWebEdit)$
  <script defer>
    window.formcentric ??= {}
    window.formcentric.dynamicInit = true
  </script>
$CMS_END_IF$

```

Setting the `window.formcentric.dynamicInit` attribute to `true` activates a MutationObserver. The Formcentric client then automatically reinitializes the form as soon as it is modified. This is particularly necessary when editing the form in the ContentCreator.

Specifying the `defer` attribute ensures that the JavaScript is executed only after the page has been fully parsed.

5.7. Themes

For styling headless forms, Formcentric offers a selection of themes that can be modified individually to suit your requirements. Each theme consists of a template file, a CSS file and a JSON file. The JSON file contains specific CSS parameters that you can use to customise the visual style of the theme in accordance with your requirements. For more advanced modifications, you can download the source code from the Formcentric npm repository, which is available at the following URL:

<https://maven.monday-consulting.com:443/artifactory/formcentric-npm/@formcentric/client/-/@formcentric/client-3.4.0.tgz>

5.8. CSS

Formcentric already includes a simple CSS, which you can use as the basis for designing your own forms. This CSS defines CSS classes that are used by the Spring MVC application's JSP templates. The example below shows you the generated HTML presentation layer (extract) for a simple contact form.

```
<div id="ajaxreplaceDE2790">
  <form accept-charset="utf-8" class="mwf-form" data-mwf-id="DE187126"
    enctype="multipart/form-data" id="commandDE187126"
    method="post" onsubmit="return false;">

    <div class="mwf-layout mwf-layout--default">
      <div class="mwf-textinput" data-mwf-container="fccc48273e2eeb">
        <input id="fccc48273e2eeb" type="text" name="email"
          class="mwf-textinput__input" data-mwf-id="fccc48273e2eeb" />
        <label class="mwf-textinput__label" for="fccc48273e2eeb">Email</label>
      </div>

      <div class="mwf-textinput" data-mwf-container="fc313d3971298a">
        <input id="fc313d3971298a" name="message" type="text"
          class="mwf-textinput__input" data-mwf-id="fc313d3971298a" />
        <label class="mwf-textinput__label" for="fc313d3971298a">Message</label>
      </div>
    </div>
  </form>
</div>
```

The system outputs the form as series of *div* containers, with each form element being embedded within a separate *div* element. The various HTML elements are given specific CSS class syntax, so as to ensure that you can use CSS to style both the entire form and its individual components – such as input fields, labels and error messages. To avoid polluting other CSS classes in the project, all class names begin with the *mwf* prefix.

6. Programming and customisation

This section, written from a software developer's point of view, shows you how you can extend or modify Formcentric. Alongside general knowledge of Java and XML, you will also need to know the fundamentals of the Spring framework and the Maven build system.

6.1. Development workspace

To give you a head start when developing your extensions, Monday provides you with a pre-configured development workspace. The workspace in question is a Maven workspace that contains all of the examples described in this manual.

The workspace consists of nine Maven artefacts:

Artefact directory	Description
/formcentric-admin-customizations	Server and Project Configuration extensions.
/formcentric-editor-customizations	Extensions to input components
/formcentric-module-customizations	Module descriptor and FirstSpirit project resources.
/formcentric-webapp-customizations	Extensions to the Spring MVC web application
/formcentric-webapp-lib-customizations	Java classes for extensions to the Spring MVC web application
/formcentric-headless-webapp-customizations	Extensions for the headless server (WAR deployment)
/formcentric-headless-server-customizations	Extensions for the headless server (embedded web server deployment)
/formcentric-headless-first-spirit-customizations	Java classes for extensions to the headless web application
/formcentric-webedit-customizations	Extensions to the web editor component.
/formcentric-webedit-lib-customizations	Java classes for the extended web editor component.

All required JAR archives (dependencies) are downloaded from the Monday Maven server (<http://maven.monday-consulting.com>) when building the workspace. You will need to enter the necessary login details beforehand in the Maven configuration file *settings.xml*. The configuration file can be found in the root directory of the development workspace.

To obtain your personal login details, please contact our Helpdesk (support@formcentric.com).

```

...
<servers>
  <server>
    <id>maven.monday-consulting.com</id>
    <username>my-username</username>
    <password>my-password</password>
  </server>
</servers>
...

```

As a final step, modify the FirstSpirit version specified in the root POM (*pom.xml*) to match the version you have deployed.

```
<cms.version>5.2.190105</cms.version>
```

To build the workspace, switch to the directory `<formcentric-firstspirit-workspace>` and execute the following from the command line:

```
mvn -s ./settings.xml clean install
```

To build the module without the Analytics extension, disable the Maven profile *analytics*. In this case, the configuration files *fsm.prototype.module.basic.xml* and *fsm-assembly-basic.xml* are used instead of the default configurations *fsm.prototype.module.xml* and *fsm-assembly.xml*.

```
mvn -s ./settings.xml clean install -P '!analytics'
```

The FirstSpirit module archive created is stored in the directory `<formcentric-firstspirit-workspace>/formcentric-module-customizations/target`.

6.2. Monday Maven plugin

Each FirstSpirit module contains a specialised module descriptor (*module.xml*), which describes the components and files contained within the corresponding module. For Formcentric, JAR archives are a key part of this, alongside configuration files and output templates. To simplify the creation of the module descriptor, Formcentric has a specialised Maven plugin that is used to generate the FirstSpirit module descriptor. The plug-in parses the dependencies defined in the Maven configurations and uses these to create the `<resource>` entries in the module descriptor.

The plugin is configured in the Maven configuration (*pom.xml*) of the *formcentric-module-customizations* artefact.

You need to specify the following parameters in the plugin's `<configuration>` tag.

Parameter	Description
configXml	References the configuration file for the Maven plugin.
prototypeXml	References the file that serves as the template for the module descriptor to be created.

```

<plugin>
  <groupId>com.monday-consulting.maven.plugins</groupId>
  <artifactId>fsm-maven-plugin</artifactId>
  <configuration>
    <configXml>${basedir}/target/extra-resources/fsm-plugin.xml</configXml>
    <prototypeXml>${basedir}/target/extra-resources/
      prototype.module.xml</prototypeXml>
    <targetXml>${basedir}/target/extra-resources/module.xml</targetXml>
  </configuration>
  <executions>
    <execution>
      <id>dependencyToXML</id>
      <phase>package</phase>
      <goals>
        <goal>dependencyToXML</goal>
      </goals>
    </execution>
  </executions>
</plugin>

```

To generate the FirstSpirit module descriptor, the templates *prototype.module.xml* or *prototype.module.basic.xml* are used as a basis. These files are located in the */form-centric-module-customizations/src/non-packaged-resources* directory. They contain various variables that are replaced when building the workspace. Any modified class names, etc., must be configured there.

```

<module>
  <name>Formcentric</name>
  <version>${project.version}</version>
  <description>Formcentric Form Editor</description>
  <vendor>Formcentric GmbH</vendor>
  <components>
    <public>
      <name>FORMCENTRIC_FORMEDITOR</name>
      <description>Formcentric editor component</description>
      <class>de.espirit.firstspirit.module.GadgetSpecification</class>
      <configuration>
        <gom>com.formcentric.examples.gom.CustomGomFormEditor</gom>
        <factory>com.formcentric.editor.
          gadgets.FormEditorSwingGadgetFactory</factory>
        <value>com.formcentric.editor.
          gadgets.FormValueEngineerFactory</value>
        <scope data="yes" content="yes" link="yes"/>
      </configuration>
      <resources>
        <resource>files/</resource>
        <!-- Variable, die durch das Maven-Plugin ersetzt wird. -->
        <dependencies>formcentric-editor-resources</dependencies>
      </resources>
    </public>

    <web-app scopes="global">
      <name>Formcentric WebApp</name>
      <description>Formcentric FIRSTspirit integration.</description>
    </web-app>
  </components>

```

```

<configurable>com.formcentric.examples.
  admin.CustomWebAppConfiguration</configurable>
<class>com.formcentric.admin.webapp.FormcentricWebApp</class>
<web-xml>web.xml</web-xml>
<resources>
  <!-- Variable, die durch das Maven-Plugin ersetzt wird. -->
  <dependencies>formcentric-admin-resources</dependencies>
</resources>
<web-resources>
  ..
  <!-- Variable, die durch das Maven-Plugin ersetzt wird. -->
  <dependencies>formcentric-webapp-resources</dependencies>
</web-resources>
</web-app>

<project-app>
  <name>Formcentric Resources</name>
  <description>Formcentric project resources</description>
  <class>com.formcentric.admin.project.FormcentricProjectApp</class>
  <resources>
    <resource>files</resource>
    <!-- Variable, die durch das Maven-Plugin ersetzt wird. -->
    <dependencies>formcentric-admin-resources</dependencies>
  </resources>
</project-app>

</components>
</module>

```

The configuration file *fsm-plugin.xml* is used to define the *<dependencies>* variable with its corresponding dependencies.

```

<fsm-maven-plugin>
  <modules>
    <module>
      <id>change.this.now.fs5:formcentric-admin-customizations:jar</id>
      <dependencyTagValueInXml>formcentric-admin-resources
        </dependencyTagValueInXml>
      <firstSpiritScope>module</firstSpiritScope>
      <firstSpiritMode>isolated</firstSpiritMode>
    </module>
    <module>
      <id>change.this.now.fs5:formcentric-editor-customizations:jar</id>
      <dependencyTagValueInXml>formcentric-editor-resources
        </dependencyTagValueInXml>
      <firstSpiritScope>module</firstSpiritScope>
      <firstSpiritMode>isolated</firstSpiritMode>
    </module>
    <module>
      <id>change.this.now.fs5:formcentric-webapp-customizations:war</id>
      <dependencyTagValueInXml>formcentric-webapp-resources
        </dependencyTagValueInXml>
      <firstSpiritScope>module</firstSpiritScope>
    </module>
  </modules>

```

```
</fsm-maven-plugin>
```

Element	Description
<fsm-maven-plugin>	Root element.
<scopes>	Optional: specifies the Maven scopes that should be considered when determining the dependent Maven artefacts. Each scope must be specified separately. If scopes are not specified here, then the default scopes <i>compile</i> and <i>runtime</i> apply instead.
<scope>	Designation of a maven scope to be considered.
<modules>	Container element for the definition of artefact dependencies.
<module>	Specifies an artefact whose dependencies should be written into the module descriptor.
<id>	The artefact's Maven identifier. Must be specified using the standard Maven notation <code><groupId>:<artifactId>:<type></code> .
<dependencyTagValueInXml>	Name of the <code><dependencies></code> variable that is entered into the module descriptor template.
<firstSpiritScope>	Specifies the FirstSpirit scope (see also section 2.5.1.2, p. 13 in the Developer Manual "MDEVDE_FirstSpirit_ModulDeveloperDoc.pdf").

6.3. Extending the input component in Site Manager

The Monday Form Editor is based on a general framework with which Swing-based XML editors can be developed as required. Within this framework, an XML document is represented by a hierarchical structure of *NodeModel* objects. Each *NodeModel* object corresponds to one or more elements in the XML structure. The framework provides methods for the display, selection and editing of the individual *NodeModel* objects.

Each *NodeModel* object is assigned a *NodeType* object. This contains information about how the associated *NodeModel* is to be initialised, presented, processed and validated. For each *NodeType* object, you can also specify which other XML elements can be assigned beneath the model.

The *NodeType* objects required are generated by the *EditorSetup* class. You therefore use this as your starting point for extending the Form Editor.

Within the form framework, actions encapsulate the actual business logic for form data processing. The following section gives you an example using an action to demonstrate how you can extend the Form Editor to include additional elements.

6.3.1. Developing a NodeEditorPane

For each element type, the system requires a modified editor, which must be derived from the *NodeEditorPane* class. The node editor is used to process a *NodeModel* of the corresponding type. The code snippet given below shows you the implementation of a *NodeEditorPane*.

```
public class CustomActionEditorPane extends TabbedBaseActionEditorPane {

    public static final String PROP_CUSTOM = "customProperty";
    protected JPanel propertiesPanel;
    protected JTextField customPropertyField;
    protected ActionModel model; // extends NodeModel

    PropertiesBundle custombundle =
        PropertiesBundle.getInstance("com/custom/forms/formeditor",
            CustomActionEditorPane.class.getClassLoader());

    protected JTextField getCustomPropertyField() {
        if (customPropertyField == null) {
            customPropertyField = new JTextField();
            customPropertyField.addFocusListener(focusListener);
            customPropertyField.addKeyListener(new KeyAdapter() {
                public void keyReleased(final KeyEvent e) {
                    model.setProperty(PROP_CUSTOM, customPropertyField.getText());
                }
            });
        }
        return customPropertyField;
    }

    protected JPanel getPropertiesPanel() {
        if (propertiesPanel != null) {
            return propertiesPanel;
        }

        propertiesPanel = new JPanel();

        GridBagDesigner layout =
            new GridBagDesigner(custombundle, propertiesPanel);

        layout.row().labelTop("propLabel").expand()
            .add(getCustomPropertyField());

        layout.fill();

        return propertiesPanel;
    }

    public void setEditable(final boolean editable) {
        if (customPropertyField != null) {
            customPropertyField.setEditable(editable);
        }
    }

    public void setModel(NodeModel model) {
```



```

    this.model = (ActionModel) model;
    update();
}

public void update() {
    getCustomPropertyField().setText(
        (String) model.getProperty(PROP_CUSTOM));
}
}

```

The example given above shows you a node editor containing a text field in which the value of the property *customProperty* can be entered. The text field and the corresponding label are arranged in a `GridBagLayout` on the underlying `JPanel`. For the purpose of editor internationalisation, the text of the label is read from a language-dependent resource bundle.

Text input is transferred to the `NodeModel` using an anonymous `KeyListener`.

6.3.2. Extending the `EditorSetup` class

Within the `init` method of the `EditorSetup` class, the `NodeType` objects of the Form Editor are generated. By overriding this method, you can generate and register an additional `NodeType` object for the new `CustomAction`:

```

@Override
public void init() {

    super.init();

    PropertiesBundle custombundle =
        PropertiesBundle.getInstance("com/custom/forms/formeditor",
            this.getClass().getClassLoader());

    // neuen Typ erzeugen
    NodeType customActionType = createCustomActionType(custombundle);

    // neuen Typ registrieren
    registerType(customActionType);

    // als mögliches Unterelement des Form-Elements registrieren
    NodeType formNodeType = getNodeTypes(FORM.TYPE.FORM);
    formNodeType.addAllowedChildType(customActionType);
}

```

The `NodeType` objects of the individual form elements are typically generated in separate factory methods. The following example shows you how they are implemented:

```

protected NodeType createCustomActionType(final EditorBundle bundle) {

    final String CUSTOM_ACTION = "customAction";

    NodeType action = new NodeType(CUSTOM_ACTION, ActionModel.class,
        CustomActionEditorPane.class);
}

```

```

action.setTitle(bundle.getString(CUSTOM_ACTION + "Label"));

action.setIcon(bundle.getImageIcon(CUSTOM_ACTION + "Icon"));

action.setToolBarIcon(bundle.getImageIcon(CUSTOM_ACTION + "LargeIcon"));

action.setValidator(new CustomActionValidator());

action.setInitializer(new CustomActionInitializer());

action.setButtonGroup(1);

return action;
}

```

In the example given above, the first step is to create a new *NodeType* instance with the name *customAction*. The name serves to identify this type uniquely in further processing steps. As one example, the associated action implementation is identified using this name in the web application. Accordingly, you can assign type names only once. Following this, a specialised *NodeValidator* and a *NodeInitializer* are defined.



If you want to modify the initialisation or validation of an existing form element, then it is generally sufficient for you to override the associated factory method, so as to set a different validator or initialiser.

6.3.3. Extending the Form Editor GUI object model

The *EditorSetup* class is instantiated via the Form Editor's GUI object model (GOM). By overriding the *createEditorSetup* method in the class *com.formcentric.editor.gadgets.FormEditorSwingGadgetFactory*, you generate the new *EditorSetup* class instead of the existing one.

```

public class CustomFormEditorSwingGadgetFactory extends
    FormEditorSwingGadgetFactory {
    @Override
    public FormEditorSetup createEditorSetup(GomFormEditor gomFormEditor,
        SpecialistsBroker broker, Language lang) {
        return new CustomFormEditorSetup(gomFormEditor, broker, lang));
    }
}

```

Configure the modified *CustomGomFormEditor* class in the *prototype.module.xml* module descriptor in the input component's *configuration* element.

```

<name>FORMCENTRIC_FORMEDITOR</name>
<description>Monday Webforms editor component</description>
<class>de.espirit.firstspirit.module.GadgetSpecification</class>
<configuration>
    <factory>com.custom.webforms.CustomFormEditorSwingGadgetFactory</factory>
    ...
</configuration>

```

6.4. Extending the ContentCreator web application

The Formcentric ContentCreator integration is a single-page application that is based on the JavaScript *React* framework. The Form Editor's user interface is generated client-side on the browser using the JSON data sent by the server. The interface layout is specified declaratively using a number of JavaScript configuration files. This approach makes it easy for you to make changes and create extensions to the form editing interface.

The JavaScript configuration files that are stored in the development workspace in the *formcentric-webedit-customizations* module in the directory `/src/main/webapp/WEB-INF/formcentric_editor/gadget/formeditor/config/editor` constitute the main starting-point for making changes to the form editing interface. All of the changes described below are made to the files in this directory.

The available form elements and their properties are described as JSON objects. The React application uses these to generate the form editing interface. The following example shows a configuration snippet for the *textArea* form element.

