

**tts** performance suite

# System Requirements 2022r2



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# 1 Producer

## 1.1 Hardware

| Component           | Requirement  |
|---------------------|--|
| Processor           | Minimal: Single-core 2.6GHz<br>Recommended: Dual-core 2.6GHz     |
| Memory              | Minimal: 4 GB<br>Recommended: 8 GB (for 64bit operating systems) |
| Free space          | ~1000 MB for program data  |
| Screen resolution   | Minimal: 1024 x 768<br>Recommended: 1920 x 1080                  |
| Multimedia hardware | 16-bit sound card and speakers or headphones                     |

## 1.2 Software

| Component           | Requirement  |
|---------------------|--|
| Operating system    | Windows 10<br>Windows 11   |
| Additional software | Visual C++ Redistributables (x86+x64) for Visual Studio 2019 (version 16.9)  |
| Webbrowser Control  | Internet Explorer Webbrowser Control needs to be available in the operating system   |
| Browser settings    | JavaScript needs to be activated   |
| Permissions         | Administrator rights are required during installation; however, there will be no changes to the system folder.<br>The Producer makes use of the Chromium project by Google. In order to ensure the proper execution of the client, the operating system and third party security tools need to enable the execution of Chromium processes. |

- Please note that it is required that all components that take part in the end-to-end-communication (i.e. Producer to and from the server component(s), as well as end-user to and from the server component(s)) support at least HTTP protocol version 1.1.
- Please note that in order to use all functionality of the Producer policies must allow the Producer process to start an external process named "Gifcreator.exe".
- Please note that for proper functionality of the tts performance suite the windows display-zoom needs to be set to 100%.

## 1.2.1 Optional Software Components

Depending on the use case of the **tts performance suite**, additional software-components are required.

## 1.2.2 Export Formats

- .doc
- .html
- .pdf

| Use case                     | Requirement  |
|------------------------------|--|
| Output formats for MS Office | MS Office 2013 or<br>MS Office 2016 or<br>MS Office 2019   |
| Word import and export       | MS Office 2013 or<br>MS Office 2016 or<br>MS Office 2019   |
| PowerPoint import and export | MS Office 2013 or<br>MS Office 2016 or<br>MS Office 2019   |
| Text-to-speech               | The text-to-speech engine needs to support SAPI 5; The Producer supports<br>Readspeaker and Acapela via Voice-as-a-Service natively. |

## 1.2.3 Video Export

In order to encode the video of an E-Learning, that is recorded as a WebM-video, as MP4 customers need to make sure that the required library ("FFmpeg") is available and properly licensed by the customer. Neither this library, nor the corresponding license, is part of the Producer or the tts performance suite.

## 1.3 Single-Sign-On (SSO)

In order to make use of Single-Sign-On-Mechanisms with the Producer the protocol needs to be NTLM. Other methods of authentication are currently not supported in the client scenario.

## 1.4 Third Party Software

### *McAfee*

Please note that a locally used virus scanner from McAfee may reduce the performance of the authoring component. You are advised to change the anti-virus program's settings so the tt knowledge force installation folder is excluded from the scanning process.

### *HP Quicktest*

Please note that HP Quicktest can only be installed on the same computer as the authoring software under specific conditions: the user under which the authoring software is launched may *not* have reading permissions to the folder in which the Quicktest executable resides.

### *HP Sprinter*

Please note that the installation will cause write access problems to the Producer profile folder which may result in a failure to load the WYSIWYG view.

### *Check Point*

Please note that the virus scanner from Check Point End Security may strongly reduce the performance of the tt knowledge force client.

### *Desktop Management Software*

In case of using multiple monitors supported by desktop management software (for instance ATI Hydravision), this can cause problems with the object recognition during (re-)recording and guiding through applications.

### *Bamboo Drivers*

As soon as Bamboo-drivers for drawing tablet and the corresponding pen are installed these drivers will interfere with the correct display and object-recognition.

### *Microsoft Snipping Tool*

As long as this tool is running it will interfere with correct object-recognition needed for recording as well as playing content.

### *Microsoft Security Policies*

If you experience problems with editing in the WYSIWYG View (i.e. no editing possible) please check if the MS Security Policy "Local Machine Lockdown" is enabled. If so, please disable this policy.

## 1.5 Technology

The associated Java VM is included in the installation package and therefore does not have to be pre-installed. Java VMs which are installed in parallel do not impact on the software's executability.

## 1.6 Installation

The installation via a setup routine does not copy files to the Windows or System directories. During setup, the software is registered as an installed program, the program files are copied and the following file types are registered:



- **.ttcp** (tt content package) – document source archive which contains the sources and resources associated with a document; based on the ZIP format
- **.ttlk** (tt license key) – automatically installs the license file with a double-click
- **.ttcfg** (tt configuration package) – archive containing the configuration-specific data
- **.ttlkr** (tt license key request) – file containing the request for a local license key.
- **.ttop** (tt options) – transport file for user preferences
- **.ttscp** (tt smart component package) – transport file for Smart Components

### Special note for the Windows 8 (or newer) operating system

When User Account Control (UAC) is activated, the recording of, as well as the guidance through programs or processes that require administrator rights can only be accomplished if the Producer and/or the Quick Access also run with administrator rights.

### Special note for environments with activated Windows-group-policy: "Security zones use only machine settings"

In order to guarantee proper functionality of our software this policy needs to be set to the default-value (deactivated), or the following Registry-Values need to be set:

64 Bit Windows:

```
[HKEY_LOCAL_MACHINE\Software\Wow6432Node\Microsoft\Internet Explorer\MAIN\FeatureControl\FEATURE_BROWSER_EMULATION] "TTKnowledgeForce-Browser.exe"=dword:0000270f
```

32 Bit Windows:

```
[HKEY_LOCAL_MACHINE\Software\Microsoft\Internet Explorer\MAIN\FeatureControl\FEATURE_BROWSER_EMULATION] "TTKnowledgeForceBrowser.exe"=dword:0000270f
```

Our tt knowledge force installer tries to set the above mentioned values during the installation process.

## 1.6.1 Placing the authoring environment's profile folder on a UNC path

If the profile folder of the Producer is installed on a UNC path, it must be ensured that the corresponding server is set to the "Intranet" security zone in the Internet Explorer security settings. This is required irrespective of whether the profile folder is addressed via UNC path, or as a "connected network drive". If all relevant endpoints are members of a windows domain, these security settings are not relevant, or more precisely, are set automatically by IE. If all UNC paths are automatically assigned to the "Intranet zone" via a global security policy, no manual adjustment is required. Please also note that in this case, the performance of the tt knowledge



force client is highly dependent on the network performance, so that performance impacts may occur.

### 1.6.2 Running The Producer With Activated Proxy

In case that a proxy is configured it is necessary to exclude "localhost" / "127.0.0.1" from the access via proxy.

## 1.7 Working With Citrix

There are two main scenarios to gain access to a Citrix system: Namely access via a Browser-Plugin or an explicit, locally installed, application: "Citrix Workspace". In general a communication over the Citrix-VDA-channels must be possible. The set of supported features depend on the set-up and are described below.

### 1.7.1 Execution Environment Requirements

Citrix Workspace App needs to be 32-bit.

|        |   |
|--------|---|
| Server | Tested on Virtual Apps and Desktops with: <ul style="list-style-type: none"> <li>• Windows Server 2019</li> <li>• Citrix VDA 2209</li> </ul>                            |
| Client | Citrix Workspace for Windows<br>Tested on: <ul style="list-style-type: none"> <li>• Windows 10 Enterprise</li> <li>• Citrix Workspace App 2209 (32-bit only)</li> </ul> |

### 1.7.2 Browser-Plug-In

In case of the Browser-Plug-In-Approach one can differentiate between a "virtual desktops" and individual virtual applications. For both cases different features are supported, which are described below.

#### 1.7.2.1 Virtual Desktop

Both, the **Producer** as well as the **Quick Access**, are fully functional and record and discover contexts within the same virtual desktop.

### 1.7.2.2 Virtual Application

We do not recommend or support this scenario for the use of **Producer** and/or **Quick Access**, since each application will be opened within its own browser-tab. The individual tabs are isolated, preventing inter-application-communication such that object- and context recognition functionality will not be available in this set-up.

### 1.7.3 Citrix Workspace

In the virtual application scenario both, the **Producer** as well as the **Quick Access**, are fully functional to record and discover contexts if the supported application is running as a “virtual application” on the same machine and inside the same user-session as well.

#### Exception 1

Producer run on a local PC or virtual desktop and each target application runs as a virtual application. In this scenario, object and context recognition are not supported.

#### Exception 2

The Citrix VDA is part of a server farm, and applications that are started are distributed to various servers via load balancing (automatic load distribution). In this scenario, it may happen that the Producer and/or Quick Access and the target application that is to be recorded are opened on different VDAs. When this happens, our clients cannot establish a connection with the target application, thus object and context recognition are impossible.

*How to bypass this problem for content creation:* All authors who use Producer to record, log on to a dedicated server. Alternatively, it would also be possible to use a group policy to make a particular server always available to a user group.

## 1.8 General Information On Citrix- and MS- terminal server

In such environments, it is often the case that the users' profile sizes are restricted to 20 MB. However, due to technical reasons, this is not sufficient to operate tts performance suite.

*How to bypass this problem:* A central configuration file can be used to re-route the directories required by tt knowledge force so that they are no longer in the user profile. In doing so, you need to ensure that this configuration is performed centrally for all users in a terminal server environment. Here, for example, it's a good idea to use a “home drive H:” (or similar), which is made available to each user via mapping. Rerouting to an identical drive for several users is not possible and would also not be a good idea due to reasons relating to data privacy protection. Rerouting to UNC paths \\Server\Release\Directory is not supported. With an average document size of ~3 MB (without sound), as well as ~10MB of local configuration data, we recommend making at least 50-100 MB of disk space available to each author.

## 2 tts performance suite – Content

The following requirements need to be met in order to play a WBT:

### 2.1 Hardware

| Component           | Requirement  |
|---------------------|--|
| Processor           | Minimal: from 1.0 GHz<br>Recommended: 1.5 GHz or more  |
| Memory              | Minimal: 512 MB<br>Recommended: 1 GB   |
| Screen resolution   | Depends on the size of the application that is recorded and the content that is produced. However, at least approx. 100 pixels higher than the recording resolution because parts of the browser interface have to be visible.<br>16-bit color depth |
| Multimedia Hardware | 16-bit sound card and speakers or headphones   |

### 2.2 Software

| Component        | Requirement  |
|------------------|--|
| Operating system | Windows 10<br>Windows 11   |
| Browser          | Edge 107<br><br>Firefox 106<br><br>Safari 16.1<br><br>Chrome 107<br><br><b>Attention:</b> Please note that due to the different technological basis, minor differences in the display of content between browsers might occur.<br><br><b>Attention:</b> Please note that Flash content is not supported in the Safari browser.<br><br><b>Attention:</b> Please note that due to a security feature in new Firefox versions, it is no longer possible to redirect at the end of a learning-object (LO) (which is loaded via an encrypted connection) to a non-secure site. In this case, the LO will not close and no progress will be stored.<br><br><b>Attention:</b> Please note that due to a browser security feature, locally stored content cannot be played back in Chrome.<br><br><b>Attention:</b> Please note that due to browser security policies the glossary is not available on locally accessed content (IE and Chrome). |

|                    |   |
|--------------------|---|
|                    | <p><b>Attention:</b> Please note that the privacy-modes of the browsers are not supported.</p> <p><b>Attention:</b> Please note that in case a host, on which an E-Learning is started, has set specific options for compatibility-view and the topmost window does not contain the "X-UA-Compatible" meta tag, the exported content will not be displayed correctly.</p> <p><b>Attention:</b> Please note that devices, which work with "touch-interactions" (e.g. tablets, phones, hybrid-notebooks) are not supported.</p> |
| Browser settings   | JavaScript and session cookies have to be activated.  |
| Multimedia support | <p>Audio: always uses native HTML5-Audio element<br/>Video: always uses native HTML5-Video element</p> <p><b>Attention:</b> Please note that due to increasing browser restrictions, the automatic playback of videos containing a sound-track cannot be guaranteed on all browsers.</p>  |

## 2.3 WBTs on Apple iPad

### Automatic playback of sounds on iPad

Apples policy on the play back for multimedia content is that a specific user interaction is required in order to initiate the playback.

