Installation Guide Process Platform 7.6

Subtitle: Installation Guide for System Architects
Owner: Resultmaker Research & Development
Version: 7.6.0
Revision: 2022-10-31

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Contents

1 About this document

This document describes how to install a Resultmaker Process Platform™ on a single server but with various options on a multi-server setup. This document will not cover the complete process for installation on multiple servers.

The reader should have some technical background e.g., operations personnel. No programming experience is required to complete the installation.

Since the Resultmaker Process Platform™ requires Microsoft Windows and SQL Server the reader should either have the knowledge to install these or the basis software should be installed by qualified personnel.

If the document is followed from start to end you should end up with a fully operational one-server setup of Resultmaker Process Platform™ fully equipped with sample content[1] and ready for additional content development.

2 Requirements overview for Resultmaker Process Platform™

2.1 Resultmaker Process Platform™ version 7.6

Minimum requirements for hardware and for Microsoft software

- A modern CPU, 2 or more core, 8-16GB ram or equivalent and minimum 500GB hard disk space
- Microsoft Windows Server 2019, 2016, 2012 R2 - all Standard Edition
- Microsoft SQL Server 2019, 2016 SP3, 2014 SP3, 2012 SP4 - Standard Edition
- .NET 2.0, 3.0, 3.5, 4.0, 4.5.*, 4.8
- ASP.NET Core 6.0 Runtime (v6.0.10) - Windows Hosting Bundle
- Internet Information Server 8.5 or higher

Software installation requirements for Process Platform™

- Http Redirect and IIS 6 Compatibility installation
- .Net frameworks must be configured to Danish culture
- SQL Server should be installed in Mixed Mode
- A backup job for the user databases and the transaction log. The transaction log should be truncated to save disk space.

The following is needed for external access

- Optionally but recommended, a domain name and an external IP for the server
- Http and Https (TCP port 80 and 443) access to the backend server for browsing and content development
- Https (TCP 443) access to the frontend server
- Access from the server to an SMTP server on TCP port 25
- RDP (TCP port 3389) access to the server for remote maintenance
- Windows File and Printer Sharing (TCP port 445) for accessing the server file system

Information the Installation specialist needs

- SQL Data location, e.g. D:\SQLData
- SQL Log location, e.g. D:\SQLLogs
- SQL Backup location, e.g. D:\SQLBackup
- SQL Instance information, Default or named instance
- SMTP address (only none authenticated relay is supported)
- What websites are used (Id, Name, Location, Host name)

3 Prerequisites for hardware and software

3.1 Resultmaker Process Platform™ version 7.6

The latest generation of the Process Platform™ runs on Microsoft Windows Server 2012 and up to 2019 and Microsoft SQL Server 2012 and up to 2019 – see service packs above. Both the SQL Server and the Windows OS should be in standard editions or higher. We recommend that the operating system is fully updated before installing the database. It is also recommended that the Automatic Updates feature is enabled.

Resultmaker applications will run on any hardware supported by the above-mentioned Microsoft Windows Server and SQL Server. The higher load on the server expected the better hardware should be installed.

3.1.1 Application server

The application server is both the frontend and the backend server. A fair starting point for the application server is a dual core modern CPU, 8-24 GB ram and around 50GB hard disk space. It is advised to setup the hard disk in a raid. The raid should be any raid that secures the data, e.g. raid 1 or 5. Setting up the hard drives in a RAID setup is an optional procedure, not described in this document.

3.1.1.1 Required services

The following services are required for Process Platform to work.
Task Scheduler
Microsoft Message Queue

3.1.2 Database server

Most of the components in the Resultmaker Process Platform™ use a database. The most intense work in the system will also happen on the database server. Therefore, the hardware recommendations are higher. We recommend using a multi core modern CPU with 8-24 GB ram and 500 GB hard disk space. As for the application server it is recommended that the hard disk is in a raid setup. The actual space needed depends a lot on load and scaling.

4 External access

The following is needed for external access

- Optionally but recommended, a domain name and an external IP for the server
- Http and Https (TCP port 80 and 443) access to the backend server for browsing and content development
- Https (TCP 443) access to the frontend server
- Access from the server to an SMTP server on TCP port 25
- RDP (TCP port 3389) access to the server for remote maintenance
- Windows File and Printer Sharing (TCP port 445) for accessing the server file system

For users and process consultants to access the server to the full extend, the standard installation may not be sufficient.