```
{
  icon: 'textarea',
  type: 'textArea',
  properties: {
    general: [
      {
        title: 'name',
        type: 'text',
        properties: {
          required: true
        }
      },
      {
        title: 'label',
        type: 'text'
      },
      {
        title: 'hint',
        type: 'text'
      },
      {
        title: 'value',
        type: 'wysiwyg'
      },
      ...
    ]
  }
}
```

6.4.1. Adding a new form element

Extend the Form Editor to include a new form element by extending the configuration *fields_custom.js*. If you want to extend the Editor to include the form element

termsCheckbox with the properties *name*, *text* and *link*, for example, then add the following object definition to the JavaScript array in the configuration *fields_custom.js*.

```
[
  {
    icon: 'termscheckbox',
    type: 'termsCheckbox',
    properties: {
      general: [
        {
          title: 'name',
          type: 'text',
          properties: {
            required: true
          }
        },
        {
          title: 'text',
          type: 'wysiwyg',
          properties: {
            required: true
          }
        },
        {
          title: 'link',
          type: 'reference',
          properties: {
            refType: 'pageref',
            FS_refType: 'pageref'
          }
        }
      ],
      specialProperties: {
        condition: {
          conditionable: false,
          operators: {}
        }
      }
    }
  }
]
```

Please note: The external JavaScript array already exists and simply needs to be extended by the configuration object.

The table below describes the possible attributes that a field definition can have at the first level.

Attribute	Description
icon	Type: <i>String</i> Name of the icon to load. The name specified must match the filename of the icon without the file extension.
type	Type: <i>String</i>

Attribute	Description
	Form element name
properties	<p>Type: <i>Object</i></p> <p>Defines the properties of a field that can be edited in Content-Creator on the right-hand side, under <i>Field properties</i>. The object properties of <i>properties</i> each correspond to individual Editor tabs. The following JSON snippet configures two tabs with the name <i>general</i> and <i>special</i>, with a total of three properties: <i>name</i>, <i>label</i>, <i>hint</i>.</p> <pre data-bbox="438 629 1279 1240"> properties: { general: [{ title: 'name', type: 'text' }, { title: 'label', type: 'text' }], special: [{ title: 'hint', type: 'text' }] } </pre> <p>To ensure that the field can be uniquely identified during later processing, the property <i>title</i> is required with the value <i>name</i> in the <i>general</i> array.</p> <p>For a list of all available property types, please see Section 6.4.5, “Input elements for element properties”.</p>
specialProperties	<p>Type: <i>Object</i></p> <p>You use the <i>specialProperties</i> attribute to configure properties that are evaluated by the Editor for internal functions. The following JSON snippet defines the usage of the field within a condition.</p> <pre data-bbox="438 1742 1279 2011"> specialProperties: { condition: { conditionable: true, operators: { startswith: { values: [], freeField: true, useChildren: false } } } } </pre>

Attribute	Description
	<pre data-bbox="443 248 933 712"> }, endswith: { values: [], freeField: true, useChildren: false }, contains: { values: [], freeField: true, useChildren: false } } } } } </pre> <p data-bbox="443 741 1189 813">You set <i>conditionable: true</i> to specify that the field can be selected in a condition.</p> <p data-bbox="443 842 1273 954">You specify the operators that are selectable in the condition for this form element type in the <i>operators</i> object. An operator definition always utilises the schema</p> <p data-bbox="443 983 1278 1014"><operator-name>: {<i>values: [], freeField: true, useChildren: false</i>}.</p> <p data-bbox="443 1043 1278 1155">The name of the operator is also used as the translation ID for user interface internationalisation (see Section 6.4.7, “User interface internationalisation”).</p> <p data-bbox="443 1184 1262 1296">In the <i>values</i> attribute, you can specify a string array containing values that can be selected by the form author when defining a condition.</p> <p data-bbox="443 1326 1278 1480">If you specify the attribute <i>freeField: true</i>, this lets form authors enter user-defined values. This option is required for comparison operators, for example, where form authors need to enter their own comparison values.</p> <p data-bbox="443 1509 1273 1621">If the new field type is a list type with predefined options, you can specify the attribute <i>useChildren</i> if you want to make the list options selectable as a value for the condition.</p>

6.4.2. Adding a new validator

To add a new validator to an input field, extend the *format* property of the corresponding input element.

The example below shows the configuration of the email validator for the single-line text field (*inputField*).

```

{
  title: 'format',
  type: 'dropdown_format',

```

```

properties: {
  options: {
    email: {
      enabled: true,
      fields: {
        errormessage: {
          title: 'errormessage',
          type: 'text'
        }
      }
    }
  }
}

```

The specified attribute name (*email* in the example) must match the external name of the validator. The name is also used for user interface internationalisation. In the translation file, the translation ID `<validator-name>Validator` is used to search for a label for the validator.

You can use *fields* to define the required fields for the validator. The available field types are listed in the table under Section 6.4.5, “Input elements for element properties”.

6.4.3. Adding a new action

Extend the Form Editor to include a new action by extending the configuration *actions_custom.js*.

If you want to extend the Editor to include the action *simpleMailAction* with the properties *to*, *subject*, *body* and *note*, for example, then add the following object definition to the JSON array in the configuration *actions_custom.js*.

```

[
  {
    icon: 'simplemailaction',
    type: 'simpleMailAction',
    properties: {
      general: [
        {
          title: 'to',
          type: 'text',
          properties: {
            required: true
          }
        },
        {
          title: 'subject',
          type: 'text',
          properties: {
            required: true
          }
        }
      ]
    }
  }
]

```

```

        {
            title: 'body',
            type: 'wysiwyg'
        },
        {
            title: 'note',
            type: 'wysiwyg'
        },
    ]
},
specialProperties: {
    condition: {
        conditionable: false,
        operators: {}
    }
}
}
]

```

The table below describes the possible attributes that an action definition can have at the first level.

Attribute	Description
icon	Type: <i>String</i> Name of the icon to load. The name specified must match the filename of the icon without the file extension.
type	Type: <i>String</i> Name of the field type.
properties	Type: <i>Object</i> Describes the properties of an action that can be edited in ContentCreator on the right-hand side, under <i>Properties</i> . The object properties of <i>properties</i> each correspond to individual tabs. The following JSON snippet creates two tabs with the name <i>general</i> and <i>special</i> , with a total of three properties: <i>to</i> , <i>subject</i> and <i>hint</i> . <pre> properties: { general: [{ title: 'to', type: 'text', properties: { required: true } }, { title: 'subject', type: 'text', properties: { </pre>

Attribute	Description
	<pre> required: true } }], special: [{ title: 'hint', type: 'text' }] } </pre> <p>For a list of all available property types, please see Section 6.4.5, “Input elements for element properties”.</p>
specialProperties	<p>Type: <i>Object</i></p> <p>You use the <i>specialProperties</i> attribute to configure properties that are evaluated by the Editor for internal functions.</p> <pre>specialProperties: { maxCount: 1 }</pre> <p>You use <code>maxCount: <count></code> to specify how many times the action can be used within a form.</p>

6.4.4. Adding new element properties

Element properties are defined under the *properties* attribute of the parent form element definition (see Section 6.4.1, “Adding a new form element”). You add a new property to the form element (form field, action or validator) by specifying a JSON object with the following structure.

```

{
  title: '<attribute-name>',
  type: '<field-type>',
  value: 'DefaultValue',
  properties: {
    required: true
  }
}

```

The following table describes the attributes of the configuration object.

Attribute	Description
title	Name used to store the field property in the form definition.
type	Property type. The available types are explained in the following list.
value	Optional specification of a default value.
properties	Other type-specific configuration options

Attribute	Description
properties.required	Specifies whether the property is a required field.

6.4.5. Input elements for element properties

The following table describes the configuration objects for the input elements of the available element properties. You can use these when defining the various form element properties. Please note that some types cannot be used with all form elements.

Type	Description
text	<p>Text field</p> <p>Usage: all form elements</p> <pre>{ title: 'label', type: 'text' }</pre>
number	<p>Number field that only allows numeric input.</p> <p>Usage: all form elements</p> <pre>{ title: 'maxlength', type: 'number', properties: { min: 0, max: null } }</pre> <p>Also supports scientific number notation (e.g. <i>10e6</i>).</p> <p>You can set upper/lower limits by specifying <i>properties.min</i> and <i>properties.max</i>. You can reset an existing limit by using <i>properties.min: null</i>, for example.</p>
date	<p>Data selection element.</p> <p>Usage: all form elements</p> <pre>{ title: 'from', type: 'date' }</pre> <p>You can define a default value with <i>value</i>. Uses the standard JavaScript date format.</p>
checkbox	Checkbox

Type	Description
	<p>Usage: all form elements</p> <pre data-bbox="470 309 1281 456"> { title: 'requiredField', type: 'checkbox' } </pre>
dropdown	<p>List with fixed options from which the form author can select a single entry.</p> <p>Usage: all form elements</p> <pre data-bbox="470 645 1281 891"> { title: 'pattern', type: 'dropdown', properties: { options: ['dd.MM.yyyy', 'yyyy-MM-dd'] } } </pre> <p>You can specify the selection options as a string array with <code>properties.options</code>.</p> <pre data-bbox="470 1025 1281 1238"> properties: { options: [{text: 'Value 1', value: 'one'}, {text: 'Example Two', value: 'two'}] } </pre> <p>Options can also be defined as objects with <i>value</i> (option value) and <i>text</i> (display name).</p>
dropdown_format	<p>Drop-down list for field validators</p> <p>Usage: Input element (<i>inputField</i>, <i>passwordField</i>, etc.)</p> <p>During selection, the properties of the selected validator are shown underneath the drop-down list.</p> <p>The following example shows how to define the email validator.</p> <pre data-bbox="470 1686 1281 2022"> { title: 'format', type: 'dropdown_format', properties: { options: { email: { enabled: true, fields: { errorMessage: { title: 'errorMessage', </pre>

Type	Description
	<pre> type: 'text' } } } } } } } } } } </pre> <p>You can specify the selectable validators with <code>properties.options</code>.</p> <p>You can manage the validator properties with <code>properties.options["<validator-name>"].fields</code>.</p> <p>You use <code>properties.options["<validator-name>"].enabled=true</code> or <code>properties.options["<validator-name>"].enabled=false</code> to activate the validator or to deactivate it so that it is no longer selectable.</p>
syntax	<p>Multi-line JavaScript input field with syntax highlighting.</p> <p>Usage: all form elements</p> <pre> { title: 'script', type: 'syntax', value: 'function calculate() {};' } </pre>
condition	<p>Input element for processing conditions.</p> <p>Usage: <i>condition</i></p> <pre> { title: 'conditionContent', type: 'condition', properties: { conditional_fields: [], condition_conjunction: 'true', condition: [] } } </pre>
wysiwyg	<p>Multi-line text input field that allows formatting syntax to be used.</p> <p>Usage: all form elements</p> <pre> { title: 'value', type: 'wysiwyg' } </pre>
element	<p>Allows the selection of other elements in the same form.</p>

Type	Description
	<p>Usage: all form elements</p> <pre data-bbox="472 309 1276 454"> { title: 'elements', type: 'element' } </pre>
dataSource	<p>Input element for a data source's variable parameter list.</p> <p>Usage: inputField, comboBox, radioGroup, checkboxGroup, hiddenField</p> <pre data-bbox="472 645 1276 887"> { title: 'datasource', type: 'dataSource', properties: { datasource_params: [] } } </pre>
reference	<p>Element for selecting a FirstSpirit reference (opens the FirstSpirit selection screen).</p> <p>Usage: all form elements</p> <pre data-bbox="472 1077 1276 1319"> { title: 'pictureUrl', type: 'reference', properties: { FS_refType: 'picture' } } </pre> <p>The property <i>properties.FS_refType</i> gives you the option of restricting the selection to a certain type of content (Page, Picture, Folder, etc.). The following items can be specified here: <i>pageref</i>, <i>picture</i>, <i>file</i>.</p>
multi_dropdown	<p>List with fixed options from which the form author can select multiple entries.</p> <p>Usage: all form elements</p> <pre data-bbox="472 1693 1276 1935"> { title: 'numberType', type: 'multi_dropdown', properties: { configuration_name: 'phoneNumberTypes' } } </pre>

Type	Description
	<p>You can define the selection options (as <i>strings</i>) with the <i>properties.options</i> attribute.</p> <p>Alternatively, the values can also be taken from the paragraph style sheet. In this case, specify the name of the corresponding GOM element in the <i>configuration_name</i> attribute.</p> <p>The <i>configuration_name</i> parameter specifies the name that is used to store the value in the form definition.</p>
regEx_dropdown	<p>Drop-down list for regular expressions.</p> <p>Usage: <i>regex</i></p> <pre data-bbox="470 703 1279 1247"> { title: 'mailPattern', type: 'regEx_dropdown', properties: { options: [{ text: '^+[0,1]{0,1}[0-9\\s-/*]*\$', label: 'phone' }, { text: '^[a-zA-ZÁ-ÿöüÖÄÜß\\s-]*\$', label: 'characters' }] } } </pre>
mediastore_mapping	<p>Element for the assignment of data upload fields to directories in the FirstSpirit media store.</p> <p>Usage: <i>mediaStoreAction</i></p> <pre data-bbox="470 1429 1279 1610"> { title: 'mediastore_mapping', type: 'mediastore_mapping', value: '[]' } </pre>
field_mapping	<p>Element for selecting a PDF template (opens a FirstSpirit selection screen).</p> <p>Usage: <i>pdfAction</i></p> <p>A PDF field from the template can then be assigned to the form fields. If the fields are drop-down lists, their options can be selected and assigned to one another.</p> <p>Usage: <i>pdfAction</i></p> <pre data-bbox="470 1989 1279 2031"> { </pre>

Type	Description
	<pre> title: 'field_mapping', type: 'field_mapping', value: '[]' } </pre>
datasource_mapping	<p>You can use this input element to assign form fields to the columns of a FirstSpirit data source.</p> <p>Usage: <i>dataSourceAction</i></p> <pre> { title: 'datasource_mapping', type: 'datasource_mapping', value: '[]' } </pre>
custom_mapping	<p>You can use this input element to design your own mapping tables.</p> <pre> { title: 'custom_table', type: 'custom_mapping', properties: { mapping: [{ type: 'dropdown', name: 'field', placeholder: 'custom_table.field', selectableFieldTypes: ['inputField', 'radioGroup'] }, { type: 'dropdown', name: 'option', placeholder: 'custom_table.option', connectedField: 'field' }, { type: 'text', name: 'otherValue', placeholder: 'custom_table.otherValue' }, { type: 'dropdown', name: 'attribut', loadRemoteData: 'FS_ServiceField', loadRemoteDataOptions: [{ name: 'connectedField', key: 'task', value: 'someDropdown' }] }] } } </pre>

Type	Description
	<pre data-bbox="466 250 1286 981"> name: 'connectedMapField_type', key: 'type', value: 'field' }, { name: 'connectedMapField', key: 'value', value: 'field' },], placeholder: 'custom_table.attribut', }, { type: 'dropdown', name: 'attributoption', placeholder: 'custom_table.attributoption', loadRemoteData: 'FS_ServiceField', connectedField: 'attribut', },], }, }, </pre>
	<p data-bbox="466 990 1286 1120">You define the columns in the <i>properties.mapping</i> attribute. You use the <i>type</i> key to decide whether this is a selection field (drop-down list) or an input field (text).</p> <p data-bbox="466 1128 1286 1218">The <i>name</i> key sets the key for the export of the respective fields in a row.</p> <p data-bbox="466 1227 1286 1317">You use the <i>placeholder</i> key to define the placeholder for the field.</p> <p data-bbox="466 1326 1286 1460">You use the <i>loadRemoteData</i> key to decide, as you can with a drop-down field, if the options should be provided by a FirstSpirit service.</p> <p data-bbox="466 1469 1286 1765">If the options are provided by a FirstSpirit service, you can use the <i>loadRemoteDataOptions</i> key to pass additional attributes, such as values of other fields on the element, for example, or from the mapping itself. The following example creates this object, so as to pass it with the <i>loadRemoteData</i> call. <code>{task: <ValueOfFieldsomeDropdown>, type: <Typeof FormElementSelectedinField>, value: '<ValueofMappingDropdownField>'}</code></p> <p data-bbox="466 1774 1286 1863">If you want to select existing form fields in a drop-down, you can pass these by using the <i>selectableFieldTypes</i> key.</p> <p data-bbox="466 1872 1286 2000">If you want to access nested options from a form field or access <i>loadRemoteData</i> from the options themselves, then you can use <i>connectedField</i> and specify the name of a</p>

Type	Description
	mapping field to access these and make them available for selection.

6.4.6. Editing existing form elements

To modify an existing form element, you copy its full element definition from the corresponding default configuration (*fields_default.js* or *actions_default.js*) into the corresponding configuration file (*fields_custom.js* or *actions_custom.js*).

You can then change or add to the element properties according to your requirements as has been described above.

Please note: Changes made to the default configurations in the development workspace have no effect on the Form Editor.

6.4.7. User interface internationalisation

For the internationalisation of the user interface, the language-dependent labels are read from master language files. Out of the box, Formcentric supports the languages English and German.

To modify or add labels for existing or new form elements, you need to extend or modify the *formeditor_de.json* and *formeditor_en.json* language files, which you will find in the development workspace.

Each label is stored in the language files with a unique translation ID. Typically, the translation IDs of the element properties are each made up of the internal element name and the name of the respective property. For the *placeholder* property of the password field, the entry is as follows:

```
"passwordField.placeholder": "Placeholder"
```

You can add a label for a new element property by adding the corresponding entry to each language file.

6.5. Extending the Spring MVC web application

6.5.1. Spring configuration files

The web app module itself is a Spring-based web application. Most of the functionality is encapsulated in specialised beans, which are instantiated and initialised by using Spring's dependency injection mechanism. By swapping out individual beans, you can augment the application with new or modified functionality. In general, however, you will merely need to override individual methods of existing beans.

Out of the box, the Spring MVC web application includes the configuration files as described below, which are stored in the web application's */WEB-INF/spring* directory.

formcentric-application.xml

This is used to aggregate the various Spring XML files and also for configuration of the *PropertySourcesPlaceholderConfigurer*. This offers a quick overview of all of the relevant Spring files that are required for the web application.

formcentric-actions.xml

Configures the required actions. Ensure that the action beans listed here are also entered into the action mapping (see below). The required properties are read from several property files and configured appropriately. If you would like to change values, you will need to modify these files accordingly.