This policy has the following consequences for automatic playback of multimedia content embedded in tt knowledge force learning objects:

- only the first sound on a page can be played automatically
- all additional sounds on that page will not be played automatically, even if the learning object is designed that way and it works in other browsers
- if more than the first sound is to be played on one page, the rest needs to be initiated by a trigger
- sounds on the very first page of a learning object cannot be played automatically at all
- if a learning object is opened with the "resume" function at a step that is not the very first one, the sounds on that step cannot be played automatically
- it is not recommended to use sounds in the page exit area, since they cannot be played automatically plus their use will prevent the sounds of the following page from being played automatically



## 2.4 Technology

Web browser application based on HTML and JavaScript. A web server is not required; WBTs can be played / viewed on a local browser (except Chrome and IE). No installation is necessary; the exported content files are automatically loaded in the browser when the corresponding start file is accessed.

## 2.5 Installation

No installation necessary, the exported content files are automatically loaded in the browser when the corresponding start file is accessed.

## 2.6 Storage Of Training Data

Training data can be stored via SCORM, AICC or locally via cookies (i.e. indexedDB for HTML5 content). Student data is stored in a database on a user-specific basis in conjunction with the WebAccess. SCORM versions 1.2 and 2004 (3<sup>rd</sup> & 4<sup>th</sup> edition) are supported.

## 2.7 Browser settings

To ensure optimal performance, you are advised not to select the "Every visit to the page" browser cache setting.

## 2.8 Use of Smart Components

Smart Components in conjunction with the tt player API extend the functional scope of the tt knowledge force player. While playing the WBT, the Smart Components are loaded once and on demand into the browser cache of the client PC.

Please note that Smart Components may impact the performance of the tt knowledge force player. Rectification of these issues lies solely in the responsibility of the developer of the Smart Component in question.

Smart Components must be placed at their designated position within the tt player. A modification at any other place within the tt player is not allowed.

tts may alter the software, the API (or both) at any time without guaranteeing the playability of existing components.

tts is not obligated to rectify any errors that have the root cause in the Smart Component or answer any questions / provide support for rectification of these external errors.

If a customer places his/her own Smart Components within the tt player, the customer acts on his/her own and sole responsibility.

## 2.9 Network bandwidth used when playing WBTs

For this, four exemplary settings have been defined:

1. MS Office 2007, high-quality simulation, refined graphics
2. MS Office 2007, high-quality simulation, refined graphics, with sound (MP3, 56 kBit/s)
3. SAP basic course, normal simulation depth, little refinement
4. SAP basic course, normal sim. depth, little refinement, with sound (MP3, 56 kBit/s).

The WBTs were worked through by learners, which resulted in the following exemplary values:

| Scenario | used time | transferred data                 | Average transfer rate                 | Maximal transfer rate                   |
|----------|-----------|----------------------------------|---------------------------------------|---|
| 1        | 7min 43s  | 5.0 MB download<br>0.5 MB upload | 11.0 kB/s download<br>1.0 kB/s upload | 247.0 kB/s download<br>38.0 kB/s upload |
| 2        | 9min 50s  | 7.5 MB download<br>0.5 MB upload | 12.7 kB/s download<br>0.8 kB/s upload | 293.0 kB/s download<br>36.8 kB/s upload |
| 3        | 5min 45s  | 2.6 MB download<br>0.3 MB upload | 7.8 kB/s download<br>0.8 kB/s upload  | 72.2 kB/s download<br>31.0 kB/s upload  |
| 4        | 11min 44s | 5.0 MB download<br>0.3 MB upload | 7.3 kB/s download<br>0.4 kB/s upload  | 208.0 kB/s download<br>34.2 kB/s upload |

**Hint:** Contents 1 and 2, as well as 3 and 4, are identical. The only difference lies in the presence or absence of speaker sounds. In most cases, users will work through WBTs without sound at a quicker pace than WBTs that contain sound. Therefore, versions with sound do not necessarily need a higher bandwidth - as reflected in the test results. Downloading the WBT player files is done automatically - and only once for all WBTs. Therefore, the test results with activated browser cache are based on the assumption that the WBT player has already been cached.

## 2.10 HTML5 Export

### Hardware

| Component | Requirement  |
|-----------|--|
| Processor | Minimal: Dual-core from 1.6 GHz<br>Recommended: Quad-core from 2.6 GHz |
| Memory    | Minimal: 1 GB<br>Recommended: 4 GB                                     |

### Software

| Component        | Requirement   |
|------------------|---|
| Operating system | Windows 10<br>Windows 11<br><br>iOS 16.1<br><br>Android 12<br><br>Please note that the functionality is tested and verified on reference devices (see below). Support cases must be reproducible on these reference devices.  |
| Browser          | Edge 107<br><br>Firefox 106<br><br>Safari 16.1<br><br>Chrome 107<br><br><b>Attention:</b> Please note that minor differences in the display of content between browsers can occur.<br><b>Attention:</b> Please note that due to a browser-security-feature, locally stored content cannot be played back in Edge and Chrome.<br><b>Attention:</b> Please note that some differences in the touch-behavior within the Edge-browser might occur on some mobile Windows devices. |
| Browser settings | JavaScript and session cookies have to be activated.  |

Please find the currently supported functions described in detail in the HTML5 Authoring Guidelines.

## 2.10.1 Reference Devices For Android

- Samsung Galaxy Tab A8
- Google Pixel
- Nexus 9
- Nexus 10



### 3 Quick Access (QA)

QuickAccess makes use of the Chromium project by Google. In order to ensure the proper execution of the QuickAccess, the operating system and third party security tools need to enable the execution of Chromium processes.

Communication to the server / Webaccess can only be established via an encrypted connection; i.e. https.

#### 3.1 Software

| Component           | Requirement   |
|---------------------|---|
| Operating system    | Windows 10<br>Windows 11  |
| Additional software | Visual C++ Redistributables (x86+x64) for Visual Studio 2019 (version 16.9) |
| Optional software   | Microsoft WebView2 component  |
| Free space          | ~560 MB for program data  |

Since ttsp version 2021r2 we allow the user to choose between two different webviews to be used in QuickAccess. The default setting is the Chromium embedded framework and as an alternative, suited for specific customer environments, we now provide the option to switch to the Microsoft WebView2 (WV2) component.

If the WV2 component is activated and used please make note of the following licensing information from Microsoft:

- Data Collection. The software may collect information about you and your end users' use of the software, and send that to Microsoft. Microsoft may use this information to provide services and improve Microsoft's products and services. There are also some features in the software that may enable you to collect data from users of your applications. If you use these features to enable data collection in your applications, you must comply with applicable law, including providing appropriate notices to users of your applications. You can learn more about data collection and use in the help documentation and the privacy statement at <https://aka.ms/privacy>. Your use of the software operates as your consent to these practices.
- Processing of Personal Data. To the extent Microsoft is a processor or subprocessor of personal data in connection with the software, Microsoft makes the commitments in the European Union General Data Protection Regulation Terms of the Online Services Terms to all customers effective May 25, 2018, at <https://docs.microsoft.com/en-us/legal/gdpr>.

## 3.2 Push Notifications

Please note that push notifications can only be used on Windows 10 operating system. Please note, that in order to display the notifications properly, certain settings-requirements in Windows 10 need to be met:

- the notification-assistant needs to be turned off
- the setting "Notifications from apps and other senders are to be collected" needs to be turned on
- in addition to the above mentioned general setting, Windows 10 allows for app-specific notifications control. Here notification-collection from QuickAccess needs to be enabled as well.

We recommend using this feature on Window10 builds higher than 1804, since in earlier Windows-builds defects in the Windows pop-up-notifications have been reported.

## 3.3 QA for SAP

Please note that this module is only supported for already existing installations.

### 3.3.1 Technology

Client-side: A SAPGUI enhancement that is activated via the function modules transported in SAP Basis (package in the /TTS/ namespace). Documents are displayed via a Web browser which is installed on the client system. Server-side: An HTTP request is used to trigger a search for content on the WebAccess and content is then fed to the client via HTTP(s) protocol. For more information, please refer to our installation guidelines.

## 3.4 Web-QA

In case of Chrome, which currently is blocking CrossSiteCookies, the corresponding application server needs be configured in such a way, that cookies are processed accordingly. E.g. in case of Tomcat the "Tomcat cookie processor" needs to be adjusted.

## 3.5 Working With Citrix

Please refer to chapter 1.7 for information on Citrix.

## 3.6 Creator

With the release 2022r2 we changed the communication method between the Creator and the recording-component to Websocket. In order to allow for this communication a port has to be open. In the standard configuration this is the port 8008. The port can be changed via configuration.

The Creator make uses of the sever-backends and thus, in order to fully use the creator, the requirements for Curator (Chapter 5) and Server Components (Chapter 6) need to be fulfilled and both applications need to be "up-and-running".

## 4 Object Recognition

### 4.1 General

In order to provide object recognition in different applications, the product uses interfaces such as Microsoft Active Accessibility (MSAA) or the Java Access Bridge (JAB). Based on those interfaces, we can achieve very high levels of object recognition for the standard applications listed below, as well as for most software and web applications available, without the need to adapt the software and/or configuration.

It is, however, **essential** that the application itself supports those APIs correctly and provides plausible data.

### 4.2 Object recognition for standard applications

The following table lists the requirements that need to be met to achieve object recognition during recordings, as well as context identification.

The first column depicts the use case (i. e. the application that is to be recorded) and the second column the requirements for this application that need to be fulfilled.

| Software                                      | Version(s) / notes   |
|---|--|
| Microsoft Windows                             | Windows 10<br>Windows 11   |
| Microsoft Office                              | Office 2019,<br>Office 365   |
| Browsers, web-enabled applications in general | Edge 107<br><br>Chrome 107   |
| SAPGUI  | SAPGUI 7.6*<br>SAPGUI 7.7 – min. patchlevel 10<br><br><b>Attention:</b> GUI Scripting must be installed and activated on the client and activated on the server side. <code>sapgui/user_scripting_set_readonly</code> is sufficient, no rights are needed to control SAPGUI. |

|                   |   |
|-------------------|---|
|                   | <p><b>Attention:</b> In combination with Win10 the Windows "Control Flow Guard" must be deactivated in order to record SAP "in-process". Otherwise the recorder switches to an alternative mode, which will result in slower recording performance.</p> |
| Java applications | <p>Java 8 (min. update 20 – tested on update #351 )<br/>         Java 17 (tested on update #35)<br/>         OpenJDK 11</p>   |

Please note that due to a defect in the chrome browser, the accessibility mode cannot be set automatically anymore, so object and context recognition is not possible for the chrome-builds beginning from build #43. As a workaround, the accessibility flag can be set manually.

Please note that in case of recording of Microsoft Office 32-bit application and the recorder-setting that all-objects should be retrieved by the recorder, the recording performance will decrease and a recorder-time of up to 15 seconds is to be expected for each step.

### 4.3 Object recognition in SAP GUI

The SAP GUI Scripting interface from SAP is used – and is therefore a prerequisite – for recording and guiding within the SAP GUI. Scripting is activated by default during the SAP GUI installation. Should this not be the case on the client computer, it can be easily installed via the SAP GUI installation.

To ensure object and context recognition in this context, two settings need to be set within the SAP GUI:

1. "Notify When a Script Attaches to a Running GUI" and
2. "Notify When a Script Opens a Connection".

Both need to be **deactivated**. These settings can be found in the GUI Options ("Adjust the local layout" button or via the shortcut Alt+F12->Options menu item) on the "Scripting" tab.

**Important note:** To ensure an optimal context and object recognition, our product attempts to automatically set the above options - provided that the user possesses the necessary rights. This behavior can be deactivated upon request. Furthermore, SAP GUI Scripting has to be activated on the server side. In order to do so, the profile parameter *sapgui/user\_scripting* has to be set to the value *TRUE*. If this is not the case, please proceed in the following way:

1. Call up the RZ11 transaction
2. Enter *sapgui/user\_scripting* in the field
3. Click "Change value"
4. As the new value, enter *TRUE*
5. Click "Save".

Please refer to SAP Note No. 480149 for further information.

### 4.3.1 Security Aspects

For notes on security-related aspects, please refer to the following SAP documentation ("SAP GUI Scripting Security Guide"):

[https://help.sap.com/doc/97d2d0bc2ed248a4a85a0bec608704f8/760.01/en-US/sap\\_gui\\_scripting\\_sec\\_guide.pdf](https://help.sap.com/doc/97d2d0bc2ed248a4a85a0bec608704f8/760.01/en-US/sap_gui_scripting_sec_guide.pdf)

As our software only needs read access to the SAP GUI, activating SAP GUI Scripting will not impact security. A more concise description of the security setting can be found in the document given above, from which the following quote was taken:

[...]