There are basically two approaches: One way is to access the server by the server's name (or internal IP), and another way is to assign a domain name and an external IP address to the server.

The first approach is commonly used in smaller networks for internal demonstration purposes. The second approach is commonly used when external customers need access or in case that the company is separated in more than one internal network. In both cases configuration modifications are needed post install.

The firewall openings for both approaches are *http (port 80)* and *https (port 443)*. The https protocol will require a server certificate installed. The installation is explained in the section *Installation of Resultmaker applications*.

Process Platform applications and the customer solutions developed on the server will most likely need to send emails. This can either be error e-mails or in the customer solutions *invitation* e-mails. In both cases a *SMTP server* is needed. The SMTP server must be setup to accept relay from the installed server. The regular SMTP port is used which is port 25. Please also note that authentication is not supported and restricted access e.g. by IP to the SMTP is recommended. Alternatively, an SMTP service can be installed easily on the server itself. This is not recommended since mail send from the server have a higher chance be caught in SPAM filters.

The process consultant or server maintenance personnel will most likely need Remote Desktop and Windows File and Printer Sharing access to the server. Remote Desktop is needed because the server will probably be installed this way. Windows File and Printer Sharing access is needed to update files on the server. These files can be images or other content or in relations to server maintenance. Also, in most multi server scenarios, a scheduled task job runs and synchronizes selected files between the frontend and backend server.

For these reasons, it is advised that the firewall is opened so Remote Desktop and Windows File and Printer Sharing access is allowed. The default port for the Remote Desktop Protocol (RDP) is TCP 3389. The main port for Windows File and Printer Sharing is TCP 445. *Since this is considered a dangerous protocol from a security point of view it is advised to allow it with caution.*

5 Architectural server setup

This section will go over an architectural server setup, which can be used as inspiration for building a multi-server setup. The section is an addition to the documents premise of a single server setup. If you are setting up a single server, some elements of this section may not apply to you. We work with three different types of servers, Frontend, Backend and Database.

5.1 Frontend

The frontend holds the .NET web application which the end user sees. It communicates with the Backend server through http (TCP port 80) and with the Database server through SQL (TCP port 1433). The Frontend might also have several custom integrations to external systems. This is usually through secured web services. The end user connects to the Frontend through https. SSL is mandatory to ensure a secure communication between the Frontend and the end user. In scenarios where the end users are outside the network, the Frontend server should be placed in a DMZ and should not be exposed to any other communication other than https. This while the backend is placed in a secure network zone. In pure internal scenarios, the frontend server can be placed in the non-DMZ zone.

5.2 Backend

This server is the core of the Resultmaker Process Platform™ and should be deployed in a secure environment with very strict access. All communication within the backend server is per default not encrypted and neither is the communication with the Database server (TCP port 1433).

If it is preferred that the internal communication is encrypted this can be setup. As on the Frontend server, custom outgoing integrations to external systems can be setup and they may communicate encrypted and through https.

5.3 Database

The Database server does not hold any Resultmaker Process Platform™ specific software. Instead, it holds databases used by the Backend server. The database never initiates connections and should not be allowed to either.

5.4 Architectural drawing

Below is an example of how a three-server setup can be. In this setup we see external systems as being remote services. These systems could instead be located either directly on the servers or within the same company network. In this case https might not be required. In other cases where external suppliers are used the choice of http or https might be fixed. This goes for standard integrations to the Danish CPR and CVR. In these cases, the suppliers have defined what security scheme should be used, which at the moment is proprietary security schemes with use of username and password for CPR and certificate based WS-Security for CVR.