```
<bean name="mailAction" class="com.formcentric.actions.mail.MailAction">
  <property name="mailer" ref="mailer" />
  <property name="successView" value="success" />

  <!-- Mapping von Formatbezeichnern auf MailBodyRenderer. -->
  <property name="bodyRendererMapping">
    <map>
      <entry key="html" value-ref="htmlBodyRenderer"/>
      <entry key="text" value-ref="textBodyRenderer"/>
      <entry key="freetext" value-ref="freeTextBodyRenderer"/>
      <entry key="freehtml" value-ref="freeHtmlBodyRenderer"/>
    </map>
  </property>
</bean>
...

```

formcentric-captcha.xml

The open source JCAPTCHA framework is used to generate captchas. The configuration here is a standard JCAPTCHA configuration, which can be used to influence the appearance and behaviour of individual captchas. For a detailed description of configuration options, please visit the project website at <https://jcaptcha.atlassian.net/wiki/display/general/Home>.

formcentric-services.xml

Configures the REST services. Enter the *RestService* beans listed here into the REST controller's service mapping as additional entries (see the section called "formcentric-controllers.xml").

```
<bean id="deCountriesRestService"
  class="com.formcentric.rest.CountriesRestService">
  <property name="lang" value="de"/>
</bean>

<bean id="enCountriesRestService"
  class="com.formcentric.rest.CountriesRestService">
  <property name="lang" value="en"/>
</bean>

```

formcentric-controllers.xml

Configures the form controller, the REST controller and the *FormCommandBeanFactory* that is used to create the *FormCommandBean*. The *FormCommandBean* calls the configured initialiser, validators and actions, and generates the form model.

You configure new actions, validators and form elements using the *CommandBean* factory:

```
<bean id="defaultFormCommandBeanFactory"
      class="com.formcentric.logicbeans.DefaultFormCommandBeanFactory">

  <property name="formElementClassMapping">
    <map>
      <entry key="inputField" value="java.lang.String"/>
      <entry key="passwordField" value="java.lang.String"/>
      <entry key="hiddenField" value="java.lang.String"/>
      <entry key="textArea" value="java.lang.String"/>
      <entry key="radioGroup" value="java.lang.String[]"/>
      <entry key="comboBox" value="java.lang.String[]"/>
      <entry key="checkboxGroup" value="java.lang.String[]"/>
      <entry key="fileUpload" value="com.formcentric.model.FileHolder"/>
      <entry key="captcha" value="java.lang.String"/>
    </map>
  </property>

  <property name="validatorMapping">
    <map>
      <entry key="notempty" value-ref="notemptyValidator"/>
      <entry key="jcaptcha" value-ref="captchaValidator"/>
      <entry key="email" value-ref="emailValidator"/>
      <entry key="date" value-ref="dateValidator"/>
      <entry key="number" value-ref="numberValidator"/>
      <entry key="javascript" value-ref="javascriptValidator"/>
      <entry key="regex" value-ref="regexValidator"/>
      <entry key="length" value-ref="lengthValidator"/>
      <entry key="zipcode" value-ref="zipCodeValidator"/>
      <entry key="phone" value-ref="phoneValidator"/>
      <entry key="password" value-ref="passwordValidator"/>
      <entry key="bic" value-ref="bicValidator"/>
      <entry key="iban" value-ref="ibanValidator"/>
      <entry key="file" value-ref="fileValidator"/>
      <entry key="equal" value-ref="equalValidator"/>
    </map>
  </property>

  <property name="actionMapping">
    <map>
      <entry key="mailAction" value-ref="mailAction"/>
      <entry key="compositeAction" value-ref="compositeAction"/>
      <entry key="dataSourceAction" value-ref="dataSourceAction"/>
      <entry key="mediaStoreAction" value-ref="mediaStoreAction"/>
      <entry key="pdfAction" value-ref="pdfAction"/>
      <entry key="datastoreAction" value-ref="datastoreAction"/>
      <entry key="redirectAction" value-ref="redirectAction"/>
    </map>
  </property>
</bean>
```

```

    </map>
  </property>
</bean>

<bean id="formController"
  class="com.formcentric.controllers.FormController">

  <property name="prefix" value="/form" />
  <!-- form controller specific part -->
  <property name="formCommandBeanFactory"
    ref="defaultFormCommandBeanFactory" />
  <property name="bindOnNewForm" value="true" />
  <property name="commandNamePrefix" value="command" />
  <property name="restoreInitialPage" value="true" />
  <property name="trimSpaces" value="false" />
  <property name="supportedMethods" value="POST" />
</bean>

<bean id="restController"
  class="com.formcentric.controllers.RestController">

  <property name="prefix" value="/rest" />
  <property name="commandNamePrefix" value="command" />

  <!-- Service-Mapping -->
  <property name="restServiceMapping">
    <map>
      <entry key="Länder" value-ref="deCountriesRestService"/>
      <entry key="Countries" value-ref="enCountriesRestService"/>
    </map>
  </property>
</bean>

```

formcentric-resourcebundle.xml

Adds the Formcentric resource bundle to the existing *messageSource* bean.

```

<bean id="messageSource"
  class="org.springframework.context.support.ResourceBundleMessageSource">
  <property name="basenames">
    <list>
      <value>com.formcentric.resourcebundle.messages</value>
    </list>
  </property>
</bean>

```



Individual Formcentric messages can be overwritten by using a project-specific resource bundle. We recommend including this bundle in the list of *basenames* at a position before the Formcentric resource bundle. For further information, please see the Spring configuration Javadoc.

formcentric-views.xml

formcentric-views.xml serves as the central configuration file. Here you specify whether JSP or FreeMarker is used by including either *formcentric-views-jsp.xml* or *formcentric-views-freemarker.xml*. In addition, the view beans for JSON, file download, image processing (Captcha, Thumbnail) and metrics are defined here.

```
<!-- use one of these for either JSP or FreeMarker templates -->
<import resource="formcentric-views-jsp.xml"/>
<!-- <import resource="formcentric-views-freemarker.xml"/> -->

<bean id="beanViewResolver"
      class="com.formcentric.view.BeanViewResolver">
  <property name="order" value="1"/>
  <property name="views">
    <map>
      <entry key="json" value-ref="jsonView"/>
      <entry key="file" value-ref="fileDownloadView"/>
      <entry key="fileInfo" value-ref="fileInfoView"/>
      <entry key="thumbnail" value-ref="thumbnailView"/>
      <entry key="captcha" value-ref="captchaView"/>
      <entry key="metrics" value-ref="metricsView"/>
    </map>
  </property>
</bean>
...
```

formcentric-views-jsp.xml

In this configuration, the *JspViewResolver* is defined. Furthermore, you determine under which path (e.g., */WEB-INF/templates/jsp/* or */WEB-INF/templates_legacy/jsp/*) the JSP templates are located.

formcentric-views-freemarker.xml

In *formcentric-views-freemarker.xml*, the *FreeMarkerViewResolver* is created and configured for accessing FreeMarker templates (e.g., in */WEB-INF/templates/ftl/* or */WEB-INF/templates_legacy/ftl/*).

formcentric-mail.xml

You use this configuration to specify the mail server connection settings. The configured *mailer* bean is used by the Mail action. If you want to change the underlying properties of the *mailer* bean, you will find all of the values you require in the *formcentric-mail.properties* file.

```
<bean id="mailer" class="com.formcentric.mail.SpringMailer">
  <constructor-arg ref="mailProperties"/>
</bean>
```



The configuration settings for the mailer bean are read with the help of a *PropertiesFactoryBean* from a separate property file, generated by Server and Project Configuration (see Section 4.4.2, “Configuration”).

formcentric-network.xml

Configures the *HttpClient*, which is used to download required web resources such as the PDF template documents. Environment-neutral configuration parameters can be found in the *formcentric-network.properties* file.

```
<!-- Proxy configuration -->
<bean id="proxy" class="com.formcentric.http.ProxyConfig">
  <property name="host" value="${proxy.host}"/>
  <property name="port" value="${proxy.port}"/>
  ...
</bean>

<!-- HttpClient configuration -->
<bean id="httpClient" class="com.formcentric.http.HttpClientFacade">
  <!-- Browser identification string -->
  <property name="userAgent" value="Mozilla/5.0 Firefox/26.0"/>

  <!-- Proxy configuration -->
  <property name="proxyConfig" ref="proxy" />
  ...
</bean>
```

formcentric-connection.xml

You use this configuration to specify the FirstSpirit server connection settings. The configured *ConnectionFactory* bean is used by the FirstSpirit action. The factory can be modified by setting properties in the associated *formcentric-connection.properties* file.

```
<bean id="firstSpiritConnection"
  class="com.formcentric.firstspirit.DisposableConnection" >
  <property name="protocol" value="${connection.transport.protocol}" />
  <property name="host" value="${connection.host}" />
  <property name="port" value="${connection.port}" />
  <property name="user" value="${connection.user}" />
  <property name="password" value="${connection.password}" />
  <property name="useHttps" value="${connection.https:false}" />
</bean>
```



The configuration settings for the *ConnectionFactory* bean are read with the help of a *PropertyPlaceholderConfigurer* from a separate property file, generated by Server and Project Configuration (see Section 4.4.2, “Configuration”).

formcentric-analytics.xml

You use this configuration to specify the connection settings to the Formcentric Backend. The configured *BackendApiClient* bean is used by the Analytics action, the *BackendFormStateStore* and the *TrackingCommandBean*.

For authentication against the Formcentric Backend, an *access token* is required. If this token should be generated automatically at runtime, the *ClientSecretCredentialsAuthProvider* can be used. This requires the client secret that was issued during Backend configuration. Alternatively, you can generate the token manually and use the *ApplicationAuthProvider*. For more information about generating an access token, please see the Installation Manual for the Formcentric Backend.

You can configure the associated properties individually in the *formcentric-analytics.properties* file.

```
<!--
  METHOD 1: Use a pre-generated token.
-->
<bean id="analyticsAuthenticator"
      class="com.formcentric.backend.api.auth.ApplicationAuthProvider">
  <constructor-arg index="0" value="{analytics.apiAuthentication}" />
</bean>

<!--
  METHOD 2: Pass the full client credentials and request a token at runtime.
-->
<bean id="analyticsAuthenticator" class="com.formcentric.backend
    .api.auth.ClientSecretCredentialsAuthProvider">
  <constructor-arg index="0" value="{analytics.backendUrl}" />
  <constructor-arg index="1" value="{analytics.apiAuthentication}" />
</bean>

<bean id="analyticsApiClientBuilder"
      class="com.formcentric.backend.api.ApiClientBuilder">
  <constructor-arg index="0" value="{analytics.backendUrl}" />
  <constructor-arg index="1" ref="analyticsAuthenticator" />
</bean>

<bean id="fcBackendApiClient"
      factory-bean="analyticsApiClientBuilder" factory-method="backendApiClient" />
```

formcentric-security.xml

formcentric-security.xml contains the basic configuration for Spring Security and controls access to protected endpoints. In this example, access to the paths */secure/*** and */servlet/secure/*** is secured by simple HTTP Basic authentication. Users who access these paths require the *ROLE_METRICS* role.

formcentric-metrics.xml

In *formcentric-metrics.xml*, the components for measuring and exporting application metrics using Micrometer are configured.

6.5.2. Property Files

The environment-specific configuration of the Spring MVC web application is handled through several property files. These contain key settings for features such as analytics, CAPTCHA, email delivery, licensing, and monitoring.

When you perform the configuration using the ServerManager, the configuration dialog automatically generates the listed property files (see Section 4.4.1, “Installation”).

The following section lists all relevant configuration files along with their parameters and a brief description.

formcentric-analytics.properties

Configuration for connecting to the Formcentric Analytics backend.

Parameter	Description
analytics.backendUrl	URL of the analytics backend
analytics.apiAuthentication	API secret for authentication
analytics.collectMetadata	Store browser metadata (true/false)

formcentric-captcha.properties

Selection and configuration of the CAPTCHA provider.

Parameter	Description
captcha.provider	CAPTCHA provider: jCaptcha, friendlyCaptcha, reCaptcha.
captcha.secret	API secret (provider-dependent, optional)
captcha.siteKey	Key for embedding CAPTCHA
captcha.endpoint	Endpoint for Friendly Captcha (e.g., global, eu)

formcentric-connection.properties

Connection configuration to the FirstSpirit server.

Parameter	Description
connection.transport.protocol	Protocol (1=HTTP, 2=Socket)
connection.host	Hostname/IP of the FirstSpirit server
connection.port	Port number
connection.user	Username for FS login
connection.password	Password for FS login
connection.maxsessions	Maximum number of parallel sessions

Parameter	Description
connection.https	Use HTTPS (true/false)

formcentric-cors.properties

Configuration for Cross-Origin Resource Sharing (CORS).

Parameter	Description
cors.allowedOriginPatterns	Allowed origin domains or wildcards
cors.allowedHeaders	Permitted headers
cors.exposedHeaders	Additional response headers
cors.maxAge	Validity of preflight requests in seconds

formcentric-license.properties

Path to the license file used to unlock Formcentric features.

Parameter	Description
license	Path to the license file, e.g., /WEB-INF/formcentric-license.txt

formcentric-mail.properties

Mail server settings for email-based form actions.

Parameter	Description
mail.smtp.host	SMTP hostname
mail.smtp.port	SMTP port
mail.user	SMTP username
mail.password	SMTP password
mail.smtp.auth	Enable SMTP authentication (true/false)
mail.smtp.starttls.enable	Enable StartTLS (true/false)
mail.charset	Character set, e.g., utf-8
mail.mime.encodefilename	Encode filenames in emails
mail.debug	Log full mail content (true/false)

formcentric-metrics.properties

Configuration for metrics collection and protection.

Parameter	Description
metrics.usage.activated	Enable usage metrics

Parameter	Description
metrics.health.activated	Enable system health metrics
metrics.user	Username for accessing metrics
metrics.password	Bcrypt-encrypted password for metrics access

formcentric-network.properties

Configuration for optional proxy access.

Parameter	Description
proxy.type	Proxy type (NONE, MANUAL, AUTO)
proxy.host	Proxy hostname
proxy.port	Proxy port
proxy.user	Proxy username
proxy.password	Proxy password
proxy.configUrl	URL to the PAC file
proxy.exclusions	Exceptions (hosts/domains)

formcentric-optin.properties

Whitelist of target URLs for the double opt-in process.

Parameter	Description
optin.urlPatterns	List of allowed URL patterns (empty = no restriction)

formcentric-pdf.properties

Configuration of PDF generation for form actions.

Parameter	Description
pdfAction.baseUrl	External base URL at runtime. Used to reference published PDF templates in the website.
pdfAction.templateDir	Directory from which PDF templates are loaded. If empty, published templates are used.

6.5.3. Usage without Formcentric Analytics

The Spring configuration files *formcentric-actions.xml*, *formcentric-controllers.xml* and *formcentric-analytics.xml* contain components that can only be used when Formcentric Analytics is deployed. If you want to use Formcentric without Analytics, then

the following beans and bean references must be removed from the Spring configuration files listed:

formcentric-actions.xml: *datastoreAction*

formcentric-controllers.xml: *formStateStore* (*BackendFormStateStore*), *defaultTrackingCommandBean*, *trackingController*

formcentric-analytics.xml: None of the beans in this file are required.

6.5.4. Formcentric licence file

The *formcentric-license.xml* file configures the LicenseLoader from Formcentric. You use the corresponding *formcentric-license.properties* to specify the path to the licence file.

Example (Linux/Unix): */path/to/formcentric-license*

Example (Windows): *C:/path/to/formcentric-license*



Paths that do not start with a / are resolved relative to the web app.

6.5.5. Web security

Formcentric contains a security servlet filter as a safeguard against cross-site scripting (XSS) attacks and cross-site request forgery (XSRF) attacks. This filter removes illegal HTML tags, CSS and scripts from the form data submitted. The filter also checks to confirm that the form data contains a valid XSRF token.

As a safeguard against XSRF attacks, each form can be given an additional XSRF token as a hidden parameter: this is then submitted to the web application along with the normal form data. The security filter verifies that the token submitted matches the token stored in the user's session. If this is the case, the request is forwarded to the web application. If not, a 401 error message is returned to the calling client and the failed access is logged in the web application log using the *warn* log level with the following information:

- URL accessed
- Form data submitted (POST parameter)
- IP address of the accessing client
- Fully qualified name of the accessing client or the last proxy used

The following example shows you how to insert the XSRF token into the form document's output template:

```
<%@ taglib prefix="form"
```

```

    uri="http://www.springframework.org/tags/form"%>
<%@ taglib prefix="fcs"
    uri="http://www.formcentric.com/web-security-1.0" %>
<%@ taglib prefix="c"
    uri="http://java.sun.com/jsp/jstl/core" %>

<c:url value="/servlet/form/${self.uid}?view=ajax" var="ajaxUrl"/>
<form:errors path="command${self.uid}" cssClass="error" />

<div id="ajaxreplace${self.uid}" class="ajax_box">

    <form:form name="${self.uid}" commandName="command${self.uid}"
        enctype="multipart/form-data">

        <!-- include XSRF token&#8211;->
        <fcs:xsrftoken/>
        ...
    </form:form>
</div>

```

In addition to the form template, the XSRF token must also be inserted into all URLs that reference a Formcentric controller. Currently, these are *FormController*, *FileUploadController* and *RestController*.

The following example shows you how to insert the XSRF token in the *fileUpload.jsp* template into the upload URL as a URL parameter.