#### **Modes for server side protection**

*The profile parameter described in the previous chapter controls the availability of SAP GUI Scripting in an all-or-nothing kind of way. Some users have asked for a more fine grained approach. This would allow them to enable only those features of SAP GUI Scripting that are required for their specific application.*

*In response to these requests we have added two additional profile parameters that modify the behavior of the `sapgui/user_scripting` profile parameter.*

#### **`sapgui/user_scripting_disable_recording`**

*This parameter disables all SAP GUI Scripting events for the system on which it is set. It is still possible to run previously recorded or written scripts. However, it is not possible to record new scripts or log any other type of information in response to SAP GUI Scripting events.*

#### **`sapgui/user_scripting_set_readonly`**

*In SAP GUI Scripting's read only mode only a subset of the API can be used from a script. This comprises read access to properties and calling read only functions.*

*Please note that the read only restriction applies to the state of the SAP GUI session on the server. This implies that you may not execute any call which changes the data stream sent to the server, even if no actual database update is attempted.*

[...]

For the Quick Access, both the

- **`sapgui/user_scripting_set_readonly`** and the
- **`sapgui/user_scripting_disable_recording`** parameters

can be set to TRUE. As described above, the SAP GUI cannot be controlled using Quick Access or any other third-party software. It is also not possible to record user interactions in the SAP GUI. Thus, there is no increased security risk.

In the following section, tts comments on the security-related aspects outlined by SAP (excerpt from the SAP document given above):

[...]

## **8.0 Security Q&A**

1. *Can a script corrupt the SAP system's data?*

*No. All changes done from a script are subject to the same data validation rules as end user interaction.*

2. *Can a script influence the system performance?*

*Yes. A script executes significantly faster than an end user, and may therefore put more load onto the system.*

**Comment by tts:** This is not the case, as the `sapgui/user_scripting_set_readonly` parameter can be set to TRUE.

3. *Can a script access data for which the end user does not have the necessary privileges?*

*No. The script has only access to the data to which the end user has access rights.*

4. *Can a script export data that the end user could otherwise not export?*

*Yes. Even if the download of a list is not allowed, an end user can extract the data from SAP GUI. Of course, the end user could also create a screen shot instead. SAP GUI Scripting can only export data that is displayed on the screen.*

5. *Can a script record end user interaction with SAP GUI?*

*Yes. However, the end user will be notified about this, unless he disabled the notification.*

**Comment by tts:** This is not the case, as the `sapgui/user_scripting_disable_recording` parameter can be set to TRUE.

6. *Can a script record passwords?*

*No. Therefore, a script cannot be played back if the user running it does not have an account on the SAP system.*

7. *Can a script run in the background without the end user's knowledge?*

*No. The end user will be notified when the script starts, unless she disabled the notification. In addition, SAP GUI Scripting needs to display SAP GUI for running a script.*

8. *Can SAP GUI Scripting be used to corrupt the client PC?*

*No. The functionality of SAP GUI Scripting is limited to driving SAP GUI. However, if you use Visual Basic Script and the Windows Script Host to access the SAP GUI Scripting interface, the functionality of the VBS language or the Windows Script Host object model might very well be used to perform arbitrary operations on the client PC.*

[...]

Special note when using Quick Access while `"sapgui/user_scripting_set_readonly"` is set to `true`  
In this mode, there are two restrictions by design:

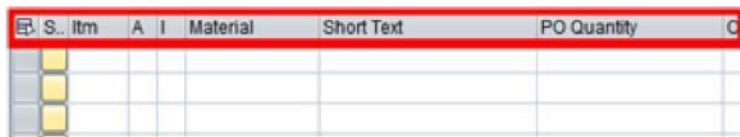
- 1) Input values automatically / Smart Link "Enter automatically": Since values can't be entered automatically as a whole per scripting API – ("**read only**"), –, these will be entered into the input fields per Windows keyboard automation key by key. The function therefore is restored but behaves differently for the user and is a little bit slower.

- 2) Activate / focus input fields automatically: This function is also “by design” not available per SAP Scripting. For this reason, there exists a second alternative method in Quick Access which activates the input field via mouse automation. Since the Quick Access, as a default for security reasons, is not allowed to do mouse clicks itself, this has to be explicitly activated in the configuration.

We also note that both functions are there for convenience reasons only, it doesn't pose a problem to use Quick Access without these functions.

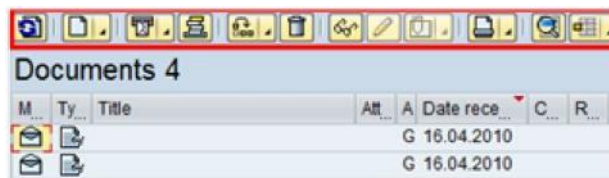
Due to known issues in the SAP GUI scripting interface, the following issues can occur during the “read only” mode with object recognition (highlighting the target object):

- Table heads in SAP table controls:



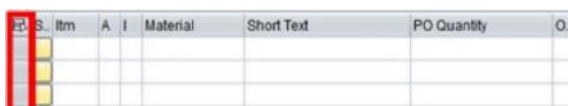
This problem does not occur when using SAPGUI 7.2 with patch level 14 or higher or SAPGUI 7.3 with patch level 2 or higher.

- Buttons in SAP grid views and SAP table tree views:



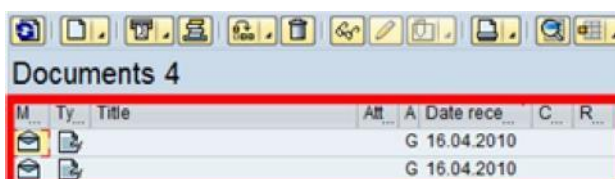
This problem does not occur when using SAPGUI 7.2 with patch level 14 or higher or SAPGUI 7.3 with patch level 2 or higher.

- Column marker in SAP table controls:



This does not occur when using SAPGUI 7.3 with patch level 6 or higher.

- Table heads, rows and cells in SAP grid views:



This does not occur when using SAPGUI 7.3 with patch level 6 or higher.

Hints for these topics can be found in the sap notes 1578980 and 1751279.

#### **4.3.2 Characteristics of F4 help**

The SAP GUI scripting interface used does not support F4 help in standard mode (referred to as amodal or control mode). Therefore, a running Quick Access will interrupt the connection to the SAP GUI scripting interface if F4 help is opened, to make sure that the help is opened in amodal mode nonetheless.

Please note that in this variant of F4 help, it is not possible to detect individual table rows as objects, but only the table as a whole (with free selection).

If detecting individual table rows is crucial even in F4 help (which will only be necessary if you need to record the help itself), you have to change the F4 help to modal (dialog based) for all SAP users that use Quick Access. Please proceed as laid out in SAP Note 977584.

For general information on this topic, please see SAP Note 977583.

#### **4.3.3 Object recognition in SAP Netweaver Business Client (NWBC)**

Object recognition via the SAP-scripting interface for the NWBC is solely possible with the NWBC Client. If this SAP component is accessed via a browser, the MSAA interface will be used. Since this provides less information, this set-up is not recommended. Please note that object information from the central SAP-content area of the NWBC Client can be retrieved via the SAP-scripting-API. Object information for structural and navigational elements in the left- and upper area cannot be accessed.

Please note, that object recognition in multiple running NWBC instances is not supported.

### **4.4 Object Recognition In Cross-Platform And Cross-Language Cases**

A basic prerequisite for cross-platform object recognition is that the process of the application(s) must be identical and the object name of the interaction object (like input fields, buttons) should match between the systems / platforms.

Please note that context recognition is explicitly ruled out if the GUI language of the recorded application is different from the one found in the live application.

Thus, we advise you, to create separate recordings for each GUI language, as we explicitly do not support cross-language object recognition. Of course, it is possible to use different instruction languages for the same GUI language without the need for a rerecording.

### **4.5 Object Recognition For JAVA Applications**

Java based programs use two different accessibility technologies depending on the type of the underlying Java UI framework. For JFC/Swing-based objects, the Java Access Bridge (JAB) is used. For JavaFX objects, accessibility is available since Java 8u40 that can be queried via UI Automation.



#### 4.5.1 JAB For Java 8 and later

For these Java versions the JAB that is provided with the corresponding JRE is used. No additional installation is required. By default the access bridge is disabled. For each installed JRE the JAB can be individually activated via the file "accessibility.properties". The „assistive\_technologies“ property specifies the assistive technologies to load into the JVM. It takes a comma-separated list as input. For example, if you set this property to "com.sun.java.accessibility.AccessBridge", the Java Access Bridge is enabled.

Please note, that from Java9 onwards Java Swing applications need to be recorded at 100% scaling in order for the object-recognition to work properly.

#### 4.6 Object recognition for third-party and custom-built applications

As outlined above, object recognition works for most software products available for Microsoft Windows, as well as for custom software, due to the fact that the MSAA interface is usually available and supported with no extra effort.

In most cases, this also holds true if the software in question was developed using Microsoft products such as MS NET, Visual C++ and/or Visual Basic, or if Microsoft Common Controls are used.

## 5 Curator

### 5.1 Minimal requirements

The Curator depicts the browser-based access to the “Document Management area” of the tt knowledge performance suite.

In order to use this, the corresponding server needs to be installed and running. For the requirements that need to be met on the server side, please refer to chapter 6.

Should any of the requirements defined herein not be met, the proper functioning of the Curator cannot be guaranteed and there exists no claim to establish this.

### 5.2 Software

| Component        | Requirement  |
|------------------|--|
| Operating system | Windows 10<br>Windows 11   |
| Browser          | Edge 107<br><br>Firefox 106<br><br>Chrome 107<br><br><b>Attention:</b> Please note that due to the different technological basis, minor differences in the display of content between browsers might occur.<br><br><b>Attention:</b> Please note that display-magnifications above 100% are not supported. |
| Browser settings | JavaScript and session cookies have to be activated.   |

### 5.3 Hardware

| Component | Requirement   |
|-----------|---|
| Processor | Minimal: Single-core 2.2GHz<br>Recommended: Dual-core 2.6GHz<br><br>Please note that these are average values and that the required hardware is strongly dependent on the use case, i. e. the expected number of authors / end users, respectively.   |
| Memory    | Minimal: 512 MB<br>Recommended: 2 GB<br><br>Please note that these are average values and that the required hardware is strongly dependent on the use case, i. e. the expected number of authors / end users, respectively.<br>These values depict the amount of RAM that should be available for the Java process. |

## 6 Server components

### 6.1 Hardware

| Component  | Requirement  |
|------------|--|
| Processor  | <p>Minimal: Single-core 2.2 GHz<br/>           Recommended: Dual-core 2.6 GHz (for Curator)<br/>           Quad-core 2.6 GHz (for WebAccess)</p> <p>Please note that these are average values and that the required hardware is strongly dependent on the use case, i. e. the expected number of authors / end users, respectively.</p>  |
| Memory     | <p>Minimal: 2 GB<br/>           Recommended: 4 GB</p> <p>Please note that these are average values and that the required hardware is strongly dependent on the use case, i. e. the expected number of authors / end users, respectively.</p> <p>These values depict the amount of RAM that should be available for the Java process.</p>   |
| Hard drive | <p>200 MB for program data</p> <p>Repository: ~ 1 GB / 500 Documents<br/>           Database: ~ 100 MB / 500 Documents</p> <p><b>Attention:</b> These values represent averages! The actual amount of data can vary greatly, depending on the complexity and media-richness of the stored objects.</p> <p><b>Attention:</b> If version management is activated, the amount of required disk space is increased significantly. For a rough estimate, multiply the values given above with the average number of document versions.</p> <p><b>Attention:</b> For optimal performance, we recommend the use of SSD hard drives.</p> |

### 6.2 Software

| Component          | Requirement   |
|--------------------|---|
| Operating system   | <p>Windows Server 2016<br/>           Windows Server 2019<br/>           Windows Server 2022</p> <p>Linux</p> |
| Browser settings   | JavaScript and session cookies have to be activated.  |
| Permissions        | Administrator-rights are required for the installation.   |
| Application server | Apache Tomcat 9.0.68  |

|                          |   |
|--------------------------|---|
|                          | <p>JDK17<br/>OpenJDK 17.0.35</p> <p><b>Attention:</b> The corresponding Java Development Kit (JDK) needs to be installed on the server; the Java Runtime Environment (JRE) alone is not sufficient.</p> |
| Database                 | <p>MSSQL Server 2017<br/>MSSQL Server 2019</p> <p>Oracle 19c<br/>Oracle 21c</p> <p><b>Attention:</b> Please note that the database tables need to be UTF-8 encoded.</p>                                 |
| Storage Service          | MinIO v2022-10-24   |
| Search Functionality     | <p>Solr Version 8.11.1<br/>Redis 6.25</p>   |
| Reverse Proxy (optional) | <p>Tomcat connector for Apache HTTP Server<br/>(mod_jk or mod_proxy_ajp)</p> <p><b>Attention:</b> Tomcat connector for Microsoft IIS (ISAPI Redirector) is not supported.</p>                           |

## 6.3 Technology

Server application based on the Java Enterprise Edition (JEE) framework Oracle.