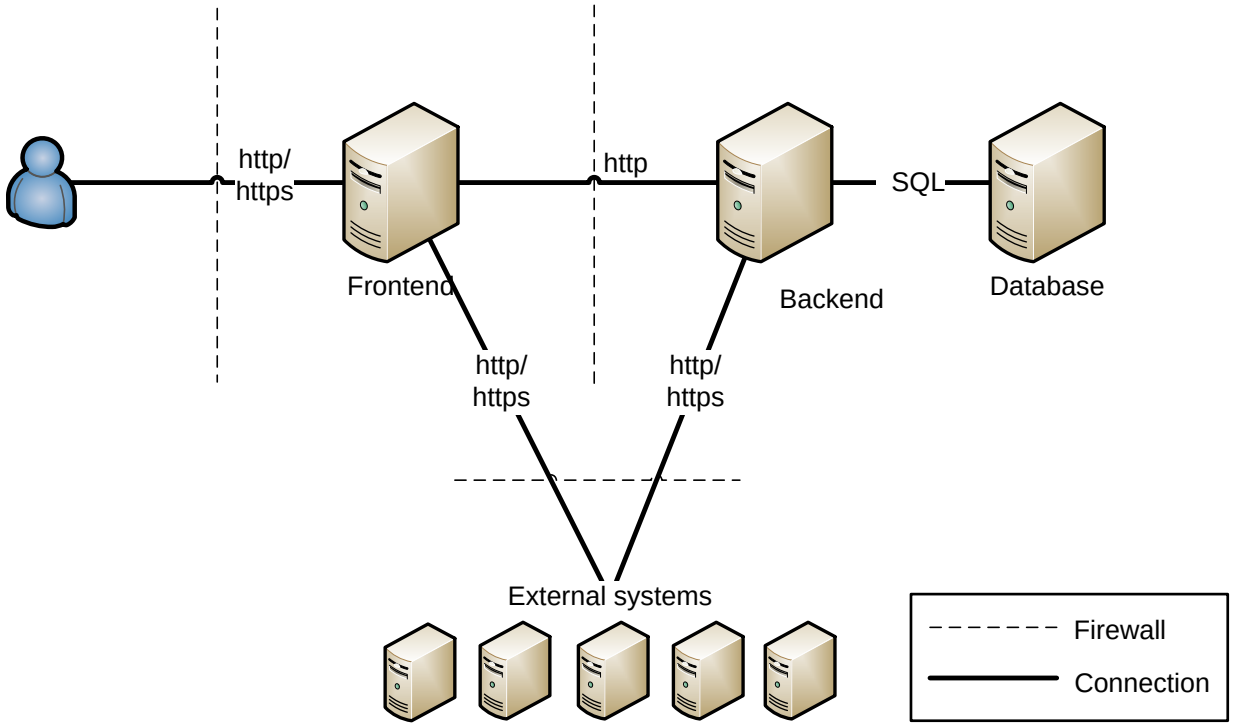


Figure 1: Basic three server setup with external integrations

7 Microsoft software installation – Process Platform™ v. 7.6

The basis of Resultmaker applications is Microsoft Windows Server 2019, 2016, 2012 R2, Internet Information Server, .NET frameworks and SQL Server 2019, 2016 SP3, 2014 SP3 or 2012 SP4.
The Resultmaker applications have been tested and verified with a default installation of the Microsoft components and special setups may or may not interfere.

Software installation requirements for Process Platform™ version 7.6

- A default installation of Windows Server 2012 or 2016 with IIS and all updates applied
- HttpRedirect and IIS 6 Compatibility must be installed
- .NET 2.0, 3.0, 3.5, 4.0, 4.5.*, 4.8 must be installed and configured correctly (set to Danish culture)
- ASP.NET Core 6.0 Runtime (v6.0.10) - Windows Hosting Bundle
- Install SQL Server 2019, 2016 SP3, 2014 SP3 or 2012 in Mixed Mode
- Ensure that the latest service packs are applied to Windows Server and SQL Server
- A backup job for the user databases and the transaction log. The transaction log should be truncated to save disk space
- Optional installation of a SMTP service

Information the Installation specialist needs

- SQL Data location, e.g. D:\SQLData
- SQL Log location, e.g. D:\SQLLogs
- SQL Backup location, e.g. D:\SQLBackup
- SQL Instance information, Default or named instance
- SMTP address (only none authenticated relay is supported)
- What websites are used (Id, Name, Location, Host name)

7.1 Step 1: Microsoft Server and IIS

Microsoft Windows Server should be installed in the English edition. All current updates and Service Packs should be applied, and the Internet Information Server (IIS) should be installed. It is expected that the Program Files folder resides in ***C:\Program Files***.