```

<%@ taglib prefix="form"
    uri="http://www.springframework.org/tags/form"%>
<%@ taglib prefix="fcs"
    uri="http://www.formcentric.com/web-security-1.0" %>
<%@ taglib prefix="c"
    uri="http://java.sun.com/jsp/jstl/core" %>

<!-- Upload-URL zusammenbauen und in Variable speichern -->
<c:url value="/servlet/upload" var="uploadUrl">
    <c:param name="_uid" value="${form.uid}"/>
    <c:param name="_lang" value="${form.lang}"/>
    <fcs:xsrftokenParam method="POST"/>
</c:url>

<c:set var="id" value="${self.id}_${form.uid}"/>

<div class="mwf-upload"
    data-mwf-fileupload='{
        "url": "${uploadUrl}",
        "id": "${id}",
        "name": "${self.name}",
        "autoUpload": ${self.properties['auto_upload']},
        "labels": ${rowLabels},
        "previewMaxWidth": "90",
        "previewMaxHeight": "90"
    }'>
    ...

```

The upload URL is created with the help of the JSP `<c:url>` tag. You use the `<fcs:xsrftokenParam>` tag to add an XSRF token parameter to the URL. As with the JSP tag `<c:param>`, this can be used together with the `<c:url>` tag (see the section called “fcs:xsrftokenParam”).

You configure the security filter in the web application's deployment descriptor (web.xml). In the mapping rules, specify all of the Formcentric controllers for which the filter should be used.

```
<filter>
  <filter-name>webSecurityFilter</filter-name>
  <filter-class>com.formcentric.security.
    SecurityServletFilter</filter-class>
  <init-param>
    <param-name>xsrftPrevention</param-name>
    <param-value>>true</param-value>
  </init-param>
  <init-param>
    <param-name>xsrftMethods</param-name>
    <param-value>POST</param-value>
  </init-param>
  <init-param>
    <param-name>xsrftSessionBased</param-name>
    <param-value>>true</param-value>
  </init-param>
  <init-param>
    <param-name>xsrftTokenName</param-name>
    <param-value>_mwftoken</param-value>
  </init-param>
  <init-param>
    <param-name>xssPrevention</param-name>
    <param-value>>true</param-value>
  </init-param>
</filter>

<filter-mapping>
  <filter-name>webSecurityFilter</filter-name>
  <url-pattern>/servlet/form/*</url-pattern>
</filter-mapping>

<filter-mapping>
  <filter-name>webSecurityFilter</filter-name>
  <url-pattern>/servlet/rest</url-pattern>
</filter-mapping>

<filter-mapping>
  <filter-name>webSecurityFilter</filter-name>
  <url-pattern>/servlet/upload</url-pattern>
</filter-mapping>
```

The servlet filter has the following configuration settings.

Parameter	Description
xsrftPrevention	Enables XSRF protection (true, false).

Parameter	Description
xsrifMethods	Comma-separated list of HTTP methods (GET, POST) that should be secured using an XSRF token.
xsrifSessionBased	Use this parameter to specify whether the XSRF token should be renewed on each page reload (true) or just once per user session (false).
xsrifTokenName	Base name of the request parameter in which the current XSRF token will be passed. In the default configuration, the name <i>com.formcentric.XSRFToken</i> is used. The base name is automatically extended by the ID of the associated form.
xssPrevention	Enables XSS protection (true, false).



The security servlet filter can be configured only once per web application.

6.5.6. Saving the form status

As standard, all of the data entered by the user is saved in the user session on the server. If forms are complex, however, the session may expire before the user has finished completing and sending the form. In this case, the data items stored in the session are lost.

Formcentric therefore offers you the option of saving the entered data for a longer period of time. This means users can take a break from form entry and continue filling out the form at a later point in time.

To activate this function, configure a *FormStateStore* in the *formcentric-controllers.xml* Spring configuration file.

```
<bean id="defaultFormCommandBeanFactory"
  class="com.formcentric.logicbeans.DefaultFormCommandBeanFactory">
  ...
  <property name="formStateStore" ref="formStateStore"/>
</bean>
```

Formcentric offers you two separate store implementations:

BackendFormStateStore

This implementation stores the form data in the Analytics Backend database. For each data record, a unique ID is generated and stored both in the database and in a cookie file. The cookie's lifetime, domain and path can be specified in the Spring configuration.

```
<bean id="formStateStore"
  class="com.formcentric.store.BackendFormStateStore">
```

```

<property name="cookiePath" value="/" />
<property name="cookieDomain" value="my-domain.com" />
<property name="cookieMaxAge" value="604800" />
<property name="backendClient" ref="backendClient" />
</bean>

```

FileFormStateStore

This implementation stores the form data in an encrypted file on the server. The associated file name is stored in a cookie. The cookie's directory, encryption password, lifetime, domain and path can all be specified in the Spring configuration.

```

<bean id="formStateStore"
  class="com.formcentric.store.FileFormStateStore">

  <property name="cookiePath" value="/" />
  <property name="cookieDomain" value="my-domain.com" />
  <property name="cookieMaxAge" value="604800" />
  <property name="secret" value="change-this-now" />
  <property name="storageDir" value="/var/webforms" />
</bean>

```

The user account used to start the application server must possess write permissions for this directory. If not otherwise specified, the directory configured in the system variable *java.io.tmpdir* is used. In a clustered environment, the directory must also be accessible to all instances of the web application.

6.5.7. Implementing an action

As already described, the business logic for form data processing is encapsulated by actions in the web application. From a technical perspective, these are classes that implement the *com.formcentric.actions.Action* interface. Additional business beans can be injected into an action via Spring. In this way, data access objects (DAOs) can be made available in order to access external databases, for example. The actions are injected into the form controller via Spring when the application starts.

Variable action parameters, which must be entered by the form author when creating the form (such as the target address for the mail action), are passed to the action implementation via the properties map of the *ActionNode* bean.

The following example shows you how you can implement and configure the *CustomAction* described in section Section 6.3.1, "Developing a NodeEditorPane".

```

public class CustomAction extends BaseAction<WebForm> {

  public static final String PROP_CUSTOM = "customProperty";

  @Override
  public ModelAndView execute(ExecutionContext<WebForm> context, Map<String,
    Object> formData) throws Exception {

```

```

WebForm formDefinition = context.getFormDefinition();
ActionNode action = context.getAction();

String customParam = action.getPropertyAsString(PROP_CUSTOM);

// Business logic
...

// ModelAndView
ModelAndView mv = new ModelAndView("success");
mv.addObject(Constants.ATTRIBUTE_SELF, formDefinition);
return mv;
}

@Override
public boolean isExecutable(ExecutionContext<WebForm> context,
    Map<String, Object> formData) throws Exception {
    return true;
}
}

```

When called via the *execute* method, the action is given all of the available data. In addition to the actual form data, *ExecutionContext* passes the form definition, the action definition, the form variables (see Section 6.5.8, “Adding variables for pre-filling form fields”) and the request object. The *parameters* map contains only the values of the visible form elements. Access to all form data is provided by calling the method *getRawFormData()* on the *ExecutionContext* bean.

The *execute* method must return an object of the *ModelAndView* type. This is used in order to present the results page, as shown to the user after data has been submitted.

Typically, the *ModelAndView* object is generated with the form bean and a specialised view (such as *success*).

In addition, however, there is also the option of redirecting the request to another page. In this case, the *ModelAndView* object can be generated as follows:

```

ModelAndView mv = ControllerUtils.redirectTo(renderBean, viewName);

```

The *renderBean* object and the view name can be generated by the specialised business logic of the action implementation.

In some application scenarios, errors in the input data are discovered only during processing by the associated backend. In this case, the user should not be presented with the results page but should be given the form again, along with an error message. To achieve this, the action – in the same way as with validators – should create an error on the *Errors* bean passed in the *ExecutionContext*.

```

public ModelAndView execute(ExecutionContext<WebForm> context, Map<String,
Object> formData) throws Exception {
    ...
    context.getErrors().rejectValue("username", DUPLICATE_USER_ERROR,
        "This username is already in use.");
}

```



```

ModelAndView mv = new ModelAndView("success");
mv.addObject("self", formDefinition);
return mv;

```

Enter the action into the Spring configuration *formcentric-actions.xml*:

```

<bean name="customAction" class="com.custom.forms.web.CustomAction">

    <!-- benötigte Properties -->
    ...

</bean>

```

In the Spring configuration *formcentric-controllers.xml*, also add the following to the action mapping:

```

<bean id="formCommandBeanFactory"
      class="com.formcentric.logicbeans.DefaultFormCommandBeanFactory">

    <!-- Mapping von Action-Namen auf Action-Implementierungen -->
    <property name="actionMapping">
        <map>
            <entry key="mailAction" value-ref="mailAction"/>
            <entry key="customAction" value-ref="customAction"/>
        </map>
    </property>
    ...

</bean>

```

6.5.8. Adding variables for pre-filling form fields

To pre-fill form fields, the form author can make use of a range of predefined variables. As standard, the form author can use the variables *date*, *time*, *language*, *ip*, *remoteUser*, *principal*, *userAgent* and *referer*.

To provide custom variables, you need to override the method *getVariables()* on the *FormCommandBean*.

```

public class CustomFormCommandBean extends DefaultFormCommandBean {

    @Override
    protected Map<String, Object> getVariables(HttpServletRequest request,
        WebForm formDefinition) {

        Map<String, Object> variables =
            super.getVariables(request, formDefinition);

        // eigene Variablen hier einfügen
        ...

        return variables;
    }
}

```

```
}
```

To instantiate the new *CustomFormCommandBean*, you will also need to override the *FormCommandBean* factory and enter this into the configuration *formcentric-controllers.xml*.

```
public class CustomCommandBeanFactory extends DefaultFormCommandBeanFactory {  
  
    @Override  
    public CustomFormCommandBean createBeanFor(WebForm formDefinition) {  
  
        CustomFormCommandBean commandBean = new CustomFormCommandBean();  
        initCommandBean(commandBean, formDefinition);  
  
        return commandBean;  
    }  
}
```

Replace the *DefaultFormCommandBeanFactory* in the Spring configuration *formcentric-controllers.xml* with the *CustomCommandBeanFactory*:

```
<bean id="formCommandBeanFactory"  
      class="com.custom.forms.web.CustomCommandBeanFactory"  
      ...
```



The form fields are initialised with the predefined pre-filled values once only, when the form is called for the first time. This also replaces the variables with their values. Accordingly, subsequent changes to variable values are not applied to an already-initialised form.

6.5.9. Implementing a REST service

Formcentric includes a REST interface, which you can use to fill drop-down lists or input fields at runtime with data from external systems. The data concerned can be static, dynamic or specific to the user. All of the interface's specialised functions are encapsulated in classes of the *com.formcentric.rest.RestService* type. By implementing your own REST service, you can extend the interface to include additional functionality. The following example shows you a REST service that generates a map with static key/value pairs.

```
public class CustomRestService extends BaseRestService {  
  
    @Override  
    public Object invoke(ServiceContext<WebForm> context, Map<String,  
        Object> remoteFormData, Map<String, Object> localFormData) {  
  
        String myCustomParam =  
            context.getConfigParameterMap().get("myCustomParam");  
        ...  
  
        HashMap<String, String> data = new HashMap<String, String>();
```

```

// Map füllen
data.put("key1", "value1");
data.put("key2", "value2");
data.put("key3", "value3");

return data;
}
}

```

By calling the *invoke* method, the *RestService* is passed both the *ServiceContext* as well as the user input already sent (*remoteFormData* parameter) and the user input not yet sent (*localFormData* parameter). This enables you to react directly to user input, regardless of whether or not this input has already been sent.

The *ServiceContext* also gives you access to the form definition, the input element, the configuration parameters for the *RestService* and the request object.

Enter the REST service into the Spring configuration *formcentric-services.xml*:

```

<bean name="customRestService"
      class="com.custom.forms.web.CustomRestService">

  <!-- benötigte Properties -->
  ...

</bean>

```

Also add the service to the REST controller's service mapping in the Spring configuration file *formcentric-controllers.xml*:

```

<bean id="restController"
      class="com.formcentric.controllers.RestController">
  <property name="prefix" value="/rest" />
  <property name="commandNamePrefix" value="command" />

  <property name="restServiceMapping">
    <map>
      <entry key="Example" value-ref="exampleRestService"/>
      ...
    </map>
  </property>
</bean>

```

The service is accessed via the URL:

```

<context-path>/servlet/rest?_service=Example&_uid=<Dokument-ID>&
      _input=<Input-Name>

```

The following JSON string is returned as the response to this call:

```

[
  {
    "k": "key1",

```

```

    "v": "value1",
    "i": "mwf6aab0bb24033",
    "h": "8d0c3e13950d86c1a7383f066105f78c"
  },
  {
    "k": "key2",
    "v": "value2",
    "i": "mwf06a7a0930d37",
    "h": "d22d445101243a5f616cfd64c765e399"
  },
  {
    "k": "key3",
    "v": "value3",
    "i": "mwf1674ffb0a121",
    "h": "c0ad1fa77bb1b79ca757ee1ffce9f416"
  }
]

```

To prevent manipulation of the JSON data so transmitted, the individual key/value pairs are secured using an additional hash value that is validated on the server during form submission.

This security mechanism means that no calls may be made to external REST services, since their data does not contain the required hash values. If you need to access external services, however, you can implement your own proxy REST service, which in turn accesses the external REST service.

From version 2.3 of Formcentric onwards, REST service calls within JSP templates are made using the HTML attribute *data-mwf-datasource*. In the attribute value, you must specify a JSON object that contains the URL of the REST service, the usage type (*checkbox*, *radio*, *selection*, *suggestion* or *hidden*) and any other parameters.

As standard, you can specify a REST service for the following input elements:

inputField:

```

<c:url value="/servlet/rest" var="restUrl">
  <c:param name="_service" value="${self.properties['datasource']}"/>
  <c:param name="_uid" value="${form.uid}"/>
  <c:param name="_input" value="${self.name}"/>
  <fcs:xsrftokenParam/>
</c:url>

<c:set var="params" value="${self.properties['datasource_params']}"/>

<form:input data-mwf-id="${self.id}"
  data-mwf-datasource='{
    "type" : "suggestion",
    "url" : "${restUrl}",
    "data" : {},
    "params" : ${params}
  }' ... />

```

hiddenField:

```

<c:url value="/servlet/rest" var="restUrl">
  <c:param name="_service" value="${self.properties['datasource']}" />
  <c:param name="_uid" value="${form.uid}" />
  <c:param name="_input" value="${self.name}" />
  <fcs:xsrftokenParam />
</c:url>

<c:set var="params" value="${self.properties['datasource_params']}" />

<form:hidden path="${self.name}" data-mwf-id="${self.id}"
  data-mwf-datasource='{
    "type" : "hidden",
    "url" : "${restUrl}",
    "data" : {},
    "params" : ${params}
  }' ... />

```

comboBox:

```

<![CDATA[<c:url value="/servlet/rest" var="restUrl">
  <c:param name="_service" value="${input.properties['datasource']}" />
  <c:param name="_uid" value="${form.uid}" />
  <c:param name="_input" value="${input.name}" />
  <fcs:xsrftokenParam />
</c:url>

<fc:valueOut var="userValue" name="${input.name}" />
<c:set var="strUserValue" value="${fn:join(userValue, ', ')}" />
<c:set var="params" value="${input.properties['datasource_params']}" />

<form:select data-mwf-id="${self.id}"
  data-mwf-datasource='{
    "type" : "selection",
    "url" : "${restUrl}",
    "preselected" : "${strUserValue}",
    "data" : {},
    "params" : ${params}
  }' ... >
  ...
</form:select>

```

checkboxGroup:

```

<c:url value="/servlet/rest" var="restUrl">
  <c:param name="_service" value="${input.properties['datasource']}" />
  <c:param name="_uid" value="${form.uid}" />
  <c:param name="_input" value="${input.name}" />
  <fcs:xsrftokenParam />
</c:url>

<fc:valueOut var="userValue" name="${input.name}" />
<c:set var="strUserValue" value="${fn:join(userValue, ', ')}" />
<c:set var="params" value="${input.properties['datasource_params']}" />

<fieldset data-mwf-id="${self.id}"

```

```

        data-mwf-datasource='{
            "name" : "${input.name}",
            "type" : "checkbox",
            "url" : "${restUrl}",
            "preselected" : "${strUserValue}",
            "data" : {},
            "params" : ${params}
        }' ... >
    ...
</fieldset>

```

radioGroup:

```

<c:url value="/servlet/rest" var="restUrl">
    <c:param name="_service" value="${self.properties['datasource']}" />
    <c:param name="_uid" value="${form.uid}" />
    <c:param name="_input" value="${self.name}" />
    <fcs:xsrftokenParam />
</c:url>

<fc:valueOut var="userValue" name="${self.name}" />
<c:set var="strUserValue" value="${fn:join(userValue, ',')}" />
<c:set var="params" value="${self.properties['datasource_params']}" />

<fieldset data-mwf-id="${self.id}"
    data-mwf-datasource='{
        "name" : "${self.name}",
        "type" : "radio",
        "url" : "${restUrl}",
        "preselected" : "${strUserValue}",
        "data" : {},
        "params" : ${params}
    }' ... >
    ...
</fieldset>

```



Since the double quotation mark must be used within the JSON string, you must use the single quotation mark for the HTML attribute.

As described previously, both the form input that has been sent and the form input not yet sent is available to you within the RestService. As one example of how to use this function, you could implement a RestService that takes a postcode entered by the user and returns a drop-down list of locations matching the postcode.

In this example, it would be advisable to update the drop-down list automatically if the user changes the postcode, since other locations may be referenced by the changed postcode. This can be achieved by using the parameter *dependsOn*. In the form editing interface, this can be entered into the parameter list of a RestService (see also section 3.2.5 in the User Manual). The value to be entered here must specify the name of the input element on which the result of the selected RestService depends. Every change made to one of the input elements specified results in another call to the RestService.

6.5.10. Template development

The output of the forms and form elements is handled by FreeMarker or JSP templates within the web application.

In the standard configuration, Formcentric is set up to use JSP templates. To reconfigure the web app to use FreeMarker templates, you need to import the *formcentric-views-freemarker.xml* configuration into the Spring configuration *formcentric-views.xml* instead of the *formcentric-views-jsp.xml* configuration.

At the data level (model), all form elements are represented by an object of the *com.formcentric.model.xml.InputNode* type. To access the properties *id*, *type*, *name*, *label*, *value*, *parent* and *children*, you can use the corresponding getter methods on the *InputNode* bean. Access to all other properties is performed using the properties map from the *InputNode* bean.

The following table shows you all of the form element types and their properties. The properties shown in square brackets must be read from the properties map.

Element	Properties
form	name, [style_class, form_style_class, next_label, submit_label, cancel_label, script, description, save_state, save_statistics, doi_to, doi_note, doi_message, doi_from, doi_sender, doi_subject, doi_enabled, doi_format, doi_condition, doi_condition_conjunction]
inputField	name, label, value, [hint, placeholder, field_width, style_class, readonly, maxlength, datasource, datasource_params]
shortText	name, label, value, [hint, placeholder, field_width, style_class, readonly, maxlength]
emailField	name, label, value, [hint, placeholder, field_width, style_class, readonly]
numberField	name, label, value, [hint, placeholder, field_width, style_class, readonly, maxlength]
dateField	name, label, value, [hint, placeholder, field_width, style_class, readonly, maxlength]
phoneField	name, label, value, [hint, placeholder, field_width, style_class, readonly, maxlength]
textArea	name, label, value, [hint, placeholder, field_width, style_class, readonly, maxlength, rows, cols]
passwordField	name, label, [hint, placeholder, field_width, style_class]
button	name, label, [hint, field_width, style_class, onclick]
checkBoxGroup	name, label, children, [pictureUrl, pictureFileName, hint, field_width, style_class, datasource, dynamic, datasource_params]

Element	Properties
comboBox	name, label, value, children, [pictureUrl, pictureFileName, hint, field_width, style_class, datasource, dynamic, datasource_params]
picture	name, [pictureUrl, pictureFileName, alt, field_width, style_class]
pageBreak	name, label, [style_class, condition, next_label, back_label, script]
paragraph	name, value, [bold, italic, field_width, style_class]
captcha	name, label, [field_width, hint]
radioGroup	name, label, children, [pictureUrl, pictureFileName, hint, field_width, style_class, datasource, dynamic, datasource_params]
summary	label, [style_class, elements, hide_empty_fields]
hiddenField	name, value, [datasource, datasource_params]
fileUpload	name, [multiple, auto_upload, hint, field_width, style_class]
condition	[condition, condition_conjunction, conditional_fields]
pageCondition	[condition, condition_conjunction, next_page, script]
layout	label, [layout]
fieldSet	name, label, [style_class]
calculatedValue	name, label, [script, visible, clientside, style_class]
mailAction	[subject, to, cc, bcc, from, sender, body, format, note, replyto, send_hidden_fields, condition, condition_execute, condition_conjunction, redirect_url, hide_empty_fields]
dataSourceAction	[note, schema, table, datasource_mapping, commit_message, release, condition, condition_execute, condition_conjunction]
mediaStoreAction	[note, mediastore_mapping, commit_message, release, condition, condition_execute, condition_conjunction]
pdfAction	[note, pdfFileName, pdfPath, pdfUid, pdfUrl, field_mapping, linktext, readonly, condition, condition_execute, condition_conjunction]
datastoreAction	[note, condition, condition_execute, condition_conjunction]
redirectAction	[note, condition, condition_execute, condition_conjunction, url, content, delay]
webhookAction	[note, condition, condition_execute, condition_conjunction, url, fields, url_parameters, custom_headers, content_type]
sequenceAction	-

In addition to the InputNode beans described above, the system passes other objects in the request to the form templates. The following table gives you an overview of all objects passed.

Parameter name	Type	Description
self	com.formcentric.model.WebForm	Current form document bean
input	com.formcentric.model.xml.InputNode	Current form element bean
pageElements	java.util.List	List with the elements of the current form page
pageCount	java.lang.Integer	Number of form pages
form	com.formcentric.model.WebForm	Form definition
currentPage	java.lang.Integer	Page number of the current form page
currentPageNode	com.formcentric.model.xml.InputNode	Current form page bean
formdata	java.util.Map	Map containing the form data entered by the user

FreeMarker templates

The FreeMarker templates are stored in the directory */WEB-INF/templates/ftl*. Alongside the parent form template, each form element type is also assigned its own template. The example below shows you the *textArea.ftl* template for the multi-line text input field:

```
<li data-mwf-container="${self.id}"
    class="mwf-field ${self.properties['style_class']}!"!""">
  <label class="mwf-label" for="${self.id}">${self.label}!"!""
    <#if self.required><span class="mwf-required">*</span></#if>
  </label>
  <div class="mwf-input">

    <@spring.bind mwf.bind(self)/>
    <#assign hasErrors=spring.status.error />
    <textarea id="${self.id}"
      class="mwf-text ${self.properties['style_class']}!"!""
      name="${spring.status.expression}!"!""
      ${self.properties['readonly']}?boolean?then("readonly", "")
      maxLength="${self.properties['maxLength']}!"!""
      spellcheck="true"
      placeholder="${self.properties['placeholder']}!"!""
      rows="${self.properties['rows']}!"!""
```

```

        cols="${self.properties['cols']}!"
        data-mwf-id="${self.id}"${spring.status.value!""}</textarea>
<#if self.properties['hint']?has_content>
    <div class="mwf-hint">
        <@fc.markdown value=(self.properties['hint']!"")?string />
    </div>
</#if>
    <@spring.showErrors separator="<p>" classOrStyle="mwf-error"/>
</div>
</li>

```

FreeMarker functions and macros

Formcentric provides you with a FreeMarker library that contains specialised functions for displaying the forms.

To utilise these functions, insert the following instruction into the FreeMarker templates:

```
<#import "/lib/formcentric.com/webforms.ftl" as mwf>
```

The following section gives you a description of the functions contained in this library.

fc.forEachPageElement

List function that contains the elements on the current page.

```
forEachPageElement(boolean layoutFacets, boolean removeEmptyFacets,
    final String exclude, final String include)
```

Parameter	Description
layoutFacets	If this value is set to <i>true</i> , the elements will be split across layoutFacets (optional).
removeEmpty-Facets	Specifies whether empty layouts should be ignored when creating the list (optional). Default value: <i>false</i>
exclude	Comma-separated list of the element types that should be ignored when creating the list. If nothing is specified here, then all element types – with the exception of excluded types – are included (optional).
include	Comma-separated list of element types that should be included when creating the list (optional).

```

<#list mwf.forEachPageElement(true, false, "condition", "") as layout>
    <ul class="${layout.properties['layout']}!">

        <#if layout_index == 0 && currentPage == 0 && self.label?has_content>
            <li class="mwf-field"><h3>${self.label!""}</h3></li>

```

```

</#if>

<#list layout.items as input>
  <@fc.include self=input view=input.type />
</#list>
</ul>
</#list>

```

fc.forEachPage

List function that returns a list of the collected pages.

```
forEachPage(final boolean compact)
```

Parameter	Description
compact	Specifies whether form pages with the same title should be consolidated together (optional). Default value: <i>false</i>

fc.include

Macro that includes a bean with a certain template.

```
<@fc.include self=input view=input.type />
```

Attribute	Description
self	Bean that is included.
view	Name of the template to be included.
params	An extended hash that you can use to pass additional parameters to the included template (optional).

fc.url

Function that can be used to generate absolute URLs on the Formcentric controller.

If nothing is specified in the *baseUrl* parameter, then the generated URL points to the Formcentric web app in which the FreeMarker template was called.

This function is helpful if you want to install the Formcentric web application on a host separate to the one hosting the surrounding web page, since in this case you are unable to use relative URLs.

Parameter	Description
base	Specifies the Formcentric controller.
params	An extended hash that you can use to pass additional parameters to the URL (optional).

Parameter	Description
baseUrl	Fully-qualified hostname, such as <i>https://your.domain.com:8000</i> (optional).

```
<#assign restUrl=fc.url("/servlet/rest", {
    "_uid": form.uid,
    "_input": self.name,
    "_service": self.properties['datasource'],
    fc.xsrfTokenName(form.uid): fc.xsrfTokenValue(form.uid)
}) />
```

fc.responseHeader

Macro that you can use to set a header in the response.

```
<@fc.responseHeader name="Content-Type"
    value="text/html; charset=UTF-8"/>
```

fc.summary

Function that returns a list of all elements as a *com.formcentric.model.InputBean* for the form. This can also be used to query the data entered by the user.

This can be used to query the following properties:

name	Form element name
label	Form element label.
type	Form element type.
object	Form element value bean.
value	String representation of the value bean.
valueLabels	String array containing the labels of the options chosen in the selection field (<i>comboBox</i> , <i>radioGroup</i> , <i>checkboxGroup</i>). If the associated input element is not a selection, then the value of the element is returned in the array.
page	Number of the page on which the element is located.
pageLabel	Label of the page on which the element is located.
layout	Name of the layout in which the element is located.
input	<i>InputNode</i> of the element.

```
summary(InputNode self, String elements,
    final String include, final String exclude,
    final boolean hideEmptyFields, final String excludeIfEmpty)
```

Parameter	Description
self	<i>InputNode</i> of a form element.

Parameter	Description
	If this value is set, then the iteration is interrupted at the specified element.
elements	Comma-separated list containing the names of the form elements that should be shown in the summary. If this attribute contains a value, then the attribute <i>self</i> is ignored (optional).
include	Comma-separated list of element types that should be considered during iteration. If nothing is specified here, then all element types – with the exception of excluded types – are included (optional).
exclude	Comma-separated list of element types that should be ignored during iteration (optional). Default value: <i>button, hiddenField, condition, pageCondition, pagebreak, captcha, passwordField</i>
hideEmptyFields	Specifies that all empty fields should be ignored. Default value: <i>false</i>
excludeEmpty-Fields	Specifies that empty fields should be ignored (optional). Default value: <i>false</i>

```

<#list mwf.summary(self, self.getPropertyAsString('elements'),
  self.getPropertyAsBoolean('hide_empty_fields', false)) as item>
  <tr>
    <#if item.input.type == "paragraph">
      <td colspan="2">
        <@fc.markdown>${item.input.value}</@fc.markdown>
      </td>
    <#else>
      <td>${item.label?has_content?then(item.label, item.name!""}</td>
      <td>${(item.valueLabels![])?join(", ")}</td>
    </#if>
  </tr>
</#list>

```

fc.captcha

Template that you can use to generate a captcha image.

Attribute	Description
url	URL of the captcha servlet.
id	ID of the captcha InputNode.
linkClass	CSS class(es) that is/are applied to the link to the captcha image (optional). Default value: ""

Attribute	Description
imgClass	CSS class(es) that is/are applied to the captcha image (optional). Default value: ""
title	The title attribute for the captcha image (optional). Default value: ""
alt	The alt attribute for the captcha image (optional). Default value: <i>Captcha</i>

```
<#assign captchaUrl=mwf.url("/servlet/captcha/captcha.jpg")!"" />
<@fc.captcha url=captchaUrl id=self.id linkClass="css-class__link"
  imgClass="css-class__img" title="A title" alt="Captcha" />
```

fc.ifCaptcha

Boolean function that evaluates whether the captcha *name* has **not** been entered correctly.

Parameter	Description
name	Name of the captcha element.

```
<#if fc.ifCaptcha(self.name!="")>
  <#assign captchaUrl=mwf.url("/servlet/captcha/captcha.jpg")!"" />
  <@fc.captcha url=captchaUrl id=self.id />
</#if>
```

fc.hasCaptcha

Boolean function that evaluates whether the form contains a captcha element.

Parameter	Description
form	The form element.

```
<#if fc.hasCaptcha(self)>
  <!-- markup that only renders
  if a captcha is present -->
</#if>
```

fc.getStandardButton

Function that supplies the standard form button determined by the *buttonType* attribute.

Parameter	Description
buttonType	Standard button type. Can be set to the following values:

Parameter	Description
<code>_next</code>	Button that takes the user to the next page of the form.
<code>_back</code>	Button that takes the user to the previous page of the form.
<code>_cancel</code>	Button that cancels form data entry.
<code>_finish</code>	Button that submits the form.
<code>_exit</code>	Button that can be used to exit from the form.

```
<#assign finishButton=mwf.getStandardButton("_finish") />
<li data-mwf-container="{finishButton.id}" class="mwf-button mwf-next">
  <input type="button" value="{submitLabel}"
    data-mwf-submit="{type: 'finish',
      'query': 'navigationId={cmpage.navigation.contentId}"}"/>
</li>
```

fc.valueOut

Function that can be used to output the current value of a form field.

```
valueOut(String name, boolean preferLabel)
```

Parameter	Description
<code>name</code>	Form field name
<code>preferLabel</code>	Specifies that the value's label should be output instead of the value itself (optional).

```
{fc.valueOut(self.name! "", true)! ""}
```

fc.conditions

Function with which the JavaScript definitions can be generated for conditional elements. Place this function at the end of the form template.

```
<#assign conditions=mwf.conditions() />
```

fc.calculatedValues

Function that generates the JSON definitions for the *calculated values*.

```
<#assign calculatedValues=mwf.calculatedValues() />
```

fc.markdown

Macro that can be used to output a value interpreted using markdown. This macro can handle both a passed value (see *value* parameter) or a body.

Parameter	Description
value	Value to be interpreted using markdown (optional).
inline	Specifies whether the output HTML should be restricted to inline elements (optional). Default value: <i>false</i>

```
<@fc.markdown value=self.value!"" inline=false />
<!-- or -->
<@fc.markdown inline=false>${self.value!""}</@fc.markdown>
```

fc.vars

Macro that can be used to replace variables from the form context in the output.

Parameter	Description
map	Map with the form data.