## 6.4 Installation

**Attention:** In order to upload content created in the authoring environment to the server component, all components that take part in the network communication (e. g. proxy, VPN software, etc.) must support HTTP 1.1 incl. chunked transfer coding.

Please note that the http-communication to the server needs to be https exclusively. Unsecured http-communication is no longer supported.

For "search-functionality" within Curator and WebAccess we require a Solr instance being available.

## 6.5 LDAP

The following section lists the known restrictions of the provided LDAP interface:

- Only "internal" authentication with user name and password is supported. Alternative mechanisms in accordance with SASL (RFC 2222) are not possible.
- Start-TLS (RFC-2830) is currently not supported.



- LDAP groups have to be associated to user entries. Users associated with groups are not supported.

## 6.6 SAML

SAML is supported in the version 2.0. With respect to the bindings, the tts performance suite supports "HTTP POST".

## 6.7 Third-party software

### FortiClient

It is a known issue that if the FortiClient virus scanner is installed on the operating server, statification of WBTs is not possible.

### McAfee

Please note that a locally used virus scanner from McAfee may reduce the performance of the authoring component.

You are advised to change the anti-virus program's settings so the TT Knowledge Force installation folder is excluded from the scanning process.

### HP Quicktest

Please note that HP Quicktest can only be installed in parallel with the authoring software under specific conditions: the user, under which the authoring software is launched, may not have reading permissions on the folder in which the Quicktest executable resides.

### HP Sprinter

Please note that the installation will cause write access problems to the Producer profile folder which may result in a failure to load the WYSIWYG view.

### Check Point

Please note that the virus scanner from Check Point End Security may strongly reduce the performance of the Producer.

### Desktop Management Software

In case of using multiple monitors supported by desktop management software (for instance ATI Hydravision), this can cause problems with the object recognition during (re-)recording and guiding through applications.

### Bamboo Drivers

As soon as Bamboo-drivers for drawing tablet and the corresponding pen are installed these drivers will interfere with the correct display and object-recognition of the Quick Access.

### Microsoft Snipping Tool

As long as this tool is running it will interfere with correct object-recognition needed for recording.

### Microsoft Security Policies

If you experience problems with editing in the WYSIWYG View (i.e. no editing possible) please check if the MS Security Policy "Local Machine Lockdown" is enabled. If so, please disable this policy.

## 7 Third Party Products

### 7.1 HTML5-Player

| Name                  | Version | License                                    |
|-----------------------|---------|--|
| <b>HammerJs</b>       | 2.0.8   | <a href="#">MIT</a>                        |
| <b>jPlayer</b>        | 2.9.2   | <a href="#">MIT</a>                        |
| <b>jQuery</b>         | 1.12.4  | <a href="#">MIT</a>                        |
| <b>Log4Javascript</b> | 1.4.9   | <a href="#">Apache License 2.0</a>         |
| <b>MediatorJs</b>     | 0.9.8   | <a href="#">MIT</a>                        |
| <b>RequireJS</b>      | 2.3.3   | <a href="#">MIT</a> or <a href="#">BSD</a> |

### 7.2 Default Player

| Name                              | Version | License                               |
|-----------------------------------|---------|---------------------------------------|
| <b>DOMPurify</b>                  | 2.3.6   | <a href="#">Apache 2.0 or MPL-2.0</a> |
| <b>iScroll</b>                    | 4.1.9   | MIT                                   |
| <b>jQuery</b>                     | 1.12.4  | <a href="#">MIT</a>                   |
| <b>mozilla/sanitizer-polyfill</b> | 0.9.0   | <a href="#">MPL-2.0 License</a>       |
| <b>RequireJS</b>                  | 2.1.9   | MIT or <a href="#">BSD</a>            |
| <b>XRegExp</b>                    | 2.2.0   | MIT                                   |

## 7.3 QA StepList Editor

| <b>name</b>                                | <b>version</b> | <b>license</b> |
|--|----------------|----------------|
| @aws-crypto/crc32                          | 2.0.0          | Apache-2.0     |
| @aws-crypto/ie11-detection                 | 2.0.0          | Apache-2.0     |
| @aws-crypto/sha256-browser                 | 2.0.0          | Apache-2.0     |
| @aws-crypto/sha256-js                      | 2.0.0          | Apache-2.0     |
| @aws-crypto/supports-web-crypto            | 2.0.0          | Apache-2.0     |
| @aws-crypto/util                           | 2.0.0          | Apache-2.0     |
| @aws-sdk/abort-controller                  | 3.40.0         | Apache-2.0     |
| @aws-sdk/chunked-blob-reader               | 3.37.0         | Apache-2.0     |
| @aws-sdk/client-s3                         | 3.44.0         | Apache-2.0     |
| @aws-sdk/config-resolver                   | 3.40.0         | Apache-2.0     |
| @aws-sdk/eventstream-marshaller            | 3.40.0         | Apache-2.0     |
| @aws-sdk/eventstream-serde-browser         | 3.40.0         | Apache-2.0     |
| @aws-sdk/eventstream-serde-config-resolver | 3.40.0         | Apache-2.0     |
| @aws-sdk/eventstream-serde-universal       | 3.40.0         | Apache-2.0     |
| @aws-sdk/fetch-http-handler                | 3.40.0         | Apache-2.0     |
| @aws-sdk/hash-blob-browser                 | 3.40.0         | Apache-2.0     |
| @aws-sdk/invalid-dependency                | 3.40.0         | Apache-2.0     |
| @aws-sdk/is-array-buffer                   | 3.37.0         | Apache-2.0     |
| @aws-sdk/lib-storage                       | 3.44.0         | Apache-2.0     |
| @aws-sdk/md5-js                            | 3.40.0         | Apache-2.0     |
| @aws-sdk/middleware-apply-body-checksum    | 3.40.0         | Apache-2.0     |
| @aws-sdk/middleware-bucket-endpoint        | 3.41.0         | Apache-2.0     |
| @aws-sdk/middleware-content-length         | 3.40.0         | Apache-2.0     |
| @aws-sdk/middleware-expect-continue        | 3.40.0         | Apache-2.0     |
| @aws-sdk/middleware-host-header            | 3.40.0         | Apache-2.0     |
| @aws-sdk/middleware-logger                 | 3.40.0         | Apache-2.0     |
| @aws-sdk/middleware-retry                  | 3.40.0         | Apache-2.0     |
| @aws-sdk/middleware-sdk-s3                 | 3.41.0         | Apache-2.0     |
| @aws-sdk/middleware-serde                  | 3.40.0         | Apache-2.0     |
| @aws-sdk/middleware-signing                | 3.40.0         | Apache-2.0     |
| @aws-sdk/middleware-ssec                   | 3.40.0         | Apache-2.0     |
| @aws-sdk/middleware-stack                  | 3.40.0         | Apache-2.0     |
| @aws-sdk/middleware-user-agent             | 3.40.0         | Apache-2.0     |
| @aws-sdk/property-provider                 | 3.40.0         | Apache-2.0     |
| @aws-sdk/protocol-http                     | 3.40.0         | Apache-2.0     |
| @aws-sdk/querystring-builder               | 3.40.0         | Apache-2.0     |
| @aws-sdk/querystring-parser                | 3.40.0         | Apache-2.0     |
| @aws-sdk/service-error-classification      | 3.40.0         | Apache-2.0     |
| @aws-sdk/signature-v4                      | 3.40.0         | Apache-2.0     |



|  |        |              |
|--|--------|--------------|
| <b>@aws-sdk/smithy-client</b>            | 3.41.0 | Apache-2.0   |
| <b>@aws-sdk/url-parser</b>               | 3.40.0 | Apache-2.0   |
| <b>@aws-sdk/util-arn-parser</b>          | 3.37.0 | Apache-2.0   |
| <b>@aws-sdk/util-base64-browser</b>      | 3.37.0 | Apache-2.0   |
| <b>@aws-sdk/util-body-length-browser</b> | 3.37.0 | Apache-2.0   |
| <b>@aws-sdk/util-config-provider</b>     | 3.40.0 | Apache-2.0   |
| <b>@aws-sdk/util-hex-encoding</b>        | 3.37.0 | Apache-2.0   |
| <b>@aws-sdk/util-locate-window</b>       | 3.37.0 | Apache-2.0   |
| <b>@aws-sdk/util-uri-escape</b>          | 3.37.0 | Apache-2.0   |
| <b>@aws-sdk/util-user-agent-browser</b>  | 3.40.0 | Apache-2.0   |
| <b>@aws-sdk/util-utf8-browser</b>        | 3.37.0 | Apache-2.0   |
| <b>@aws-sdk/xml-builder</b>              | 3.37.0 | Apache-2.0   |
| <b>@log4js-node/log4js-api</b>           | 1.0.2  | Apache-2.0   |
| <b>@soda/get-current-script</b>          | 1.0.2  | MIT          |
| <b>@transloadit/prettier-bytes</b>       | 0.0.7  | MIT          |
| <b>@uppy/core</b>                        | 1.20.1 | MIT          |
| <b>@uppy/dashboard</b>                   | 1.21.1 | MIT          |
| <b>@uppy/drag-drop</b>                   | 1.4.31 | MIT          |
| <b>@uppy/informer</b>                    | 1.6.6  | MIT          |
| <b>@uppy/progress-bar</b>                | 1.3.30 | MIT          |
| <b>@uppy/status-bar</b>                  | 1.9.6  | MIT          |
| <b>@uppy/store-default</b>               | 1.2.7  | MIT          |
| <b>@uppy/thumbnail-generator</b>         | 1.7.11 | MIT          |
| <b>@uppy/utlis</b>                       | 3.6.2  | MIT          |
| <b>@vue/cli-service</b>                  | 4.5.17 | MIT          |
| <b>@vue/composition-api</b>              | 1.3.2  | MIT          |
| <b>ajv</b>                               | 8.6.1  | MIT          |
| <b>assert</b>                            | 1.5.0  | MIT          |
| <b>axios</b>                             | 0.23.0 | MIT          |
| <b>base64-js</b>                         | 1.3.1  | MIT          |
| <b>browser</b>                           | 2.11.0 | MIT          |
| <b>browserify-zlib</b>                   | 0.2.0  | MIT          |
| <b>buffer</b>                            | 5.6.0  | MIT          |
| <b>classnames</b>                        | 2.3.1  | MIT          |
| <b>constants-browserify</b>              | 1.0.0  | MIT          |
| <b>core-util-is</b>                      | 1.0.2  | MIT          |
| <b>css-loader</b>                        | 3.6.0  | MIT          |
| <b>cuid</b>                              | 2.1.8  | MIT          |
| <b>date-format</b>                       | 3.0.0  | MIT          |
| <b>debug</b>                             | 4.3.1  | MIT          |
| <b>entities</b>                          | 2.2.0  | BSD-2-Clause |
| <b>events</b>                            | 3.3.0  | MIT          |

|                                 |               |                |
|---------------------------------|---------------|----------------|
| <b>exifr</b>                    | 6.3.0         | MIT            |
| <b>fabric</b>                   | 5.2.1         | MIT            |
| <b>fast-deep-equal</b>          | 3.1.3         | MIT            |
| <b>fast-diff</b>                | 1.2.0         | Apache-2.0     |
| <b>fast-xml-parser</b>          | 3.19.0        | MIT            |
| <b>flatted</b>                  | 2.0.2         | ISC            |
| <b>fs-extra</b>                 | 8.1.0         | MIT            |
| <b>graceful-fs</b>              | 4.2.8         | ISC            |
| <b>ieee754</b>                  | 1.2.1         | BSD-3-Clause   |
| <b>image-blob-reduce</b>        | 4.1.0         | MIT            |
| <b>inherits</b>                 | 2.0.4         | ISC            |
| <b>isarray</b>                  | 1.0.0         | MIT            |
| <b>is-shallow-equal</b>         | 1.0.1         | MIT            |
| <b>jsms</b>                     | 1.0.16        | MIT            |
| <b>jsms-ext-chromium</b>        | 2.0.0-alpha.0 | MIT            |
| <b>jsonfile</b>                 | 4.0.0         | MIT            |
| <b>json-schema-traverse</b>     | 1.0.0         | MIT            |
| <b>lodash</b>                   | 4.17.21       | MIT            |
| <b>lodash.clonedeep</b>         | 4.5.0         | MIT            |
| <b>lodash.debounce</b>          | 4.0.8         | MIT            |
| <b>lodash.isequal</b>           | 4.5.0         | MIT            |
| <b>lodash.throttle</b>          | 4.1.1         | MIT            |
| <b>log4js</b>                   | 6.3.0         | Apache-2.0     |
| <b>math-log2</b>                | 1.0.1         | MIT            |
| <b>memoize-one</b>              | 5.2.1         | MIT            |
| <b>mime-match</b>               | 1.0.2         | ISC            |
| <b>ms</b>                       | 2.1.2         | MIT            |
| <b>namespace-emit</b>           | 2.0.1         | MIT            |
| <b>node-libs-browser</b>        | 2.2.1         | MIT            |
| <b>object-assign</b>            | 4.1.1         | MIT            |
| <b>pako</b>                     | 1.0.11        | (MIT AND Zlib) |
| <b>path-browserify</b>          | 0.0.1         | MIT            |
| <b>pinia</b>                    | 2.0.11        | MIT            |
| <b>preact</b>                   | 8.2.9         | MIT            |
| <b>process-nextick-args</b>     | 2.0.1         | MIT            |
| <b>quill</b>                    | 1.3.7         | BSD-3-Clause   |
| <b>quill-delta</b>              | 4.2.2         | MIT            |
| <b>readable-stream</b>          | 3.6.0         | MIT            |
| <b>resize-observer-polyfill</b> | 1.5.1         | MIT            |
| <b>rfdc</b>                     | 1.3.0         | MIT            |
| <b>rxjs</b>                     | 7.5.2         | Apache-2.0     |
| <b>safe-buffer</b>              | 5.2.1         | MIT            |

