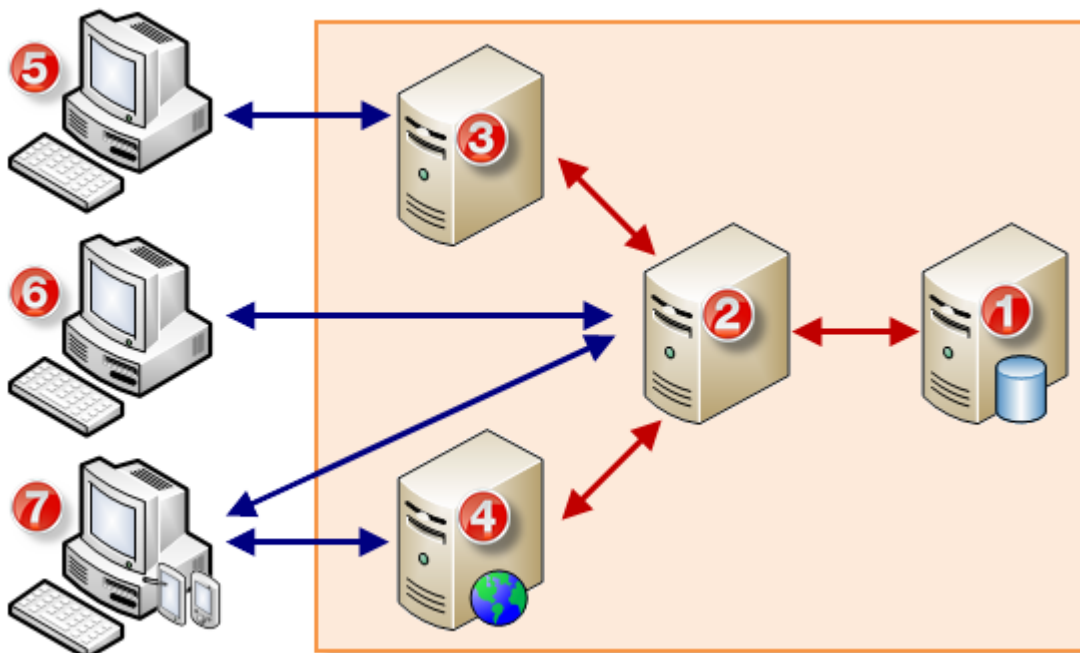# System Requirements

The access to waveware is diverse. The deployment can be differently scaled depending on the requirement:



In the above example, a system structure is displayed, as it is recommended for the larger installations.

**❶** **Data base server**

**❷** **waveware server**

**❸** **Terminal server** (optional)

**❹** **Reverse Proxy** (optional)

For a waveware system installation, a database and the waveware server are necessary. The deployment is also possible through a terminal server. The optional Reserve Proxy serves in the above example of the deployment of the web client via the Internet. Each of the roles can be offered through any private server, as displayed above. Alternatively, you can also pool the deployment on a server.
During the performed set-up, the following access methods are available for the users:

**⑤** **Terminal server-Client** (RDP)

**⑥　　waveware Windows Client**

**⑦　　waveware Web Client / Custom Pages**

---

## Information
The type and method of the deployment are to be made on the grounds of the performance and reliability, depending on the installation size. The installation of all services should be considered only during small installations.

## Important
The deployment of the services requires free ports on the relevant server. Check whether the default ports (Consider the FAQ: 'Network-Ports') can be used, or whether this must be changed directly after the installation.

## Note
The FIPS (Federal Information Processing Standard) cryptography process is not supported by waveware. This is offered for example, in Windows operating systems as a security policy, but is deactivated by default. If you activate this security policy, the following error message appears when you log in:



---
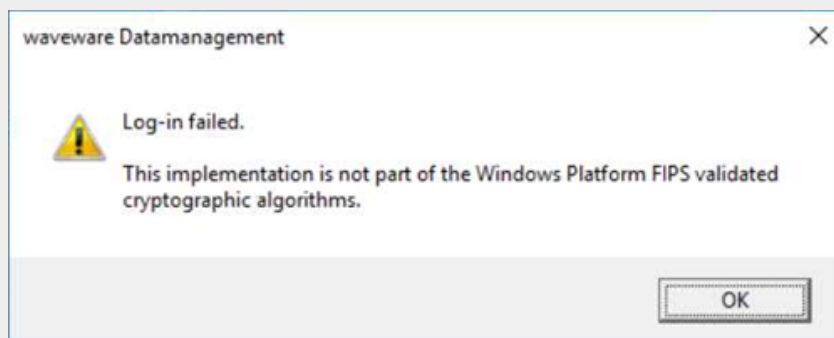
# 1. Requirements

Below you can find a list of specific hardware and software terms. The mentioned products of third party producer are not the proposed item of the Loy & Hutz Solutions GmbH.

## Note
waveware Support in scope of the support and maintenance agreement is applied only during the usage of the listed components.

---

## 1.1. waveware Server

|  | Minimal | Recommended | Optimal |
|---|---|---|---|
| **Architecture** | 64-Bit | 64-Bit | 64-Bit |
| **Clock speed** | 1 GHz | 1,4 GHz | ≥ 2 GHz |

|            | Minimal | Recommended | Optimal  |
|------------|---------|-------------|----------|
| **Core**   | 1       | 2           | ≥ 4      |
| **RAM**    | 8 GB    | 16 GB       | ≥ 32 GB  |
| **Hard drive** | 4 GB |            |          |

> **Note**
> If the waveware document management system (DMS) is used, the storage place must be available for the expected amount of data.

**Operating system**
Microsoft Windows Server 2012,
Microsoft Windows Server 2012 R2
Microsoft Windows Server 2016,
Microsoft Windows Server 2019 (mandatory for wave.IQ)

**Software**
Microsoft .NET Framework 4.8 or higher
Microsoft VisualC++ 2010 Runtime (x64: 10.0.30319.1; x86: 10.0.40219.1)
Microsoft VisualC++ 2012 Runtime (x64/x86: 11.0.61030.0)

> **Note**
> Necessary software components (.NET Framework 4.8, Visual C++ Runtimes) are in the deploy.zip (directory "Redist") of the delivery. Further information is in Documentation on Installation.

If the waveware server is processed in a virtual setting, USB dongle is not required unlike the earlier versions.

Furthermore, a Reverse-Proxy can be used for the web access over the Internet. For that, the Microsoft Internet Information Services (IIS) and the Apache-Server are released.

## 1.2. Database Server

|                  | Minimal | Recommended | Optimal  |
|------------------|---------|-------------|----------|
| **Architecture** | 64-Bit  | 64-Bit      | 64-Bit   |
| **Clock speed**  | 1 GHz   | 1,4 GHz     | ≥ 2 GHz  |
| **Core**         | 1       | 2           | ≥ 8      |
| **RAM**          | 8 GB    | 16 GB       | > 16 GB  |
| **Hard drive**   | depending on data traffic | | |

**Software**
Microsoft SQL Server 2012,
Microsoft SQL Server 2014,
Microsoft SQL Server 2016,
Microsoft SQL Server 2017,
Microsoft SQL Server 2019

The Microsoft SQL Server can be used not depending on edition. The express as well as standard and enterprise/data center editions are supported in the cluster operations. The database server must be kept as current as possible. Before a version shift, the release is to be inquired by the support of the Loy & Hutz Solutions GmbH.

## 1.3. Windows Client

|  | Minimal | Recommended | Optimal |
| --- | --- | --- | --- |
| **Architecture** | 32-Bit | 64-Bit | 64-Bit |
| **Clock speed** | 1 GHz | 1,4 GHz | ≥ 2 GHz |
| **Core** | 1 | 2 | ≥ 4 |
| **RAM** | 1 GB | 2 GB | ≥ 4 GB |
| **Hard drive** | 2 GB | | |

**Graphics**
DirectX 9-Graphic cards with WDDM 1.0 or higher drivers

**Operating system**
Microsoft Windows 8.1,
Microsoft Windows 10 (min. version 1803, for wave.IQ min. version 1809)

**Software**
Microsoft .NET Framework 4.8 or higher
Microsoft VisualC++ 2012 Runtime (x64/x86: 11.0.61030.0)

> ### Important
> Consider that these requirements apply to all clients in the network. However, you must ensure, that deployment of the necessary software, such as the .NET Framework or Visual C++ runtimes already exist, before the waveware Client is installed or deployed. Necessary software components are in the Deploy.zip (directory "Redist") of the delivery. Further information in the Documentation on Installation.