```
<@fc.vars map=formdata>${action.properties['note']!""}</@fc.vars>
```

fc.bind

Function that returns the path to which the node is bound.

Parameter	Description
node	InputNode whose path is being queried.

```
<@spring.bind mwf.bind(self) />
```

fc.encodeUrl

Function that encodes the URL passed in UTF-8.

Parameter	Description
url	URL that is to be encoded.

fc.hasValidator

Function that checks whether the validator specified by the *name* parameter is present in the InputNode *node*.

Parameter	Description
node	InputNode that is to be evaluated.

Parameter	Description
name	Name of the validator.

fc.validatorByName

Function that returns the validator specified in the *name* parameter of the *InputNode node*.

Parameter	Description
node	InputNode that is to be evaluated.
name	Name of the validator.

fc.elementByName

Function that returns the *InputNode* specified in the *name* parameter for the form *form*.

Parameter	Description
form	Form that contains the <i>InputNode</i> .
name	Name of the element.

Security library

Formcentric includes a security library for the generation and output of XSRF tokens (see Section 6.5.5, “Web security”). This security library is also included by the integration of the FreeMarker functions.

The FreeMarker functions that are included are described below.

fc.xsrfToken

Macro that generates a hidden form field with an XSRF token.

```
<@fc.xsrfToken />
```

fc.xsrfTokenName

Function that generates an *xsrfTokenName* from the form ID.

Parameter	Description
formId	ID of the form for which the token should be generated. If this parameter is empty, the form ID passed in the request is used (optional).

```
<#assign restUrl=mwf.url("/servlet/rest", {"_uid": form.uid, ...,
    "tokenName": fc.xsrfTokenName(), "tokenValue": fc.xsrfTokenValue()})!"/>
```

fc.xsrfTokenValue

Function that generates an xsrfTokenValue from the form ID.

Parameter	Description
formId	ID of the form for which the token should be generated. If this parameter is empty, the form ID passed in the request is used (optional).

```
<#assign restUrl=mwf.url("/servlet/rest", {"_uid": form.uid, ...,
    "tokenName": fc.xsrfTokenName(), "tokenValue": fc.xsrfTokenValue()})!"/>
```

JSP templates

The JSP templates are stored in the directory `/WEB-INF/templates/jsp`. Alongside the parent form template, each form element type is also assigned its own template. The example below shows you the `textArea.jsp` template for the multi-line text input field:

```
<%@ page contentType="text/html; charset=UTF-8" language="java"%>
<%@ taglib prefix="c" uri="http://java.sun.com/jsp/jstl/core" %>
<%@ taglib prefix="spring" uri="http://www.springframework.org/tags" %>
<%@ taglib prefix="form" uri="http://www.springframework.org/tags/form" %>

<jsp:useBean id="self" type="com.formcentric.model.xml.InputNode"
    scope="request"/>
<jsp:useBean id="form" type="com.formcentric.model.WebForm"
    scope="request"/>

<c:set var="id" value="${self.id}_${form.uid}"/>
<mwf:hasErrors var="hasErrors" path="${self.name}"/>
<li data-mwf-container="${id}" class="mwf-field">
    <label class="mwf-label" for="${id}">
        <c:out value="${self.label}"/>
        <c:if test="${self.required}">
            <span class="mwf-required">*</span>
        </c:if>
    </label>
    <div class="mwf-input">
        <form:textarea id="${id}" path="${self.name}"
            cssClass="mwf-text ${self.properties['field_width']}"
            readOnly="${self.properties['readonly']}"
            maxLength="${self.properties['maxLength']}"
            spellcheck="true"
            rows="${self.properties['rows']}"
            cols="${self.properties['cols']}"
            data-mwf-id="${id}"
            placeholder="${self.properties['placeholder']}"/>
        <c:if test="${not empty self.properties['hint']}">
            <p class="mwf-hint">
                <small><c:out value="${self.properties['hint']}" /></small>
            </p>
        </c:if>
        <form:errors path="${self.name}" cssClass="mwf-error" element="p"/>
    </div>
</li>
```

```
</div>
</li>
```

Taglib formcentric-1.0

Formcentric provides you with a tag library that contains specialised tags for displaying the forms.

To utilise this taglib, insert the following instruction into the JSP template:

```
<%@taglib prefix="fc" uri="http://www.monday-consulting.com/webfoms-1.0"%>
```

The following section gives you a description of the tags contained in this library.

fc:forEachPageElement

Iterator tag, which you can use to iterate over the individual elements in a form page. In the process, the current form element is passed in the control variable.

Attribute	Description
var	Name of the control variable that contains the current form element.
varStatus	Iteration status.
exclude	Comma-separated list of element types that should be ignored during iteration. If nothing is specified here, then all element types – with the exception of excluded types – are considered.
include	Comma-separated list of element types that should be considered during iteration.
layoutFacets	Specifies whether form elements should be grouped by layout for output. In this case, the control variable contains the current layout. Note that this is a bean of the type <i>PageIterateTag.LayoutFacet</i> . This can be used to query the following properties: layout Layout descriptor items List containing form elements assigned to this layout. Default value: <i>false</i>
removeEmpty-Facets	Specifies whether empty layouts should be ignored during iteration. Default value: <i>false</i>

```
<mwf:forEachPageElement var="input"
  exclude="pageBreak,calculatedValue,condition">
  <mwf:include self="{input}" view="{input.type}"/>
</mwf:forEachPageElement>
```

```

<mf:forEachPageElement var="layout" varStatus="s" layoutFacets="true"
  exclude="pageBreak,calculatedValue,condition">

  <c:choose>

    <!-- einspaltiges Layout -->
    <c:when test="{empty layout.layout or layout.layout eq '1'}">
      <fieldset class="onecolumn">
        <c:forEach items="{layout.items}" var="input" varStatus="i">
          <mf:include self="{input}" view="{input.type}"/>
        </c:forEach>
      </fieldset>
    </c:when>

    <!-- mehrspaltiges Layout -->
    <c:when test="{not empty layout.layout and layout.layout eq '2'}">
      <fieldset class="twocolumn">
        <c:forEach items="{layout.items}" var="input" varStatus="i">
          <mf:include self="{input}" view="{input.type}"/>
        </c:forEach>
      </fieldset>
    </c:when>

  </c:choose>
</mf:forEachPageElement>

```

fc:forEachPage

Iterator tag, which you can use to iterate over the pages in a form. The page title and other items of status information are passed in the control variable.

Attribute	Description
var	Name of the control variable, which contains a bean of the type <i>ForEachPageTag.Item</i> . This can be used to query the following properties: <ul style="list-style-type: none"> label Form page label index Page number selected Specifies whether the associated form page is currently being shown. finished Specifies whether the associated form page has already been filled out.
varStatus	Iteration status.
compact	Specifies whether form pages with the same title should be consolidated together. Default value: <i>false</i>

```

<mf:forEachPage var="page" varStatus="status">

```

```

<c:set var="class" value="${entry.selected ? 'selected' : ''}"/>
<span class="${class}">
  <c:out value="${status.index}"/>. <c:out value="${page.label}"/>
</span>
</mwf:forEachPage>

```

fc:summary

Tag that you can use to iterate over all of the elements in a form. Alongside the element properties *name*, *type* and *label*, the value entered by the user is also passed in the control variable.

Attribute	Description																				
var	<p>Name of the control variable, which contains a bean of the type <i>com.formcentric.model.InputBean</i>. This can be used to query the following properties:</p> <table border="0"> <tr> <td>name</td> <td>Form element name</td> </tr> <tr> <td>label</td> <td>Form element label</td> </tr> <tr> <td>type</td> <td>Form element type</td> </tr> <tr> <td>object</td> <td>Form element value bean</td> </tr> <tr> <td>value</td> <td>String representation of the value bean</td> </tr> <tr> <td>valueLabels</td> <td>String array containing the labels of the options chosen in the selection field (<i>comboBox</i>, <i>radioGroup</i>, <i>checkboxGroup</i>). If the associated input element is not a selection, then the value of the element is returned in the array.</td> </tr> <tr> <td>page</td> <td>Number of the page on which the element is located.</td> </tr> <tr> <td>pageLabel</td> <td>Label of the page on which the element is located.</td> </tr> <tr> <td>layout</td> <td>Name of the layout in which the element is located.</td> </tr> <tr> <td>input</td> <td><i>InputNode</i> of the element.</td> </tr> </table>	name	Form element name	label	Form element label	type	Form element type	object	Form element value bean	value	String representation of the value bean	valueLabels	String array containing the labels of the options chosen in the selection field (<i>comboBox</i> , <i>radioGroup</i> , <i>checkboxGroup</i>). If the associated input element is not a selection, then the value of the element is returned in the array.	page	Number of the page on which the element is located.	pageLabel	Label of the page on which the element is located.	layout	Name of the layout in which the element is located.	input	<i>InputNode</i> of the element.
name	Form element name																				
label	Form element label																				
type	Form element type																				
object	Form element value bean																				
value	String representation of the value bean																				
valueLabels	String array containing the labels of the options chosen in the selection field (<i>comboBox</i> , <i>radioGroup</i> , <i>checkboxGroup</i>). If the associated input element is not a selection, then the value of the element is returned in the array.																				
page	Number of the page on which the element is located.																				
pageLabel	Label of the page on which the element is located.																				
layout	Name of the layout in which the element is located.																				
input	<i>InputNode</i> of the element.																				
varStatus	Iteration status.																				
elements	Comma-separated list containing the names of the form elements that should be shown in the summary. If this attribute contains a value, then the attribute <i>self</i> is ignored.																				
self	<p><i>InputNode</i> of a form element.</p> <p>If this value is set, then the iteration is interrupted at the specified element.</p>																				
include	Comma-separated list of element types that should be considered during iteration. If nothing is specified here, then all																				

Attribute	Description
	element types – with the exception of excluded types – are considered.
exclude	Comma-separated list of element types that should be ignored during iteration. Default value: <i>button, hiddenField, condition, pageCondition, pagebreak, captcha, passwordField</i>
hideEmptyFields	Specifies that all empty fields should be ignored. Default value: <i>false</i>
excludelfEmpty	Enter the types of form fields here that should be ignored if they are empty.

```
<table>
  <fc:summary exclude="hiddenField" var="item"
    elements="${self.properties['elements']}"
    hideEmptyFields="${self.properties['hide_empty_fields']}">
    <tr>
      <td><c:out value="${empty item.label ? item.name : item.label}"/></td>
      <td><c:out value="${fn:join(item.valueLabels, ', ')}"/></td>
    </tr>
  </fc:summary>
</table>
```

fc:captcha

Tag that you can use to generate a captcha image.

Attribute	Description
url	URL of the captcha servlet.
alt	Alternative text for the captcha image

```
<mf:captcha url="/servlet/captcha/captcha.jpg" path="${self.name}"
  title="Click for new Captcha"/>
```

fc:captchaLink

Tag that you can use to generate a reload link for the embedded captcha image. The generated link is provided with an *onClick* event handler that replaces the captcha image with a new image when clicked by the user.

Attribute	Description
url	URL of the captcha servlet.

```
<mf:captchaLink url="/servlet/captcha/captcha.jpg" path="${self.name}">
```

```
<mf:captcha url="/servlet/captcha/captcha.jpg" path="{self.name}"
  title="Click for new Captcha"/>
</mf:captchaLink>
```

mf:ifCaptcha

Conditional tag whose body is **not** executed if the captcha specified in the *name* attribute has been entered correctly.

Attribute	Description
name	Name of the captcha element.
var	Name of the variable that is used to store a successful captcha entry.

```
<mf:ifCaptcha name="{self.name}">
  <mf:captchaLink url="/jcaptcha/captcha.jpg" path="{self.name}">
    <mf:captcha url="/jcaptcha/captcha.jpg" path="{self.name}"
      title="Click for new Captcha"/>
  </mf:captchaLink>
</mf:ifCaptcha>
```

mf:hasCaptcha

Conditional tag, whose body is **not** executed if the form contains a captcha element.

Attribute	Description
var	Name of the variable that is used to store the captcha element present status.

```
<mf:hasCaptcha>
  <!-- markup that only renders
    if a captcha is present -->
</mf:hasCaptcha>
```

mf:getStandardButton

Tag that can be used to access the form's standard buttons.

Attribute	Description
var	Name of the variable in which the button is stored.
buttonType	Standard button type. Can be set to the following values: <ul style="list-style-type: none"> <code>_next</code> Button that takes the user to the next page of the form. <code>_back</code> Button that takes the user to the previous page of the form.

Attribute	Description
<code>_cancel</code>	Button that cancels form data entry.
<code>_finish</code>	Button that submits the form.
<code>_exit</code>	Button that can be used to exit from the form.

```
<fc:getStandardButton buttonType="_finish" var="finishButton" />
<li data-mwf-container="{finishButton.id}" class="mwf-button mwf-next">
  <input type="button" value="{fn:escapeXml(submitLabel)}"
    data-mwf-id="{finishButton.id}" data-mwf-submit="{type: 'finish'}"/>
</li>
```

fc:forEachCondition

Tag that you can use to iterate over the individual rules of a condition. During the iteration, the input element, the operator and the value used for comparison are made available in the control variable.

Attribute	Description
<code>var</code>	Name of the control variable, which contains a bean of the type <i>ForEachConditionTag.Rule</i> . This can be used to query the following properties: <ul style="list-style-type: none"> <code>input</code> Input element to which the condition refers. <code>operator</code> Logical operator for the condition <code>value</code> Value used by the condition for comparison
<code>self</code>	Condition element
<code>varStatus</code>	Iteration status

```
<mwf:forEachCondition self="{self}" var="cond">
  <c:out value="{cond.input.name}"/>
  <c:out value="{cond.operator}"/>
  <c:out value="{cond.value}"/>
</mwf:forEachCondition>
```

fc:valueOut

Tag that can be used to output the current value of a form field.

Attribute	Description
<code>name</code>	Form field name
<code>var</code>	Name of the variable in which the value of the field should be stored.
<code>preferLabel</code>	Specifies that the value's label should be output instead of the value itself.

Attribute	Description
escapeXml	A Boolean flag that specifies whether the standard XML entities, such as "<" or "&", should be converted to their entity codes.

```
<mwf:valueOut name="\${input.name}"/>
```

fc:conditions

Tag that generates the JSON definitions for the conditional elements.

Attribute	Description
var	Name of the variable in which the JSON data should be stored.

```
<mwf:conditions var="conditions"/>
```

fc:calculatedValues

Tag that calculates the JSON definitions of the *calculated values*.

Attribute	Description
var	Name of the variable in which the JSON data should be stored.

```
<mwf:calculatedValues var="calculatedValues"/>
```

fc:markdown

Tag that searches through the text passed in the body for markdown syntax and converts this into HTML.

Attribute	Description
inline	Specifies whether the output HTML should be restricted to inline elements (optional). Default value: <i>false</i>

```
<mwf:markdown inline="false">**Dieser Text wird  
fettgedruckt ausgegeben.**</mwf:markdown>
```

fc:hasGlobalBindErrors

This tag can be used to check whether global errors were identified while validating the command bean specified in the *name* attribute. The HTML code contained within the tag is output only if the validation resulted in global errors. The errors identified are provided in the request scope for further processing in the variable *errors*, which has the variable type *org.springframework.validation.Errors*.

Attribute	Description
name	Name of the command bean

```
<mwf:hasGlobalBindErrors name="command${self.uid}">
  <ul>
    <li class="mwf-error">
      <form:errors cssClass="mwf-error" element="p" />
    </li>
  </ul>
</mwf:hasGlobalBindErrors>
```

fc:vars

Tag that searches through the text passed in the body for variables in the format `#{name-der-variable}` and replaces them with their corresponding values.

Attribute	Description
map	Map with the variable values (key, value). Please note: A map with the form variables (<i>formVariables</i>) and a map with the form values (<i>formdata</i>) are passed by default in the page scope.
var	Name of the page scope variable in which the filtered body text should be stored.

```
<fc:vars map="${formdata}">
  <fc:markdown><c:out value="${action.properties['note']}" /></fc:markdown>
</fc:vars>
```

You can specify dynamic tag attributes to extend the list of variables.

```
<fc:vars map="${formdata}" my-variable="${any-page-scope-variable}">
  <p>#{my-variable}</p>
</fc:vars>
```

fc:url

Tag that can be used to generate absolute URLs on Formcentric controllers.

If nothing is specified in the *baseUrl* attribute, then the URL generated points to the Formcentric web app in which the JSP template was called.

This tag is helpful if you want to install the Formcentric web application on a host separate to the one hosting the surrounding web page, since in this case you are unable to use relative URLs.

Attribute	Description
value	Specifies the Formcentric controller.

Attribute	Description
var	Name of the variable in which the generated URL should be stored.
scope	Scope in which the generated URL is stored. If you do not enter anything here, the page scope is used.
context	Name of a local web application.