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|-------------------------------|--------|--------------|
| <b>shallow-equal</b>          | 1.2.1  | MIT          |
| <b>stream-browserify</b>      | 3.0.0  | MIT          |
| <b>streamroller</b>           | 2.2.4  | MIT          |
| <b>string_decoder</b>         | 1.3.0  | MIT          |
| <b>tslib</b>                  | 1.14.1 | 0BSD         |
| <b>universalify</b>           | 0.1.2  | MIT          |
| <b>uri-js</b>                 | 4.4.1  | BSD-2-Clause |
| <b>util</b>                   | 0.11.1 | MIT          |
| <b>util-deprecate</b>         | 1.0.2  | MIT          |
| <b>uuid</b>                   | 8.3.2  | MIT          |
| <b>vue</b>                    | 2.6.14 | MIT          |
| <b>vue-class-component</b>    | 7.2.6  | MIT          |
| <b>vue-demi</b>               | 0.12.1 | MIT          |
| <b>vue-i18n</b>               | 8.26.7 | MIT          |
| <b>vue-i18n-composable</b>    | 0.2.2  | MIT          |
| <b>vue-loader</b>             | 15.9.8 | MIT          |
| <b>vue-property-decorator</b> | 9.1.2  | MIT          |
| <b>vue-shortkey</b>           | 3.1.7  | MIT          |
| <b>vuetify</b>                | 2.6.3  | MIT          |
| <b>vuetify-loader</b>         | 1.7.3  | MIT          |
| <b>vuex</b>                   | 3.6.2  | MIT          |
| <b>webpack</b>                | 4.46.0 | MIT          |
| <b>wildcard</b>               | 1.1.2  | MIT          |

## 7.4 C++

| Name                                     | Version  | License   |
|--|--|---|
| <b>Java Servlet API</b>                  | 3.1.0  | <a href="#">CDDL1</a>   |
| <b>Eclipse</b>                           | 3.5.0  | <a href="#">Eclipse Foundation Software User Agreement</a>                    |
| <b>Spring</b>                            | 3.2.4  | <a href="https://pivotal.io/terms-of-use">https://pivotal.io/terms-of-use</a> |
| <b>Java Mail</b>                         | 1.4.1  | <a href="#">CDDL1</a>   |
| <b>Java Inject</b>                       | 1.0.0  | <a href="#">Apache License 2.0</a>  |
| <b>Java Native Access</b>                | 4.1.0  | <a href="#">Apache License 2.0</a>  |
| <b>Google Guice</b>                      | 4.2.0  | <a href="#">Apache License 2.0</a>  |
| <b>Google Guava</b>                      | 28.1-jre   | <a href="#">Apache License 2.0</a>  |
| <b>Google Soundlibs</b>                  | 1.9.5  | <a href="#">Apache License 2.0</a>  |
| <b>Saxon</b>                             | 8.8.0  | <a href="#">Mozilla Public License</a>  |
| <b>Jaxen</b>                             | 1.1.1  | <a href="#">The Werken Company License</a>                                    |
| <b>Jackson</b>                           | jackson:2.9.5<br>jackson-asl:1.9.9   | <a href="#">Apache License 2.0</a>  |
| <b>JSON</b>                              | 1.1.0  | Public Domain   |
| <b>JSON Smart</b>                        | 1.2.0  | -   |
| <b>Jayway JSON Path</b>                  | 0.9.1  | <a href="#">Apache License 2.0</a>  |
| <b>Apache Commons</b>                    | io:2.5<br>codec:1.6.0<br>compress:1.8.1<br>collections:3.2.1<br>lang:2.4.0<br>logging:1.1.1<br>bcel:5.2.0<br>xml:1.3.4 | <a href="#">Apache License 2.0</a>  |
| <b>Apache ServiceMix</b>                 | 2.0.3  | <a href="#">Apache License 2.0</a>  |
| <b>Apache HttpComponents</b>             | HttpClient: 4.5.9<br>HttpCore: 4.4.11<br>HttpMime: 4.5.9   | <a href="#">Apache License 2.0</a>  |
| <b>Apache Jakarta POI</b>                | 3.8.0  | <a href="#">Apache License 2.0</a>  |
| <b>Apache XML Commons</b>                | 11.2.0   | <a href="#">Apache License 2.0</a>  |
| <b>Apache Xalan XML Serializer</b>       | 12.7.1   | <a href="#">Apache License 2.0</a>  |
| <b>Apache Xerces XML Support</b>         | 12.9.1   | <a href="#">Apache License 2.0</a>  |
| <b>Apache Regular Expression Library</b> | 11.5.0   | <a href="#">Apache License 2.0</a>  |
| <b>Apache Ant</b>                        | 11.8.1   | <a href="#">Apache License 2.0</a>  |
| <b>Apache Batik</b>                      | 11.7.0   | <a href="#">Apache License 2.0</a>  |

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|--|--|---|
| <b>Apache Log4J</b>                                | 11.2.16  | <a href="#">Apache License 2.0</a>  |
| <b>Apache Groovy</b>                               | 12.0.1   | <a href="#">Apache License 2.0</a>  |
| <b>AspectJ</b>                                     | 11.6.12  | <a href="#">EPL</a>   |
| <b>Code Generation Library</b>                     | 12.2.0   | <a href="#">Apache License 2.0</a>  |
| <b>Antlr</b>                                       | 12.7.7   | <a href="http://www.antlr2.org/license.html">http://www.antlr2.org/license.html</a>   |
| <b>JTidy</b>                                       | 10.0.0-r938  | <a href="http://jtidy.sourceforge.net/license.html">http://jtidy.sourceforge.net/license.html</a>   |
| <b>Objenesis</b>                                   | 11.2.0   | <a href="#">Apache License 2.0</a>  |
| <b>JSoup</b>                                       | 11.5.2   | <a href="#">MIT</a>   |
| <b>SAC</b>   | 11.3.0   | <a href="https://www.w3.org/Consortium/Legal/2002/copyright-software-20021231">https://www.w3.org/Consortium/Legal/2002/copyright-software-20021231</a> |
| <b>Castor</b>                                      | 11.2.0   | <a href="#">Apache License 2.0</a>  |
| <b>AOP Alliance</b>                                | 11.0.0   | Public Domain   |
| <b>HTML Cleaner</b>                                | 12.7.0   | <a href="#">BSD</a>   |
| <b>Hibernate Validator</b>                         | 14.2.0   | <a href="#">Apache License 2.0</a>  |
| <b>Equals Verifier</b>                             | 11.7.5   | <a href="#">Apache License 2.0</a>  |
| <b>JDeferred</b>                                   | 11.2.3   | <a href="#">Apache License 2.0</a>  |
| <b>JDOM</b>  | 11.1.0 and 2.0.5   | <a href="#">Apache-style open source license</a>  |
| <b>Java Hamcrest</b>                               | 11.3.0   | <a href="#">BSD-3-Clause</a>  |
| <b>ObjectWeb ASM</b>                               | 11.5.3   | <a href="http://asm.ow2.org/license.html">http://asm.ow2.org/license.html</a>   |
| <b>Joda Time</b>                                   | 12.10.4  | <a href="#">Apache License 2.0</a>  |
| <b>SLF4J</b>                                       | 11.7.7   | <a href="http://www.slf4j.org/license.html">http://www.slf4j.org/license.html</a>   |
| <b>Hunspell</b>                                    | 11.3.2   | <a href="#">LGPL</a>  |
| <b>JACOB - Java COM Bridge</b>                     | 11.17  | <a href="#">LGPL</a>  |
| <b>LAME</b>  | 13.97  | <a href="#">LGPL</a>  |
| <b>MP3 SPI for Java™ Sound</b>                     | 11.9.5   | <a href="#">LGPL</a>  |
| <b>Java Access Bridge (optional for recording)</b> | 12.0.4,<br>22.0.5,<br>7.0.760.13,<br>8.0.20.26,<br>8.0.40.26 | <a href="#">Oracle Binary Code License Agreement</a>  |
| <b>CXImage</b>                                     | 6.0.0  | <a href="#">zlib/libpng License (Zlib)</a>  |
| <b>libpng</b>                                      | 1.2.24   | <a href="#">libpng license</a>  |
| <b>TinyXML++</b>                                   | 2.5.3  | <a href="#">MIT/ZLib</a>  |
| <b>Zlib</b>  | 1.2.11   | <a href="#">ZLib</a>  |
| <b>TessdII</b>                                     | 2.04   | <a href="#">Apache License 2.0</a>  |
| <b>Crypto++</b>                                    | 5.6.3  | <a href="#">Boost Software License 1.0</a>  |
| <b>Polymer</b>                                     | 1.0.6  | <a href="#">BSD</a>   |
| <b>MediatorJs</b>                                  | ~0.9.7   | <a href="#">MIT</a>   |
| <b>jQuery</b>                                      | ~2.1.1   | <a href="#">MIT</a>   |
| <b>jQuery.dotdotdot</b>                            | 1.7.2  | <a href="#">MIT</a>   |
| <b>jquery-simple-combobox</b>                      | 1.1.16   | <a href="#">MIT</a>   |
| <b>node-uuid</b>                                   | ~1.4.1   | <a href="#">MIT</a>   |
| <b>Chromium Embedded Framework</b>                 | 99.2.9.0   | <a href="#">BSD</a>   |
| <b>Chromium</b>                                    | ttkf client:<br>99.0.4844.51                                 | <a href="#">BSD</a> , <a href="#">LGPL</a> , <a href="#">MIT</a>  |

QuickAccess:  
99.0.4844.51

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|---|---------|---|
| <b>C++ REST SDK</b>                               | 2.10.16 | <a href="#">Apache License 2.0</a>  |
| <b>Juniversalchardet</b>                          | 2.0.0   | <a href="#">Mozilla Public License 1.1</a>  |
| <b>JCrop</b>                                      | 2.0.4   | <a href="#">MIT</a>   |
| <b>International Components for Unicode (ICU)</b> | 4.0.1   | <a href="#">IBM ICU License</a>   |
| <b>JSMS (JavaScript Message Service)</b>          | 1.0.16  | <a href="#">MIT</a>   |
| <b>JSMS Chromium Extension</b>                    | 2.0.2   | <a href="#">MIT</a>   |
| <b>Vue</b>  | 2.6.14  | <a href="#">MIT</a>   |
| <b>Vuetify</b>                                    | 2.5.10  | <a href="#">MIT</a>   |
| <b>WinToast</b>                                   | 1.2.0   | <a href="#">MIT</a>   |
| <b>Boost</b>                                      | 1.74    | <a href="https://www.boost.org/users/license.html">https://www.boost.org/users/license.html</a><br>(Boost Software License) |