> ### Note
> When CAD is used on a FAT Client CAD, you should interpret the client on its needs, as CAD needs more resources.

## 1.4. Terminal Server

The following data refer to a terminal server with maximum 20 concurrent users.

|  | Minimal | Recommended | Optimal |
| --- | --- | --- | --- |
| **Architecture** | 64-Bit | 64-Bit | 64-Bit |
| **Clock speed** | 1 GHz | 2 GHz | ≥ 2 GHz |
| **Core** | 2 | 2 | ≥ 4 |
| **RAM** | 4 GB | 6 GB | ≥ 8 GB |
| **Hard drive** | 2 GB | | |

**Operating System**
Microsoft Windows Server 2012,
Microsoft Windows Server 2012 R2,
Microsoft Windows Server 2016,
Microsoft Windows Server 2019

**Software**
Microsoft .NET Framework 4.8 or higher
Microsoft VisualC++ 2012 Runtime (x64/x86: 11.0.61030.0)

## 1.5. Single Sign-On per IIS

To be able to use Single Sign-On through the Web, an **IIS Web server** with **.NET Framework 4.5** is necessary. The Single Sign-On Website must be installed on the Web server per MSDeploy.

Further information on the setting and usage is under 'Single Sign-On in the Web and Custom Pages'.

## 1.6. Web Clients

You can call a waveware Web-Client via each hardware, which supports the following browsers:

**Microsoft Edge**
from Version 44

**Apple Safari**

**Google Chrome**
from Version 79

**Mozilla Firefox**
from Version 68

> ### Note
> Microsoft Internet Explorer is no longer supported as of waveware 11.180.

For the operation of the web client, a performance of at least 5MBit/s per session is recommended.

## 1.7. Mobile Clients

The waveware Mobile Client is offered native for three platforms iOS, Android, Windows 10 (Universal Windows Platform - UWP). The following software versions are needed for the operation of the application:

**Android**
Supported Android versions depend on the build time of the Mobile Client. The last two major versions are always supported to the build time. Currently they are:

Android 9 (Pie) and newer

**Apple**
Supported iOS versions depend on the build time of the Mobile Client. The last two major versions are always supported to the build time:

iOS 12.3 and newer

This results in the following compatible Apple devices:

iPhone 5s and newer

iPad mini 2 und newer

**Windows**
Windows 10 Version 1803 and newer,
Windows 10 Mobile is not supported

> ### Information
> End devices must be able to connect to the waveware Server (WLAN, 3G/4G, VPN etc.).

## 1.8. File System DMS

As the document management creates single files in sub-folders within the data directory, it should be considered, that such file system is used for many documents, that allows a relevant number of sub-folders. The file system NTFS is recommended.

## 1.9. Print

To print from waveware, the service 'Print queue' must run and at least a printer driver must be installed. This applies to the client and server.

## 1.10. Notes on Hardware Data

In general, all data apply to the current hardware. They are distinguished among:

**Minimal:**
waveware is completely loadable. Up to 5 CC users can execute all the possible operations in the default data world with few records; however, the execution of single operations can last for several minutes.

**Recommended:**
Up to 5 CC users can work in a the default data world with an amount of data of up to 500.000 records without greater latency.

**Optimal:**
Factors for a performant hardware equipment (and so to decide on case-by-case basis):

Number of users, who work with the system

Package and rules, which require database actions and/or computing capacity

Package for mass data processing is used, e.g.:

Dashboard/KPIs

Work directives / work stages

etc.

Intensive and regular use of the module selection,Dashboard/KPI, Import/Export:

Interfaces

Users, who work with a lot of analysis

Multi-Operations

etc.

Other applications are executed on the system alongside waveware.

A virtual machine as waveware host, must share hardware resources with other virtual machines.