```
<fc:url value="/servlet/rest" var="restUrl">
  <fc:param name="_service" value="${self.properties['datasource']}" />
  <fc:param name="_uid" value="${form.uid}" />
  <fc:param name="_input" value="${self.name}" />
  <fcs:xsrftokenParam />
</fc:url>
```

Taglib web-security-1.0

Another tag library is available for generating and issuing XSRF tokens. To utilise this taglib, insert the following instruction into the JSP template:

```
<%@ taglib prefix="fcs"
  uri="http://www.formcentric.com/web-security-1.0"%>
```

The following section gives you a description of the tags contained in this library.

fcs:xsrftoken

Tag that creates a hidden field with an XSRF token.

Attribute	Description
formId	ID of the form for which the XSRF token should be generated. If nothing is entered here, then the ID of the form passed in the <i>from</i> request attribute is used.
varName	Name of the variable in which the XSRF token should be stored. If this attribute contains a value, then no hidden field is created.

```
<fcs:xsrftoken />
```

fcs:xsrftokenParam

This tag can be used together with the `<c:url>` tag in order to add an XSRF token to the URL as a parameter.

Attribute	Description
formId	ID of the form for which the XSRF token should be generated. If nothing is entered here, then the ID of the form passed in the <i>from</i> request attribute is used.

Attribute	Description
method	Specifies the HTTP method (GET, POST) used to access the corresponding URL. Default value: <i>GET</i>

```
<c:url value="/servlet/upload" var="uploadUrl">
  <c:param name="_uid" value="{form.uid}"/>
  <c:param name="_lang" value="{form.lang}"/>
  <fcs:xsrftokenParam method="POST"/>
</c:url>
```

6.5.11. JavaScript

Out of the box, Formcentric ships with the JavaScript files as described below. These are stored in the development workspace, in the directory */formcentric-webapp-customizations/src/main/webapp/js* and the export file */formcentric-module-customizations/resources_export.zip*.

jQuery-File-Upload

For file uploading, Formcentric uses the Blueimp jQuery-File-Upload plugin. Depending on the browser used, files are either transferred using AJAX or within a hidden iframe. The plugin comprises the following JavaScript files.

- jquery_ui_widget_1_13_2.js
- jquery_iframe_transport.js
- jquery_xdr_transport.js
- load-image-all-min.js
- canvas-to-blob.min.js
- jquery_fileupload_10_31_0.js
- jquery_fileupload_process_10_31_0.js
- jquery_fileupload_image_10_31_0.js

Since some of the JavaScripts have dependencies on one another, they must be loaded in the order specified here.

jquery-autocomplete.js

This JavaScript contains a jQuery plugin that can be used to add autocomplete functionality to input fields. Values for the autocomplete function are loaded asynchronously from the specified REST service.

jquery-format-1.3.js

This JavaScript contains a jQuery plugin that enables the formatting or analysis of dates and numbers. Note that this is a JavaScript alternative to the Java classes *SimpleDateFormat* and *NumberFormat*.

json2.js

Formcentric uses the native *JSON* object supplied by modern browsers to parse and construct JSON objects. For older browsers that do not support the *JSON* object, the object is provided by this JavaScript.

Select2

Formcentric uses the Select2 jQuery plugin to offer a configurable selection field that supports functions such as search, selection, user-defined options and many other features. Once the plugin has been loaded by the browser, all drop-down lists are automatically shown as Select2 selection fields. Select2 offers a wide range of plugin-specific configuration parameters, which you can specify in the JSP or FreeMarker template as a JSON object in the data attribute *data-mwf-select* within the `<form:select>` tag. For further information about the Select2 plugin, see <https://select2.org>.

```
<form:select id="${self.id}"  
  
  <!-- Select2 config -->  
  data-mwf-select='{  
    "placeholder": "${placeholder}",  
    "width": "100%",  
    "tags": "${customInput}"  
  }'  
  
  ...
```

jquery-formcentric-1.9.js

This JavaScript contains a jQuery plugin that provides the JavaScript functions required by Formcentric. As shown below, an instance of the plugin can be generated in the JSP template *webforms.jsp*.

```
<mwf:calculatedValues var="calculatedValues"/>  
<mwf:conditions var="conditions"/>  
  
<script type="text/javascript">  
  jQuery('#command${self.uid}').webforms({  
    trackingUrl: "${trackingUrl}",  
    calculatedValues: ${calculatedValues},  
    conditions: ${conditions}  
  });  
</script>
```

When calling the plugin method *webforms*, you have the option of passing a configuration object that may contain the following options.

Option	Description
conditions	Type: <i>JSON</i> JSON definition of the client-side conditions to be evaluated.
calculatedValues	Type: <i>JSON</i> JSON definition of the client-side <i>calculated values</i> to be calculated.
appendUrlVars	Type: <i>Boolean</i> You use this parameter to specify that the URL parameters in the host page will be appended to the AJAX request sent to the form controller.
trimSpaces	Type: <i>Boolean</i> You use this parameter to specify that leading and trailing spaces will be trimmed from the form data.
createOption	Type: <i>Function(\$form, entry, selected)</i> Function that creates an option element in a dynamic drop-down list (<i>comboBox</i>).
createRadio	Type: <i>Function(\$form, name, entry, checked)</i> Function that creates a radio button in a dynamic Radio Button Select field (<i>radioGroup</i>).
createCheckBox	Type: <i>Function(\$form, name, entry, checked)</i> Function that creates a check box button in a dynamic Check Box Select field (<i>checkBoxGroup</i>).
createUploadFileRow	Type: <i>Function(Object \$form, Object attr, file)</i> This function creates a new entry in the file list of the File-Upload element before the file is uploaded.
createDownload-FileRow	Type: <i>Function(Object \$form, Object attr, file)</i> This function creates a new entry in the file list of the File-Upload element after the file has been uploaded.
updateCalculatedValue	Type: <i>Function(\$form, id, value)</i> Function that updates the display of a <i>calculatedValue</i> when this has been re-calculated.
updateFormValue	Type: <i>Function(\$form, \$elem, name, l)</i>

Option	Description
	This function updates the value of a form field in the summary, if this value has been entered or changed by the user. If the corresponding form field is a selection (list) field, the labels of the options selected are passed in the <i>l</i> parameter. Otherwise, the text value entered is passed.
onFillDropdown	Type: <i>Function(Object \$form, Object \$elem)</i> Callback function that is called after a dynamic dropdown list has been filled.
onFillSelection	Type: <i>Function(Object \$form, Object \$elem)</i> Callback function that is called after a dynamic drop-down list has been filled.
onInit	Type: <i>Function(Object \$form)</i> Callback function that is called after the jQuery plugin has been initialised. Use this function to perform your own initialisations.
onSubmit	Type: <i>Function(Object \$form, String url, String query)</i> Callback function that is called when the form is submitted. The form is submitted only if the function returns the Boolean value <i>true</i> .
onSuccess	Type: <i>Function(Object \$form, Object data, String status, Object jqXHR)</i> Callback function that is called after the form has been submitted successfully.
onAjaxError	Type: <i>Function(Object jqXHR, String status, String error)</i> Function that is called when an error occurs during an AJAX request. As standard, this function creates an entry in the browser's error log.
onRedirect	Type: <i>Function(Object \$form, Object data, String status, Object jqXHR)</i> The <i>onRedirect</i> function is a callback function that is executed if the server response contains the header <i>X-Redirect-Location-Header</i> when the form is submitted. If the <i>onRedirect</i> function returns the Boolean value <i>true</i> , this indicates that the redirect has already been processed within the <i>onRedirect</i> callback function. If, on the other hand, the function returns <i>false</i> or no response is returned, then the redirect is executed automatically to

Option	Description
	the URL (X-Redirect-Location-Header) specified in the server response.
operations.visible	Type: <i>Function(Object \$form, Object field)</i> Function with which input fields can be made visible.
operations.hidden	Type: <i>Function(Object \$form, Object field)</i> Function with which input fields can be hidden.
operations.writeable	Type: <i>Function(Object \$form, Object field)</i> Function with which input fields can be changed from write-protected to editable.
operations.readonly	Type: <i>Function(Object \$form, Object field)</i> Function with which input fields can be changed from editable to write-protected.
operations.enabled	Type: <i>Function(Object \$form, Object field)</i> Function with which input fields can be changed from deactivated to activated.
operations.disabled	Type: <i>Function(Object \$form, Object field)</i> Function with which input fields can be changed from activated to deactivated.
operations.optional	Type: <i>Function(Object \$form, Object field)</i> Function with which input fields can be marked as optional.
operations.mandatory	Type: <i>Function(Object \$form, Object field)</i> Function that is used to mark input fields as required fields.

The default implementations of the JavaScript functions listed can be found in the JavaScript *jquery-formcentric-1.9.js*.

In the following example, the *operations.mandatory* function is replaced by a modified version.

```
<fc:calculatedValues var="calculatedValues"/>
<fc:conditions var="conditions"/>

<script type="text/javascript">
    $('#command${form.uid}').webforms({
        "calculatedValues" : ${calculatedValues},
        "conditions" : ${conditions},
        "operations": {
            "mandatory": function ($form, field) {
                var $label = $form.find('label[for="' + field.input + '"]');
```



```

        $label.children('em').remove();
        $label.append('<em>*</em>', '');
    }
}
});
</script>

```

Event reference

The Formcentric jQuery plugin makes a series of events available that enable you to respond to scenarios that match the various events. The corresponding event handler must be registered on the *document* object.

Detailed kinds of event-dependent information such as the associated form element, for example, are passed to the event handler in the *event.details* event object.

```

document.addEventListener("mwf-fill-selection",
    function(event) {
        console.log(event.detail.$form);
        console.log(event.detail.$elem);
    }
);

```

The following table describes the events that you can monitor and program specific responses to:

Event name	Detailed information	Is sent when
mwf-ajax-finished	<i>\$dest, \$content</i>	the function <i>mwfAjaxReplace</i> has been executed successfully.
mwf-ajax-error	<i>\$dest, jqXHR, textStatus, errorThrown</i>	the asynchronous call (AJAX call) has an error.
mwf-fill-dropdown	<i>\$form, \$elem</i>	a drop-down list has been filled by a data source.
mwf-fill-selection	<i>\$form, \$elem</i>	a radio button or check box select field has been filled by a data source.
mwf-fill-hidden	<i>\$form, \$elem</i>	a hidden field has been filled by a data source.
mwf-suggestion-selected	<i>\$form, \$elem, id, selection, params</i>	an autocomplete item has been selected for an input field.
mwf-value-changed	<i>\$form, \$elem, name, value</i>	the value of a form field has changed.

6.6. Extending the headless web application

The Formcentric headless web application is a Spring Boot application that provides a REST interface with various end points for form processing. For client-side connec-

tivity to the headless application, a ready-to-use React client is provided, which you can also configure to suit your requirements (see also Section 6.7, “Formcentric client”).

The following section describes how to extend the functionality of the headless application. Please note: some of the names of the framework classes are the same as those from the Spring MVC web application but are located outside of the *com.formcentric.headless.rest* package.

6.6.1. Implementing an action

Similarly to the Spring MVC web application, the headless application also uses actions that encapsulate the business logic for the formdata processing. These classes implement the interface *com.formcentric.headless.actions.Action*. You can then integrate any backend systems you need to by developing a custom action. These actions are Spring beans: as a result, configuration parameters can be passed to the action by using the standard Spring mechanisms. The following example shows you how to implement and configure a *CustomAction*.

```
import com.formcentric.headless.actions.*;

public class CustomAction extends BaseAction {

    public static final String PROP_CUSTOM = "anyCustomActionPropertyName";

    @Override
    public ActionResult execute(ExecutionContext context, Map<String,
        Object> formData) throws ActionException {

        WebForm formDefinition = context.getFormDefinition();
        ActionNode action = context.getAction();

        String customParam = action.getPropertyAsString(PROP_CUSTOM);

        // Business-Logic
        ...

        ActionResult actionResult = new ActionResult();
        actionResult.setView("success");
        return actionResult;
    }

    @Override
    public boolean isExecutable(ExecutionContext context,
        Map<String, Object> formValues) throws ActionException;
    return true;
}

public String name() {
    return "customAction";
}
}
```

To instantiate and configure your own actions in the headless application, create a configuration class as shown in the following code example. Label the configuration class with the annotation `@Configuration`. In your configuration class, you define a method that instantiates an object of your action class. This method must be annotated with `@Bean` in order to document the fact that this method provides a bean definition.

If your action class has dependencies on other beans, use the method parameters to inject these beans. Use the annotation `@Value` to inject configuration values or pass other beans directly as parameters.

```
package com.example.myapp.config;

import com.example.myapp.actions.MyCustomAction;
import org.springframework.context.annotation.Bean;
import org.springframework.context.annotation.Configuration;

@Configuration
public class MyActionsConfiguration {

    @Bean
    public MyCustomAction myCustomAction() {
        // Configuration and initialization of the MyCustomAction
        return new MyCustomAction();
    }

    // Additional bean definitions can be added here
}
```

If you place your configuration class in the base package `com.formcentric.headless` or a sub-package, Spring Boot will find and load your class automatically. If you use different package names, you must extend the `scanBasePackage` parameter for the `@SpringBootApplication` annotation in the main application class.

In the development workspace, the application class `CustomHeadlessWebApplication` is already created, which you can modify for this purpose.

6.6.2. Adding variables for pre-filling form fields

Alongside the predefined variables, you also have the option of adding your own variables for pre-filling form fields. To do this, register a Spring bean of the `VariablesService` type in the application context of the headless application.

```
import com.formcentric.headless.services.VariablesService;
import com.formcentric.headless.model.WebForm;
import org.springframework.stereotype.Service;
import jakarta.servlet.http.HttpServletRequest;

@Service
public class CustomVariablesService implements VariablesService {
    @Override
    public final Map<String, Object> getVariables(HttpServletRequest request,
```

```

WebForm formDefinition) {

    Map<String, Object> vars = new HashMap<>();

    // Add custom variables to the variables Map
    vars.put("custom_var", "custom_value");
    return vars;
}
}

```

This *VariablesService* bean is a Spring bean, which means you can also access external systems or services when creating the variables.

In some application scenarios, you will need to pre-fill form fields with values from the web page or client application into which the form is embedded. For this use case, it is sufficient to specify the variables in the data attribute *data-fc-vars* from the *div* tag with which the form is associated.

```

<div
  data-fc-id="1249010"
  ...
  data-fc-vars='{ "custom_var": "custom_value" }'
></div>

```

6.6.3. Implementing a REST service

All of the REST services described in section Section 6.5.9, “Implementing a REST service” are also available to you when deploying the headless application. The following example shows you a REST service that generates a map with static key/value pairs.