## 7.5 Server

| Name   | Version  | License                     |
|--|----------|-----------------------------|
| <b>AntLR Parser Generator</b>                  | 2.7.7    | BSD License                 |
| <b>Not Yet Commons SSL</b>                     | 0.3.11   | Apache License v2           |
| <b>XMP Library for Java</b>                    | 6.0.6    | The BSD License             |
| <b>AWS Java SDK for Amazon CloudWatch</b>      | 1.11.890 | Apache License, Version 2.0 |
| <b>AWS Java SDK for Amazon CloudWatch</b>      | 1.12.147 | Apache License, Version 2.0 |
| <b>AWS SDK for Java - Core</b>                 | 1.11.890 | Apache License, Version 2.0 |
| <b>AWS SDK for Java - Core</b>                 | 1.12.131 | Apache License, Version 2.0 |
| <b>AWS SDK for Java - Core</b>                 | 1.12.147 | Apache License, Version 2.0 |
| <b>AWS Java SDK for AWS KMS</b>                | 1.12.147 | Apache License, Version 2.0 |
| <b>AWS Java SDK for Amazon CloudWatch Logs</b> | 1.12.147 | Apache License, Version 2.0 |

|   |          |  |
|---|----------|--|
| <b>AWS Java SDK for Amazon S3</b>           | 1.12.147 | Apache License, Version 2.0              |
| <b>AWS Java SDK for AWS Secrets Manager</b> | 1.12.131 | Apache License, Version 2.0              |
| <b>ElastiCacheJavaClusterClient</b>         | 1.1.2    | Apache 2.0 License                       |
| <b>JMES Path Query library</b>              | 1.11.890 | Apache License, Version 2.0              |
| <b>JMES Path Query library</b>              | 1.12.131 | Apache License, Version 2.0              |
| <b>JMES Path Query library</b>              | 1.12.147 | Apache License, Version 2.0              |
| <b>HPPC Collections</b>                     | 0.8.1    | The Apache Software License, Version 2.0 |
| <b>com.drewnoakes:metadata-extractor</b>    | 2.12.0   | The Apache Software License, Version 2.0 |
| <b>Esri Geometry API for Java</b>           | 2.2.0    | The Apache Software License, Version 2.0 |
| <b>Jackson-annotations</b>                  | 2.12.3   | The Apache Software License, Version 2.0 |
| <b>Jackson-annotations</b>                  | 2.13.1   | The Apache Software License, Version 2.0 |
| <b>Jackson-core</b>                         | 2.12.3   | The Apache Software License, Version 2.0 |
| <b>Jackson-core</b>                         | 2.13.1   | The Apache Software License, Version 2.0 |
| <b>jackson-databind</b>                     | 2.11.4   | The Apache Software License, Version 2.0 |
| <b>jackson-databind</b>                     | 2.12.3   | The Apache Software License, Version 2.0 |
| <b>jackson-databind</b>                     | 2.13.1   | The Apache Software License, Version 2.0 |
| <b>Jackson dataformat: CBOR</b>             | 2.12.3   | The Apache Software License, Version 2.0 |
| <b>Jackson dataformat: CBOR</b>             | 2.13.1   | The Apache Software License, Version 2.0 |
| <b>Jackson dataformat: Smile</b>            | 2.12.3   | The Apache Software License, Version 2.0 |
| <b>Jackson datatype: JSR310</b>             | 2.13.1   | The Apache Software License, Version 2.0 |
| <b>jackson-module-jsonSchema</b>            | 2.13.1   | The Apache Software License, Version 2.0 |
| <b>Woodstox</b>                             | 6.2.4    | The Apache License, Version 2.0          |
| <b>ClassMate</b>                            | 1.3.1    | The Apache Software License, Version 2.0 |

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|--|---|---|
| <b>ClassMate</b>   | 1.5.1                                     | Apache License, Version 2.0   |
| <b>Caffeine cache</b>  | 2.8.0                                     | Apache License, Version 2.0   |
| <b>Caffeine cache</b>  | 2.9.2                                     | Apache License, Version 2.0   |
| <b>JSON.simple</b>   | 3.0.2                                     | The Apache Software License, Version 2.0  |
| <b>better-files</b>  | 3.9.1                                     | MIT   |
| <b>waffle-jna</b>  | 2.1.0                                     | Eclipse Public License  |
| <b>Java SemVer</b>   | 0.9.0                                     | The MIT License   |
| <b>FindBugs-jsr305</b>                                       | 3.0.2                                     | The Apache Software License, Version 2.0  |
| <b>error-prone annotations</b>                               | 2.3.3                                     | Apache 2.0  |
| <b>error-prone annotations</b>                               | 2.7.1                                     | Apache 2.0  |
| <b>Guava InternalFutureFailureAccess and InternalFutures</b> | 1.0.1                                     | The Apache Software License, Version 2.0  |
| <b>Guava: Google Core Libraries for Java</b>                 | 31.0.1-jre                                | Apache License, Version 2.0   |
| <b>Guava ListenableFuture only</b>                           | 9999.0-empty-to-avoid-conflict-with-guava | The Apache Software License, Version 2.0  |
| <b>J2ObjC Annotations</b>                                    | 1.3                                       | The Apache Software License, Version 2.0  |
| <b>Protocol Buffers [Core]</b>                               | 3.11.0                                    | 3-Clause BSD License  |
| <b>RE2/J</b>   | 1.2                                       | Go License  |
| <b>Diff, Match and Patch libraries for Plain Text</b>        | 0.0.0-20120106                            | Apache 2.0  |
| <b>ICU4J</b>   | 68.2                                      | Unicode/ICU License   |
| <b>project ':json-path'</b>                                  | 2.4.0                                     | The Apache Software License, Version 2.0  |
| <b>project ':json-path'</b>                                  | 2.6.0                                     | The Apache Software License, Version 2.0  |
| <b>Disruptor Framework</b>                                   | 3.4.2                                     | The Apache Software License, Version 2.0  |
| <b>mchange-commons-java</b>                                  | 0.2.15                                    | Eclipse Public License, Version 1.0<br>GNU Lesser General Public License, Version 2.1 |
| <b>Dependency Injection for Java</b>                         | 1.0.0                                     | CDDL 1.0  |
| <b>CGLIB Code Generation Library</b>                         | 2.2.0                                     | Apache 2.0  |
| <b>Apache Commons HTTP Client</b>                            | 3.1.0                                     | Apache  |
| <b>Apache Commons Logging</b>                                | 1.1.1                                     | Apache 2.0  |
| <b>Apache Xalan XML Serializer</b>                           | 2.7.1                                     | Apache 2.0  |
| <b>Apache Xalan XSLT Support</b>                             | 2.7.1                                     | Apache 2.0  |
| <b>Proxool JDBC connection pool</b>                          | 0.9.1                                     | Proxool   |



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|---|----------------|---|
| <b>com.springsource.org.w3c.css.sac</b>   | 1.3.0          | W3C   |
| <b>JDOM DOM Processor</b>                 | 1.1.0          | Apache  |
| <b>Objenesis</b>                          | 1.2.0          | Apache 2.0                                      |
| <b>Jakarta Activation</b>                 | 1.2.2          | EDL 1.0   |
| <b>istack common utility code runtime</b> | 3.0.11         | Eclipse Distribution License - v 1.0            |
| <b>istack common utility code runtime</b> | 3.0.7          | CDDL 1.1<br>GPL2 w/ CPE                         |
| <b>JavaMail API</b>                       | 1.6.2          | CDDL/GPLv2+CE                                   |
| <b>Old JAXB Core</b>                      | 2.3.0.1        | CDDL+GPL License                                |
| <b>Old JAXB Runtime</b>                   | 2.3.2          | Eclipse Distribution License - v 1.0            |
| <b>fastinfoset</b>                        | 1.2.15         | Apache License, Version 2.0                     |
| <b>Jakarta SOAP Implementation</b>        | 1.5.2          | Eclipse Distribution License - v 1.0            |
| <b>T-Digest</b>                           | 3.1            | The Apache Software License, Version 2.0        |
| <b>ArchUnit</b>                           | 0.22.0         | BSD<br>The Apache Software License, Version 2.0 |
| <b>tts-struts-patched</b>                 | 1.2.10-patched | Apache  |
| <b>akka-actor</b>                         | 2.5.31         | Apache License, Version 2.0                     |
| <b>akka-http-core</b>                     | 10.1.12        | Apache-2.0                                      |
| <b>akka-http</b>                          | 10.1.12        | Apache-2.0                                      |
| <b>akka-parsing</b>                       | 10.1.12        | Apache-2.0                                      |
| <b>akka-protobuf</b>                      | 2.5.31         | Apache License, Version 2.0                     |
| <b>akka-stream</b>                        | 2.5.31         | Apache License, Version 2.0                     |
| <b>scala-logging</b>                      | 3.9.2          | Apache 2.0 License                              |
| <b>config</b>                             | 1.3.3          | Apache License, Version 2.0                     |
| <b>ssl-config-core</b>                    | 0.3.8          | Apache-2.0                                      |
| <b>SparseBitSet</b>                       | 1.2            | The Apache Software License, Version 2.0        |
| <b>Apache Commons BeanUtils</b>           | 1.9.4          | Apache License, Version 2.0                     |
| <b>Apache Commons CLI</b>                 | 1.4            | Apache License, Version 2.0                     |
| <b>Apache Commons Codec</b>               | 1.15           | Apache License, Version 2.0                     |
| <b>Apache Commons Collections</b>         | 3.2.2          | Apache License, Version 2.0                     |

|   |        |  |
|---|--------|--|
| <b>Commons Digester</b>                             | 2.1    | The Apache Software License, Version 2.0 |
| <b>Apache Commons FileUpload</b>                    | 1.4    | Apache License, Version 2.0              |
| <b>HttpClient</b>                                   | 3.1    | Apache License                           |
| <b>Apache Commons IO</b>                            | 2.11.0 | Apache License, Version 2.0              |
| <b>Commons Lang</b>                                 | 2.6    | The Apache Software License, Version 2.0 |
| <b>Commons Logging</b>                              | 1.1.1  | The Apache Software License, Version 2.0 |
| <b>Commons Logging</b>                              | 1.1.3  | The Apache Software License, Version 2.0 |
| <b>Apache Commons Logging</b>                       | 1.2    | The Apache Software License, Version 2.0 |
| <b>User-Agent-Utils</b>                             | 1.21   | New BSD License                          |
| <b>Metrics Core</b>                                 | 4.0.7  | Apache License 2.0                       |
| <b>Metrics Core</b>                                 | 4.1.5  | Apache License 2.0                       |
| <b>Graphite Integration for Metrics</b>             | 4.1.5  | Apache License 2.0                       |
| <b>Metrics Integration for Jetty 9.3 and higher</b> | 4.1.5  | Apache License 2.0                       |
| <b>Metrics Integration with JMX</b>                 | 4.0.7  | Apache License 2.0                       |
| <b>Metrics Integration with JMX</b>                 | 4.1.5  | Apache License 2.0                       |
| <b>JVM Integration for Metrics</b>                  | 4.1.5  | Apache License 2.0                       |
| <b>s3mock</b>                                       | 0.2.6  | MIT                                      |
| <b>micrometer-core</b>                              | 1.6.5  | The Apache Software License, Version 2.0 |
| <b>micrometer-registry-cloudwatch</b>               | 1.6.5  | The Apache Software License, Version 2.0 |
| <b>micrometer-registry-jmx</b>                      | 1.6.5  | The Apache Software License, Version 2.0 |
| <b>micrometer-registry-prometheus</b>               | 1.6.5  | The Apache Software License, Version 2.0 |
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| <b>Scala Library</b>                  | 2.13.2  | Apache-2.0  |
| <b>Scala Compiler</b>                 | 2.13.0  | Apache-2.0  |
| <b>JCL 1.2 implemented over SLF4J</b> | 1.7.24  | MIT License   |
| <b>SLF4J API Module</b>               | 1.7.24  | MIT License   |
| <b>SLF4J API Module</b>               | 1.7.25  | MIT License   |
| <b>SLF4J API Module</b>               | 1.7.30  | MIT License   |