```

package com.formcentric.headless.examples.rest;

import com.formcentric.headless.rest.BaseRestService;
import com.formcentric.headless.rest.ServiceContext;
import org.jetbrains.annotations.NotNull;
import org.springframework.stereotype.Component;

import java.util.HashMap;
import java.util.Map;

@Component
public class CustomRestService extends BaseRestService {

    @Override
    public Object invoke(ServiceContext context, Map<String, Object> formData) {

        HashMap<String, String> data = new HashMap<>();

        // fill the map
        data.put("key1", "value1");
        data.put("key2", "value2");
        data.put("key3", "value3");
    }
}

```

```

        return data;
    }

    @NotNull
    @Override
    public String name() {
        return "customRestService";
    }
}

```

By calling the *invoke* method, the *RestService* is passed both the *ServiceContext* as well as the current user input (*formData* parameter). This lets you respond directly to user input.

The *ServiceContext* also gives you access to the form definition, the input element, the configuration parameters for the *RestService* and the request object.

All form elements, which also includes the REST services, must have their own unique name with which they can be referenced within the form definition. The name is determined when starting the application by calling the method *name()*.

Spring uses the *@Component* annotation to instantiate your REST service automatically and register it using the specified name.

6.6.4. Property Files

Environment-specific configuration of the Headless application is defined in the *application-headless.properties* file. This configuration overrides the default settings from the *application.properties* file, which is included in the Headless server's JAR archive and cannot be modified directly.

During configuration with the *ServerManager*, the system generates the *application-headless.properties* file automatically.

application.properties

The *application.properties* file contains the default configuration of the application. To override individual parameters, copy them to the *application-headless.properties* file.

Action Configuration:

Parameter	Description
actions.redirect.supportDynamicURLs	Enables dynamic URLs in redirects
actions.webhook.allowlist	Allowed URLs/IPs for webhooks (e.g., https://localhost/). Warning: Accessing private addresses can enable SSRF.

File Upload Configuration:

Parameter	Description
spring.servlet.multipart.max-file-size	Maximum file size for uploads
spring.servlet.multipart.max-request-size	Maximum total size for multipart uploads
upload.storage.type	Storage type: filesystem or minio
upload.location	Path for file uploads (filesystem)
upload.thumbnail.width	Width of generated thumbnails
upload.thumbnail.height	Height of generated thumbnails
upload.thumbnail.crop	Crop thumbnails (true/false)
upload.thumbnail.outputQuality	Quality of generated thumbnails
minio.url	MinIO host
minio.bucket	MinIO bucket
minio.access-key	MinIO access key
minio.secret-key	MinIO secret key

Cache Configuration:

Parameter	Description
spring.cache.type	Caching strategy used, e.g., hazelcast
cache.time-to-live-seconds	Lifetime of cache entries in seconds

Mail Server Settings:

Parameter	Description
mail.charset	Character set used for emails
mail.transport.protocol	Transport protocol (e.g., smtp)
mail.smtp.host	SMTP server
mail.smtp.port	SMTP port
mail.smtp.auth	SMTP authentication (true/false)
mail.user	Username for mail server
mail.password	Password for mail server
mail.smtp.socketFactory.class	SocketFactory class for SSL
mail.smtp.starttls.enable	Enable TLS (true/false)
mail.debug	Log full email content (true/false)

CAPTCHA Configuration:

Parameter	Description
captcha.provider	CAPTCHA provider: jCaptcha, friendlyCaptcha, re-Captcha
captcha.secret	API secret (provider-specific, optional)
captcha.siteKey	Key for embedding CAPTCHA
captcha.endpoint	Endpoint for Friendly Captcha (e.g., global, eu)

Analytics Configuration:

Parameter	Description
analytics.enabled	Enable analytics functionality (true/false)
analytics.backendUrl	URL of the analytics backend
analytics.clientToken	Client token for analytics usage

CORS Configuration:

Parameter	Description
cors.pathPattern	Path pattern for CORS
cors.allowedOrigins	Allowed origins
cors.allowedOriginPatterns	Allowed origin patterns
cors.allowCredentials	Allow credentials (true/false)
cors.allowedMethods	Allowed HTTP methods
cors.allowedHeaders	Allowed HTTP headers

Proxy Configuration:

Parameter	Description
proxy.type	Proxy type (none, manual, automatic)
proxy.host	Proxy host
proxy.port	Proxy port
proxy.authScheme	Authentication method (e.g., Basic)
proxy.urlScheme	Scheme (http or https)
proxy.password	Proxy password
proxy.user	Proxy username
proxy.configUrl	PAC file (only for automatic)
proxy.exclusions	Exceptions (hosts/domains)

HttpClient Configuration:

Parameter	Description
httpClient.connectTimeout	Connection timeout in milliseconds
httpClient.allowCircularRedirects	Allow circular redirects
httpClient.maxConnectionsTotal	Maximum total connections
httpClient.maxConnections	Maximum connections per host
httpClient.maxRedirects	Maximum number of redirects
httpClient.userAgent	User-Agent header

Double-Opt-In Whitelist:

Parameter	Description
optin.urlPatterns	Whitelist of allowed target addresses for double opt-in

Metrics Configuration:

Parameter	Description
metrics.security.enabled	Protect metric endpoints
metrics.usage.activated	Enable usage metrics
metrics.actions.activated	Enable action metrics
metrics.user	Username for metrics access
metrics.password	Bcrypt-hashed password for metrics access
management.endpoints.web.exposure.include	Exposed web endpoints
management.endpoints.jmx.exposure.exclude	Excluded JMX endpoints
management.endpoint.env.access	Environment variable access control
management.endpoints.access.default	Default endpoint access permissions

application-headless.properties

This file is used to define custom configuration values. All parameters listed here override the corresponding defaults from *application.properties*. Only changed values need to be specified.

Server Connection:

Parameter	Description
connection.transport.protocol	Protocol to use (1=HTTP, 2=Socket)
connection.host	Hostname or IP address of the FirstSpirit server

Parameter	Description
connection.port	Port number of the FirstSpirit server
connection.user	Username for server authentication
connection.password	Encrypted password for the connection
connection.maxsessions	Maximum number of concurrent sessions
connection.https	Use HTTPS (true/false)

6.7. Formcentric client

The NPM module `@formcentric/client` (<https://www.npmjs.com/package/@formcentric/client>) is required to present Formcentric forms in the browser. This applies both for projects based on HTML only plus JavaScript as well as for projects that utilise frontend frameworks or frontend libraries.

The installed package includes various variants of modules for a wide range of applications. The files required are installed using NPM, which itself has no dependencies, however, and can also be used without any bundlers.

For installation, execute the following command:

```
npm install @formcentric/client
```

Or alternatively:

```
pnpm install @formcentric/client
```

The following items must be present in order for a form to be displayed correctly:

1. A `div` tag with an `fc-id` data attribute, into which the form will be rendered.
2. A loaded theme, consisting of CSS, templates and CSS custom properties, if these are being used in the CSS file.
3. To be able to be embedded as a script tag, `formapp.js` must also be accessible.
4. To be able to be embedded as a link tag, `formcentric_component_style.css` must also be accessible, if internal components like Datepicker or FileUploader are being used.

```
<head>
  {...}
  <link rel="stylesheet" href="/example-url/formcentric_component_style.css"/>
</head>
<div
  data-fc-id="1249010"
  data-fc-formapp-url="/example-url/formapp.js"
  data-fc-theme-url="/example-url/formcentric.css"
  data-fc-template-url="/example-url/formcentric_templates.js">
```

```
data-fc-theme-variable-url="/example-url/formcentric.json"
data-fc-form-definition="K82AClXH1YpNGtKt ... ffUuAm40yEQsC9"
data-fc-refs="ffUuAm40yEQsC9 ... 2AClXH1YpNGtKt"
data-fc-vars='{}'
data-fc-params='{}'
data-fc-data-url='https://example-url-to-formcentric-headless-server.com'
></div>
```

```
<script
  src="./formcentric.js"
  defer
></script>
```

6.7.1. Theme

The theme CSS must be loaded to ensure that the form can be displayed correctly. This can be achieved by using a link tag in the HTML head and the use of custom properties. If available, these must be set in the HTML code.

Each input field has its own template, which can be modified. These templates are defined on the *Window* object in a JS file called *formcentric_templates.js*. This ensures that they can be found later when rendering the form. The templates are required in order to present the form correctly (see Section 6.7.3, “Templates”).

6.7.2. Initialisation

To start the client, either the script *formcentric.js* can be loaded or, after this has been loaded, *window.formcentric.initFormcentric()* can be called at a later point in time. You use the data attribute *fc-data-url* to configure the URL for accessing the Formcentric headless server.

6.7.3. Templates

Templates always consist of a function whose return value is used by the Formcentric Client to render HTML code. To achieve this, the Formcentric client passes two parameters (*html* and *props*) to a template function. The exact structure and the parameters used will depend on the specific usage of the template.

html: A template literal tag, which is used to render HTML code. This parameter enables the embedding of HTML into the template’s JavaScript code.

props: An object that contains the properties of the form field. These consist of calculated values from the Formcentric Client as well as field data supplied by the Editor. The specific properties vary according to the form field.

The final HTML is created from a combination of static HTML code and the values from the *props* properties. This can be achieved by combining strings together or using functions to render HTML. The resulting HTML created is then passed back as a template function return value to the Formcentric client, which then renders it in the DOM.



All template functions can also be processed asynchronously by the Form-centric client as a promise.

Template properties

The Formcentric client passes template properties to the corresponding template function as parameters (*props*). These include all of the information required for the presentation and behaviour of the respective form fields.

The following properties are passed to the templates:

Property	Description
key	The element's unique ID.
oninput	(event: InputEvent) => void Updates the field value.
onfocus	(event: FocusEvent) => void If present, returns any validation errors for the field.
onclick	A function that evaluates the <i>onClick</i> functions defined by the editor.
fieldSuccess	A Boolean value that specifies whether the element was successfully validated and has no errors.
fieldError	An object that contains information about an error in the element.
properties	An object that contains the properties of the field element.
components	An object that contains components for certain field types. These components are used to render the element in the template. The object contains components for <i>captcha</i> , <i>fileUploader</i> , <i>comboBox</i> , <i>suggestions</i> , <i>hint</i> , <i>datePicker</i> and <i>markdown</i> .
fieldSetFields	An array that contains the fields from a <i>fieldset</i> .
layoutFields	An array that contains the fields from a <i>Layout</i> .
summaryFields	An array that contains the information from fields as specified in a <i>SummaryField</i> .
fieldEmptyText	A piece of boilerplate displayed if the <i>SummaryField</i> contains no values.
contentMarkup	A content component that is returned by a function specified by the <i>form</i> div.
hasService	A Boolean value that specifies whether the element has a REST service.
setRESTParams	(params: Record<string,any>) => void:

Property	Description
	A function that is used to specify the parameters for the element's REST service.

Element: The properties also contain all of the information about the element to be shown.

```
interface fcElement {
  id: string // ID des Elements
  name: string // Technischer Name des Elements
  type: fcFieldTypes // Elementtyp
  fieldSetId?: string // ID des FieldSets, in dem das Element enthalten ist
  layoutId?: string // ID des Layout Elements, in dem das Element enthalten ist
  label?: string // Label des Elements
  value?: string | string[] // Wert des Elements
  validators?: fcElementValidator[] // Validatoren
  children?: {
    id: string
    type: fcFieldTypes
    name: string
    label?: string
    value?: string | string[]
    checked?: boolean
    properties?: fcProperties
    validators?: fcElementValidator[]
  }[]
  properties?: fcProperties // Properties des Elements (siehe Properties)
}
```

Field types:

```
type fcFieldTypes =
  | 'error'
```

```
| 'success'  
| 'formHeader'  
| 'formFooter'  
| 'inputField'  
| 'button'  
| 'form'  
| 'layout'  
| 'condition'  
| 'passwordField'  
| 'textArea'  
| 'radioGroup'  
| 'comboBox'  
| 'checkBoxGroup'  
| 'fileUpload'  
| 'calculatedValue'  
| 'hiddenField'  
| 'paragraph'  
| 'summary'  
| 'dateField'  
| 'numberField'  
| 'emailField'  
| 'phoneField'  
| 'shortText'  
| 'captcha'  
| 'content'  
| 'option'  
| 'fieldSet'
```

Validators:

```

interface fcElementValidator {

    id: string

    name: string

    properties?: {

        errormessage?: string

        from?: string

        to?: string

        days_from?: string

        days_to?: string

        pattern?: string

        max_files?: string

        max_size?: string

        file_types?: string

    }
}

```

Properties: All HTML attributes and field properties from the form definition are contained in *props.properties*. These are calculated as a result of conditions by the Formcentric client, for example, or configured by the form author for the corresponding form field. The following table gives an overview of possible properties:

Property	Description
hint	An optional note text that gives the user more information or provides instructions.
placeholder	An optional placeholder text that is displayed in an input field if no value has been entered.
selected	A Boolean value that specifies whether the element is selected by default.
errormessage	An optional error message that is displayed if the element is invalid.
multiple	A Boolean value that specifies whether multiple values can be selected for this element.
auto_upload	A Boolean value that specifies whether an automatic upload function is activated.
datasource	A character string that specifies a data source.
datasource_params	A character string that specifies the parameters for the data source.

Property	Description
dynamic	A Boolean value that specifies whether the element is dynamic and has properties that can be changed at runtime.
visible	A Boolean value that specifies whether the element should be visible.
hidden	A Boolean value that specifies whether the element should be hidden.
writable	A Boolean value that specifies whether the element should be writable.
readonly	A Boolean value that specifies whether the element should be read-only.
optional	A Boolean value that specifies whether the element is optional.
mandatory	A Boolean value that specifies whether the element is required.
disabled	A Boolean value that specifies whether the element should be deactivated.
enabled	A Boolean value that specifies whether the element should be activated.
type	A character string that specifies the element type.

Components

Internal components are provided for selection by *props.components*. This is intended to simplify work with individual form fields if there is no need to modify the functionality provided by these fields. The following components are available:

Property	Description
captcha	Loads captcha images from the Headless Server
combobox	Displays drop-down lists
datePicker	Displays a date picker
fileUploader	Displays an upload dialog
hint	Displays note text
markdown	Displays markdown as HTML elements
suggestions	Displays autocomplete items from REST services as a drop-down list under input fields

The following properties can be passed to the components named above:

captcha:

Property	Description
buttonText	An optional character string for the refresh button on the captcha component. If this is not specified, the button shows an icon instead.

combobox:

Property	Description
all	All properties from the template's parameter must be passed.

datepicker:

Property	Description
all	All properties from the template's parameter must be passed.

fileUploader:

Property	Description
trigger	The class or ID of the trigger element
inline	An optional Boolean value that specifies whether the element should be displayed inline.

hint:

Property	Description
all	All properties from the template's parameter must be passed.

markdown:

Property	Description
markdown	The <i>markdown</i> property accepts stringified markdown as a value.

suggestions:

Property	Description
All	All properties from the template's parameter must be passed.

The components are executed within the HTML template literal tag in the templates:

```
${ props.components.captcha( {...} ) }
```


Modifying and extending templates

To extend the templates, you can modify the HTML elements and classes inside the templates. This gives you the option of modifying the appearance and behaviour of the components.

You can add or remove classes to modify the styling, or add additional HTML elements in order to provide additional functionality.

The templates can also be executed asynchronously: this means that you can access and display data that is not passed directly to the templates by the Formcentric client. This gives you the option of integrating with APIs or other external data sources.

To use asynchronous data in the templates, you can use JavaScript functions like *fetch* to request data from a server. You can then display the data received in the templates by utilising the corresponding variables or placeholders.

Extension options:

1. Support for one or more user-defined CSS classes. Optional CSS classes can be added, so as to modify the styling of the input element. For this, a custom class can be used in the *className* definition:

```
input className="customClass" />
```

2. Modifying the markup: New markup elements can easily be added and existing elements modified:

```
inputField: (html, props) => html`<div className="fc-field
  ${props?.properties?.hidden ? 'fc-hiddenField' : ''}
  ${props?.properties?.hint ? 'fc-field--has-hint' : ''}
  ${props?.fieldError ? 'fc-field--has-error' : ''}
  ${props?.fieldSuccess ? 'fc-field--is-valid' : ''}>

  ${customFunction(html, props)}

  <div className="fc-textinput">
    <div className="fc-textinput__input">
      <input
        id=${props.id}
        name=${props.name}
        value=${props.value}
        oninput=${props.oninput}
        onfocus=${props.onfocus}
        onblur=${props.onblur}
        type=${props.properties.type || 'text'}
        autocomplete=${props.properties?.autocomplete}
        maxLength=${props.properties?.maxLength}
        disabled=${props.properties?.disabled}
        placeholder=${props.properties?.placeholder || ''}
        readOnly=${props.properties?.readOnly}

        ${...customProperties}
      />
```

```

        ${props.components.suggestions(props)}
    </div>

    ${label(html, props)} ${hint(html, props)} ${error(html, props)}
</div>
</div>

```

6.7.4. Special integration scenarios

For most use cases, the `@formcentric/client` script is simply loaded and then executed. However, there are some special scenarios, such as single-page applications (SPA), in which the script must not be executed until the DOM tree has been fully constructed. In such cases, it is useful to be able to import the script dynamically and execute it at the exact moment when the virtual DOM has been fully constructed. This point in time will depend on the SPA framework.

```

function App() {
  const ref = useRef(null);

  const formDef = "TGU5Kmx4svPaahc2aSm-4PHzoKWWtvC ... D-ZwC6MPQRWA==";

  useEffect(() => {
    if (!ref) return;

    import("@formcentric/client/dist/formcentric");
  }, [ref]);

  return (
    <div
      ref={ref}
      data-fc-id="<<id>>"
      data-fc-form-definition={formDef}
    ></div>
  );
}

```

If no dynamic import is possible, the function `initFormcentric` from the `window.formcentric` object can be called after loading the script.

```

window.formcentric.initFormcentric()

```

6.7.5. Troubleshooting

Always check the browser log. If no client output can be found there, then the `formcentric.js` script was not loaded and/or executed.

There are two reasons for a message stating that the form `div` could not be found:

1. No `div` tag with the data attribute `fc-id` was found
2. The script `formcentric.js` was loaded without specifying the `defer` attribute

Several issues may cause a situation where no form is displayed although a form *div* was found:

1. No *div* tag with the data attribute *fc-id* was found
2. The script *formapp.js* was not loaded

Internal components like DatePicker or FileUploader are rendered without styling:

1. *@formcentric/client/dist/formcentric_component_style.css* was not found in the page

Debugging

The Formcentric client provides various debugging options that allow you to troubleshoot issues during development or in live operation. You have two ways to selectively enable debugging:

Local debugging via attribute

Enable debug output for a specific form by setting the attribute *data-fc-debug="true"* directly on the form container (see Section 5.1, "Paragraph style sheet"). Only the form assigned with this attribute will output debug information to the browser console. All other forms on the page remain unaffected. Typical debug output includes information about loading and initialization status, errors when retrieving form data, and server responses.

Example:

```
<div
  data-fc-id="..."
  data-fc-debug="true"
  ...weitere Attribute...
></div>
```

Global activation

Alternatively, you can globally enable debugging for all forms on a page or within an application (see Section 5.6, "Page template"). In this case, debugging is activated for all embedded Formcentric forms on the page, without the need to modify each form's attributes individually. This method is particularly useful for automated debugging during development.

To enable this, add the following statement in the browser console or in your own JavaScript code:

```
window.formcentric ??= {};
window.formcentric.debug = true;
```