|   |               |  |
|---|---------------|--|
| <b>Spring Batch Core</b>                  | 4.3.4         | The Apache Software License, Version 2.0 |
| <b>Spring Batch Infrastructure</b>        | 4.3.4         | The Apache Software License, Version 2.0 |
| <b>Spring Batch Test</b>                  | 4.3.4         | The Apache Software License, Version 2.0 |
| <b>spring-boot</b>                        | 2.4.11        | Apache License, Version 2.0              |
| <b>spring-boot-actuator</b>               | 2.4.11        | Apache License, Version 2.0              |
| <b>spring-boot-actuator-autoconfigure</b> | 2.4.11        | Apache License, Version 2.0              |
| <b>spring-boot-autoconfigure</b>          | 2.4.11        | Apache License, Version 2.0              |
| <b>Spring REST Docs Core</b>              | 2.0.5.RELEASE | The Apache Software License, Version 2.0 |
| <b>Spring REST Docs Core</b>              | 2.0.6.RELEASE | The Apache Software License, Version 2.0 |
| <b>Spring REST Docs MockMvc</b>           | 2.0.5.RELEASE | The Apache Software License, Version 2.0 |
| <b>Spring REST Docs MockMvc</b>           | 2.0.6.RELEASE | The Apache Software License, Version 2.0 |
| <b>Spring Retry</b>                       | 1.3.1         | Apache 2.0                               |
| <b>OAuth2 for Spring Security</b>         | 2.5.1.RELEASE | Apache 2.0                               |
| <b>spring-security-config</b>             | 5.6.1         | Apache License, Version 2.0              |
| <b>spring-security-core</b>               | 5.6.1         | Apache License, Version 2.0              |
| <b>spring-security-crypto</b>             | 5.6.1         | Apache License, Version 2.0              |
| <b>spring-security-web</b>                | 5.6.1         | Apache License, Version 2.0              |
| <b>spring-ws-core</b>                     | 3.1.2         | Apache License, Version 2.0              |
| <b>spring-xml</b>                         | 3.1.2         | Apache License, Version 2.0              |
| <b>Spring AOP</b>                         | 5.3.18        | Apache License, Version 2.0              |
| <b>Spring Beans</b>                       | 5.3.18        | Apache License, Version 2.0              |
| <b>Spring Context</b>                     | 5.3.18        | Apache License, Version 2.0              |
| <b>Spring Context Support</b>             | 5.3.18        | Apache License, Version 2.0              |
| <b>Spring Core</b>                        | 5.3.18        | Apache License, Version 2.0              |

|  |                |  |
|--|----------------|--|
| <b>Spring Expression Language (SpEL)</b>                   | 5.3.18         | Apache License, Version 2.0              |
| <b>Spring Commons Logging Bridge</b>                       | 5.3.18         | Apache License, Version 2.0              |
| <b>Spring JDBC</b>   | 5.3.18         | Apache License, Version 2.0              |
| <b>Spring Messaging</b>                                    | 5.3.18         | Apache License, Version 2.0              |
| <b>Spring Object/Relational Mapping</b>                    | 5.3.18         | Apache License, Version 2.0              |
| <b>Spring Object/XML Marshalling</b>                       | 5.3.18         | Apache License, Version 2.0              |
| <b>Spring TestContext Framework</b>                        | 5.3.18         | Apache License, Version 2.0              |
| <b>Spring Transaction</b>                                  | 5.3.18         | Apache License, Version 2.0              |
| <b>Spring Web</b>  | 5.3.18         | Apache License, Version 2.0              |
| <b>Spring WebFlux</b>                                      | 5.3.18         | Apache License, Version 2.0              |
| <b>Spring Web MVC</b>                                      | 5.0.15.RELEASE | Apache License, Version 2.0              |
| <b>Spring Web MVC</b>                                      | 5.3.18         | Apache License, Version 2.0              |
| <b>Spring WebSocket</b>                                    | 5.3.18         | Apache License, Version 2.0              |
| <b>snappy-java</b>   | 1.1.7.6        | Apache-2.0                               |
| <b>SnakeYAML</b>   | 1.26           | Apache License, Version 2.0              |
| <b>Jedis</b>   | 3.7.0          | MIT                                      |
| <b>software.amazon.ion:ion-java</b>                        | 1.0.2          | The Apache License, Version 2.0          |
| <b>Art Technology Group JSON Tag Library</b>               | 0.4.1          | Apache 2.0                               |
| <b>WSDL4J</b>  | 1.6.3          | CPL                                      |
| <b>XML Commons External Components XML APIs</b>            | 1.0.b2         | The Apache Software License, Version 2.0 |
| <b>XML Commons External Components XML APIs Extensions</b> | 1.3.04         | The Apache Software License, Version 2.0 |

## 7.6 Server npm

| Package                         | Version(s) | License             |
|---------------------------------|------------|---------------------|
| <b>abortcontroller-polyfill</b> | 1.7.3      | <a href="#">MIT</a> |
| <b>adm-zip</b>                  | 0.5.9      | <a href="#">MIT</a> |

|                                |        |                              |
|--------------------------------|--------|------------------------------|
| <b>adm-zip</b>                 | 0.5.5  | <a href="#">MIT</a>          |
| <b>ajv</b>                     | 8.6.1  | <a href="#">MIT</a>          |
| <b>assert</b>                  | 2.0.0  | <a href="#">MIT</a>          |
| <b>available-typed-arrays</b>  | 1.0.5  | <a href="#">MIT</a>          |
| <b>axios</b>                   | 0.25.0 | <a href="#">MIT</a>          |
| <b>@babel/polyfill</b>         | 7.12.1 | <a href="#">MIT</a>          |
| <b>@babel/polyfill</b>         | 7.2.5  | <a href="#">MIT</a>          |
| <b>@babel/runtime</b>          | 7.15.4 | <a href="#">MIT</a>          |
| <b>@babel/runtime</b>          | 7.12.1 | <a href="#">MIT</a>          |
| <b>base64-js</b>               | 1.5.1  | <a href="#">MIT</a>          |
| <b>browserify-zlib</b>         | 0.2.0  | <a href="#">MIT</a>          |
| <b>buffer</b>                  | 6.0.3  | <a href="#">MIT</a>          |
| <b>call-bind</b>               | 1.0.2  | <a href="#">MIT</a>          |
| <b>chunked-file-reader</b>     | 0.0.3  | <a href="#">MIT</a>          |
| <b>classnames</b>              | 2.3.1  | <a href="#">MIT</a>          |
| <b>core-js</b>                 | 2.6.12 | <a href="#">MIT</a>          |
| <b>core-js</b>                 | 2.6.2  | <a href="#">MIT</a>          |
| <b>cuid</b>                    | 2.1.8  | <a href="#">MIT</a>          |
| <b>define-properties</b>       | 1.1.3  | <a href="#">MIT</a>          |
| <b>es-abstract</b>             | 1.18.6 | <a href="#">MIT</a>          |
| <b>es-to-primitive</b>         | 1.2.1  | <a href="#">MIT</a>          |
| <b>es6-object-assign</b>       | 1.1.0  | <a href="#">MIT</a>          |
| <b>exifr</b>                   | 6.3.0  | <a href="#">MIT</a>          |
| <b>fast-deep-equal</b>         | 3.1.3  | <a href="#">MIT</a>          |
| <b>follow-redirects</b>        | 1.14.9 | <a href="#">MIT</a>          |
| <b>font-roboto</b>             | 1.0.1  | <a href="#">BSD 3-clause</a> |
| <b>foreach</b>                 | 2.0.5  | <a href="#">MIT</a>          |
| <b>fromentries</b>             | 1.3.2  | <a href="#">MIT</a>          |
| <b>function-bind</b>           | 1.1.1  | <a href="#">MIT</a>          |
| <b>get-form-data</b>           | 2.0.0  | <a href="#">MIT</a>          |
| <b>get-intrinsic</b>           | 1.1.1  | <a href="#">MIT</a>          |
| <b>get-symbol-description</b>  | 1.0.0  | <a href="#">MIT</a>          |
| <b>has</b>                     | 1.0.3  | <a href="#">MIT</a>          |
| <b>has-bigints</b>             | 1.0.1  | <a href="#">MIT</a>          |
| <b>has-symbols</b>             | 1.0.2  | <a href="#">MIT</a>          |
| <b>has-tostringtag</b>         | 1.0.0  | <a href="#">MIT</a>          |
| <b>hydrolysis</b>              | 1.19.1 | <a href="#">BSD 3-clause</a> |
| <b>ieee754</b>                 | 1.2.1  | <a href="#">BSD-3-Clause</a> |
| <b>inherits</b>                | 2.0.4  | <a href="#">ISC</a>          |
| <b>internal-slot</b>           | 1.0.3  | <a href="#">MIT</a>          |
| <b>iron-a11y-announcer</b>     | 1.0.3  | <a href="#">BSD 3-clause</a> |
| <b>iron-a11y-keys-behavior</b> | 1.0.6  | <a href="#">BSD 3-clause</a> |

|                                   |        |                              |
|-----------------------------------|--------|------------------------------|
| <b>iron-ajax</b>                  | 1.0.0  | <a href="#">BSD 3-clause</a> |
| <b>iron-autogrow-textarea</b>     | 1.0.6  | <a href="#">BSD 3-clause</a> |
| <b>iron-behaviors</b>             | 1.0.8  | <a href="#">BSD 3-clause</a> |
| <b>iron-component-page</b>        | 1.0.5  | <a href="#">BSD 3-clause</a> |
| <b>iron-doc-viewer</b>            | 1.0.6  | <a href="#">BSD 3-clause</a> |
| <b>iron-flex-layout</b>           | 1.0.4  | <a href="#">BSD 3-clause</a> |
| <b>iron-form-element-behavior</b> | 1.0.4  | <a href="#">BSD 3-clause</a> |
| <b>iron-icon</b>                  | 1.0.5  | <a href="#">BSD 3-clause</a> |
| <b>iron-icons</b>                 | 1.0.4  | <a href="#">BSD 3-clause</a> |
| <b>iron-iconset</b>               | 1.0.3  | <a href="#">BSD 3-clause</a> |
| <b>iron-iconset-svg</b>           | 1.0.5  | <a href="#">BSD 3-clause</a> |
| <b>iron-input</b>                 | 1.0.6  | <a href="#">BSD 3-clause</a> |
| <b>iron-localstorage</b>          | 1.0.5  | <a href="#">BSD 3-clause</a> |
| <b>iron-meta</b>                  | 1.0.3  | <a href="#">BSD 3-clause</a> |
| <b>iron-pages</b>                 | 1.0.0  | <a href="#">BSD 3-clause</a> |
| <b>iron-resizable-behavior</b>    | 1.0.2  | <a href="#">BSD 3-clause</a> |
| <b>iron-selector</b>              | 1.0.5  | <a href="#">BSD 3-clause</a> |
| <b>iron-validatable-behavior</b>  | 1.0.4  | <a href="#">BSD 3-clause</a> |
| <b>is-arguments</b>               | 1.1.1  | <a href="#">MIT</a>          |
| <b>is-bigint</b>                  | 1.0.4  | <a href="#">MIT</a>          |
| <b>is-boolean-object</b>          | 1.1.2  | <a href="#">MIT</a>          |
| <b>is-callable</b>                | 1.2.4  | <a href="#">MIT</a>          |
| <b>is-date-object</b>             | 1.0.5  | <a href="#">MIT</a>          |
| <b>is-generator-function</b>      | 1.0.10 | <a href="#">MIT</a>          |
| <b>is-nan</b>                     | 1.3.2  | <a href="#">MIT</a>          |
| <b>is-negative-zero</b>           | 2.0.1  | <a href="#">MIT</a>          |
| <b>is-number-object</b>           | 1.0.6  | <a href="#">MIT</a>          |
| <b>is-regex</b>                   | 1.1.4  | <a href="#">MIT</a>          |
| <b>is-shallow-equal</b>           | 1.0.1  | <a href="#">MIT</a>          |
| <b>is-string</b>                  | 1.0.7  | <a href="#">MIT</a>          |
| <b>is-symbol</b>                  | 1.0.4  | <a href="#">MIT</a>          |
| <b>is-typed-array</b>             | 1.1.8  | <a href="#">MIT</a>          |
| <b>isomorphic-fetch</b>           | 3.0.0  | <a href="#">MIT</a>          |
| <b>jquery</b>                     | 3.5.1  | MIT                          |
| <b>jquery-dotdotdot</b>           | 1.7.2  | <a href="#">MIT</a>          |
| <b>jsms</b>                       | 1.0.16 | <a href="#">MIT</a>          |
| <b>jsms-ext-chromium</b>          | 1.1.13 | <a href="#">MIT</a>          |
| <b>json-schema-traverse</b>       | 1.0.0  | <a href="#">MIT</a>          |
| <b>lodash.debounce</b>            | 4.0.8  | <a href="#">MIT</a>          |
| <b>lodash.throttle</b>            | 4.1.1  | <a href="#">MIT</a>          |
| <b>@log4js-node/log4js-api</b>    | 1.0.2  | <a href="#">Apache-2.0</a>   |
| <b>marked</b>                     | 0.3.5  | MIT                          |



|                            |         |                              |
|----------------------------|---------|------------------------------|
| <b>marked-element</b>      | 1.1.1   | <a href="#">BSD 3-clause</a> |
| <b>math-log2</b>           | 1.0.1   | <a href="#">MIT</a>          |
| <b>mediator-js</b>         | 0.9.9   | <a href="#">MIT</a>          |
| <b>memoize-one</b>         | 5.2.1   | <a href="#">MIT</a>          |
| <b>mime-match</b>          | 1.0.2   | <a href="#">ISC</a>          |
| <b>namespace-emitter</b>   | 2.0.1   | <a href="#">MIT</a>          |
| <b>nanoid</b>              | 3.2.0   | <a href="#">MIT</a>          |
| <b>node-fetch</b>          | 2.6.7   | <a href="#">MIT</a>          |
| <b>node-uuid</b>           | 1.4.3   | MIT                          |
| <b>object-inspect</b>      | 1.11.0  | <a href="#">MIT</a>          |
| <b>object-is</b>           | 1.1.5   | <a href="#">MIT</a>          |
| <b>object-keys</b>         | 1.1.1   | <a href="#">MIT</a>          |
| <b>object.assign</b>       | 4.1.2   | <a href="#">MIT</a>          |
| <b>original-fs</b>         | 1.1.0   | <a href="#">LGPL-3.0</a>     |
| <b>pako</b>                | 1.0.11  | (MIT AND Zlib)               |
| <b>paper-behaviors</b>     | 1.0.3   | <a href="#">BSD 3-clause</a> |
| <b>paper-button</b>        | 1.0.0   | <a href="#">BSD 3-clause</a> |
| <b>paper-header-panel</b>  | 1.0.1   | <a href="#">BSD 3-clause</a> |
| <b>paper-icon-button</b>   | 1.0.3   | <a href="#">BSD 3-clause</a> |
| <b>paper-input</b>         | 1.0.0   | <a href="#">BSD 3-clause</a> |
| <b>paper-material</b>      | 1.0.2   | <a href="#">BSD 3-clause</a> |
| <b>paper-radio-button</b>  | 1.0.3   | <a href="#">BSD 3-clause</a> |
| <b>paper-radio-group</b>   | 1.0.4   | <a href="#">BSD 3-clause</a> |
| <b>paper-ripple</b>        | 1.0.1   | <a href="#">BSD 3-clause</a> |
| <b>paper-styles</b>        | 1.0.11  | <a href="#">BSD 3-clause</a> |
| <b>paper-toast</b>         | 1.0.0   | <a href="#">BSD 3-clause</a> |
| <b>paper-toolbar</b>       | 1.0.1   | <a href="#">BSD 3-clause</a> |
| <b>polymer</b>             | 1.0.6   | <a href="#">BSD 3-clause</a> |
| <b>preact</b>              | 10.5.14 | <a href="#">MIT</a>          |
| <b>preact</b>              | 8.2.9   | <a href="#">MIT</a>          |
| <b>prism</b>               | 1.1.0   | MIT                          |
| <b>prism-element</b>       | 1.0.2   | <a href="#">BSD 3-clause</a> |
| <b>process</b>             | 0.11.10 | <a href="#">MIT</a>          |
| <b>promise-polyfill</b>    | 1.0.0   | MIT                          |
| <b>punycode</b>            | 2.1.1   | <a href="#">MIT</a>          |
| <b>qs-stringify</b>        | 1.2.1   | <a href="#">MIT</a>          |
| <b>querystringify</b>      | 2.2.0   | <a href="#">MIT</a>          |
| <b>readable-stream</b>     | 3.6.0   | <a href="#">MIT</a>          |
| <b>redux</b>               | 4.1.1   | <a href="#">MIT</a>          |
| <b>regenerator-runtime</b> | 0.13.9  | <a href="#">MIT</a>          |

|                                    |        |                       |
|------------------------------------|--------|-----------------------|
| <b>regenerator-runtime</b>         | 0.13.7 | <a href="#">MIT</a>   |
| <b>require-from-string</b>         | 2.0.2  | <a href="#">MIT</a>   |
| <b>requires-port</b>               | 1.0.0  | <a href="#">MIT</a>   |
| <b>resize-observer-polyfill</b>    | 1.5.1  | <a href="#">MIT</a>   |
| <b>safe-buffer</b>                 | 5.2.1  | <a href="#">MIT</a>   |
| <b>shallow-equal</b>               | 1.2.1  | <a href="#">MIT</a>   |
| <b>side-channel</b>                | 1.0.4  | <a href="#">MIT</a>   |
| <b>spark-md5</b>                   | 3.0.2  | (WTFPL OR MIT)        |
| <b>spark-md5</b>                   | 3.0.1  | <a href="#">WTFPL</a> |
| <b>stream-browserify</b>           | 3.0.0  | <a href="#">MIT</a>   |
| <b>string_decoder</b>              | 1.3.0  | <a href="#">MIT</a>   |
| <b>string.prototype.trimend</b>    | 1.0.4  | <a href="#">MIT</a>   |
| <b>string.prototype.trimstart</b>  | 1.0.4  | <a href="#">MIT</a>   |
| <b>tr46</b>                        | 0.0.3  | <a href="#">MIT</a>   |
| <b>@transloadit/prettier-bytes</b> | 0.0.7  | <a href="#">MIT</a>   |
| <b>ts-md5</b>                      | 1.2.9  | <a href="#">MIT</a>   |
| <b>@types/adm-zip</b>              | 0.4.34 | <a href="#">MIT</a>   |
| <b>@types/node</b>                 | 14.6.1 | <a href="#">MIT</a>   |
| <b>unbox-primitive</b>             | 1.0.1  | <a href="#">MIT</a>   |
| <b>@uppy/aws-s3</b>                | 2.0.3  | <a href="#">MIT</a>   |
| <b>@uppy/aws-s3</b>                | 1.8.0  | <a href="#">MIT</a>   |
| <b>@uppy/companion-client</b>      | 2.0.1  | <a href="#">MIT</a>   |
| <b>@uppy/companion-client</b>      | 1.10.2 | <a href="#">MIT</a>   |
| <b>@uppy/core</b>                  | 2.0.3  | <a href="#">MIT</a>   |
| <b>@uppy/core</b>                  | 1.20.1 | <a href="#">MIT</a>   |
| <b>@uppy/dashboard</b>             | 2.0.3  | <a href="#">MIT</a>   |
| <b>@uppy/dashboard</b>             | 1.21.1 | <a href="#">MIT</a>   |
| <b>@uppy/drag-drop</b>             | 1.4.31 | <a href="#">MIT</a>   |
| <b>@uppy/form</b>                  | 2.0.2  | <a href="#">MIT</a>   |
| <b>@uppy/informer</b>              | 2.0.2  | <a href="#">MIT</a>   |
| <b>@uppy/informer</b>              | 1.6.6  | <a href="#">MIT</a>   |
| <b>@uppy/locales</b>               | 2.0.1  | <a href="#">MIT</a>   |
| <b>@uppy/progress-bar</b>          | 1.3.30 | <a href="#">MIT</a>   |
| <b>@uppy/provider-views</b>        | 2.0.2  | <a href="#">MIT</a>   |
| <b>@uppy/provider-views</b>        | 1.12.3 | <a href="#">MIT</a>   |
| <b>@uppy/status-bar</b>            | 2.0.2  | <a href="#">MIT</a>   |
| <b>@uppy/status-bar</b>            | 1.9.6  | <a href="#">MIT</a>   |
| <b>@uppy/store-default</b>         | 2.0.0  | <a href="#">MIT</a>   |
| <b>@uppy/store-default</b>         | 1.2.7  | <a href="#">MIT</a>   |
| <b>@uppy/thumbnail-generator</b>   | 2.0.3  | <a href="#">MIT</a>   |
| <b>@uppy/thumbnail-generator</b>   | 1.7.11 | <a href="#">MIT</a>   |
| <b>@uppy/utils</b>                 | 4.0.1  | <a href="#">MIT</a>   |

|                               |        |                              |
|-------------------------------|--------|------------------------------|
| <b>@uppy/utils</b>            | 3.6.2  | <a href="#">MIT</a>          |
| <b>@uppy/vue</b>              | 0.2.7  | MIT                          |
| <b>@uppy/xhr-upload</b>       | 2.0.3  | <a href="#">MIT</a>          |
| <b>@uppy/xhr-upload</b>       | 1.7.5  | <a href="#">MIT</a>          |
| <b>uri-js</b>                 | 4.4.0  | <a href="#">BSD-2-Clause</a> |
| <b>url-parse</b>              | 1.5.9  | <a href="#">MIT</a>          |
| <b>util</b>                   | 0.12.4 | <a href="#">MIT</a>          |
| <b>util-deprecate</b>         | 1.0.2  | <a href="#">MIT</a>          |
| <b>uuid</b>                   | 8.3.2  | <a href="#">MIT</a>          |
| <b>vue</b>                    | 2.6.14 | <a href="#">MIT</a>          |
| <b>vue-class-component</b>    | 7.2.6  | <a href="#">MIT</a>          |
| <b>vue-i18n</b>               | 8.24.5 | <a href="#">MIT</a>          |
| <b>vue-property-decorator</b> | 9.1.2  | <a href="#">MIT</a>          |
| <b>vuetify</b>                | 2.6.4  | <a href="#">MIT</a>          |
| <b>webcomponentsjs</b>        | 0.7.14 | BSD                          |
| <b>webidl-conversions</b>     | 3.0.1  | <a href="#">BSD-2-Clause</a> |
| <b>whatwg-fetch</b>           | 3.6.2  | <a href="#">MIT</a>          |
| <b>whatwg-url</b>             | 5.0.0  | <a href="#">MIT</a>          |
| <b>which-boxed-primitive</b>  | 1.0.2  | <a href="#">MIT</a>          |
| <b>which-typed-array</b>      | 1.1.7  | <a href="#">MIT</a>          |
| <b>wildcard</b>               | 1.1.2  | <a href="#">MIT</a>          |

## 7.7 JS Libraries

| Name                           | Version    | License                                    |
|--------------------------------|------------|--|
| <b>hashmap.js</b>              | -          | <a href="#">BSD-3-Clause</a>               |
| <b>json2.js</b>                | 2012-10-08 | Public Domain                              |
| <b>Prototype</b>               | 1.6.1      | <a href="#">MIT</a>                        |
| <b>zip.js</b>                  | -          | <a href="#">BSD-3-Clause</a>               |
| <b>ttn.bd.docportal</b>        |            |  |
| <b>Bootstrap: carousel.js</b>  | 3.1.0      | <a href="#">MIT</a>                        |
| <b>Hammer.js</b>               | 1.0.6      | <a href="#">MIT</a>                        |
| <b>iscroll.js</b>              | 4.1.9      | <a href="#">MIT</a>                        |
| <b>jQuery Plugin: Autosize</b> | 1.17.2     | <a href="#">MIT</a>                        |
| <b>jCaret</b>                  | 1.02       | <a href="#">MIT</a>                        |
| <b>Clearable Text Field</b>    | 0.3.2      | <a href="#">MIT</a> OR <a href="#">GPL</a> |

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|--|-------------------------------|---------------------------------------|
|  |                               | <i>Dual-licensed, we can use MIT.</i> |
| <b>Hammer.js jQuery Plugin</b>   | 1.0.0                         | <a href="#">MIT</a>                   |
| <b>Infinite Scroll PACKAGED</b>  | 4.0.1                         | Commercial license, purchased         |
| <b>jQuery Infinite Scroll</b>  | 2.0b2.120519                  | MIT                                   |
| <b>jQuery custom content scroller</b>  | 2.3.2                         | <a href="#">MIT</a>                   |
| <b>jQuery Mousewheel</b>   | 3.0.6                         | <a href="#">MIT</a>                   |
| <b>jQuery Tag-it!</b>  | 2.0                           | <a href="#">MIT</a>                   |
| <b>jQuery</b>  | 1.12.4                        | <a href="#">MIT</a>                   |
| <b>jQuery UI</b>   | 1.12.1                        | <a href="#">MIT</a>                   |
| <b>JSMS</b>  | 1.0.16                        | <a href="#">MIT</a>                   |
| <b>JSMS extension for integration of Chromium Embedded Framework (CEF) clients</b> | 2.0.0-alpha.0                 | <a href="#">MIT</a>                   |
| <b>json2.js</b>  | 2012-10-08                    | Public Domain                         |
| <b>Prototype</b>   | 1.7.1                         | <a href="#">MIT</a>                   |
| <b>jQuery File Upload Plugin &amp; jQuery Iframe Transport Plugin</b>              | 5.19.7<br>1.2.1<br>7.0<br>1.5 | <a href="#">MIT</a>                   |
| <b>TabFocus Script</b>   | 1.0                           | Free for private and commercial use   |
| <b>UUID</b>  | 8.3.2                         | <a href="#">MIT</a>                   |