7.1.1 Roles and features

Add roles and features to the server and remove the deprecated SMB1 protocol by running the following PowerShell script:

Windows 2012

```
Import-Module Servermanager

Add-WindowsFeature Application-Server, Web-Server, File-Services, Web-App-Dev, web-asp-net, Web-Http-Redirect, Web-Security -IncludeAllSubFeature, Web-Log-Libraries, Web-Http-Tracing, Web-Dyn-Compression, Web-Mgmt-Console, Web-Metabase, Web-Scripting-Tools, Web-Mgmt-Service, MSMQ-HTTP-Support, Web-Net-Ext, Web-WebSockets, Web-AppInit, NET-WCF-HTTP-Activation45, Telnet-Client, RSAT-AD-PowerShell -restart

Remove-WindowsFeature -Name FS-SMB1

Set-SmbServerConfiguration -EnableSMB1Protocol $false -force
```

Windows 2016

```
Import-Module Servermanager
```

```
Add-WindowsFeature Web-Server, File-Services, Web-App-Dev, web-asp-net, Web-Http-Redirect, Web-Security -IncludeAllSubFeature, Web-Log-Libraries, Web-Http-Tracing, Web-Dyn-Compression, Web-Mgmt-Console, Web-Metabase, Web-Scripting-Tools, Web-Mgmt-Service, MSMQ-HTTP-Support, Web-Net-Ext, Web-WebSockets, Web-AppInit, NET-WCF-HTTP-Activation45, Telnet-Client, RSAT-AD-PowerShell -restart

Remove-WindowsFeature -Name FS-SMB1

Set-SmbServerConfiguration -EnableSMB1Protocol $false -force
```

Features description:

WindowsFeature	Explanation
Application-Server	Provides central management and hosting of high-performance distributed business applications
Web-Server	The IIS server it self
File-Services	Provides technologies that help manage storage and shared folders, enable file replication
Web-App-Dev	Enables Application Development
web-asp-net	Enables .Net Framework
Web-Http-Redirect	Feature to redirect http requests
Web-Security -IncludeAllSubFeatures	Enables the feature to edit the security settings
Web-based-Auth	
Web-Windows-Auth	
Web-Digest-Auth	
Web-Client-Auth	
Web-Cert-Auth	
Web-Url-Auth	
Web-IP-Security	
Web-Log-Libraries	Enables Logging Tools
Web-Http-Tracing	Enables Tracing
Web-Dyn-Compression	Enables Dynamic Content Compression
Web-Mgmt-Console	Enables IIS Management Console
Web-Metabase	IIS 6 Metabase compability
Web-Scripting-Tools	Enables IIS Management Scripts and Tools
Web-Mgmt-Service	Enables Management Service
MSMQ-HTTP-Support	Enables MSMQ Http Support
Web-Net-Ext	Enables .Net Extensibility
Web-WebSockets	Enables WebSocket Protocol
Web-AppInit	Enables Application Initialazation. After an ApplicationPool restart, the app will start again automatically instead of waiting for the first web-call
NET-WCF-HTTP-Activation45	Enables .Net Framework 4.5 HTTP activation
Telnet-Client	Enables the Telnet client
RSAT-AD-PowerShell	Remote Server Administration Tools

7.1.2 IIS URL Rewrite Module

The use of the IIS URL Rewrite Module has only been tested on Windows 2012/2016.

Download and install the IIS URL Rewrite Module on the server from this site:

https://www.iis.net/downloads/microsoft/url-rewrite

If needed, a URL rewrite rule can be constructed by following this guide:

http://www.jppinto.com/2010/03/automatically-redirect-http-requests-to-https-on-iis7-using-url-rewrite-2-0/

7.2 Step 2: Installation of Microsoft ASP.NET Core 6.0 Runtime (v6.0.10) - Windows Hosting Bundle

As a minimum, .Net Core SDK 2.1.4 needs to be installed:

https://dotnet.microsoft.com/en-us/download/dotnet/6.0

- Scroll down to v6.0.10 (second column)
- In the second column (ASP.NET Core Runtime 6.0.10), download the **Windows Hosting Bundle**

7.3 Step 3: Installation of Microsoft .NET framework (4.8 and later)

As a minimum, .Net Framework 4.8 needs to be installed.

Download and install the **.Net Framework 4.8 Runtime** from this site:
https://dotnet.microsoft.com/download/dotnet-framework/net48

7.3.1 ISAPI and CGI Restrictions

After installation of .Net frameworks in the previous sections, the ISAPI and CGI Restrictions must be enabled. This is described here.

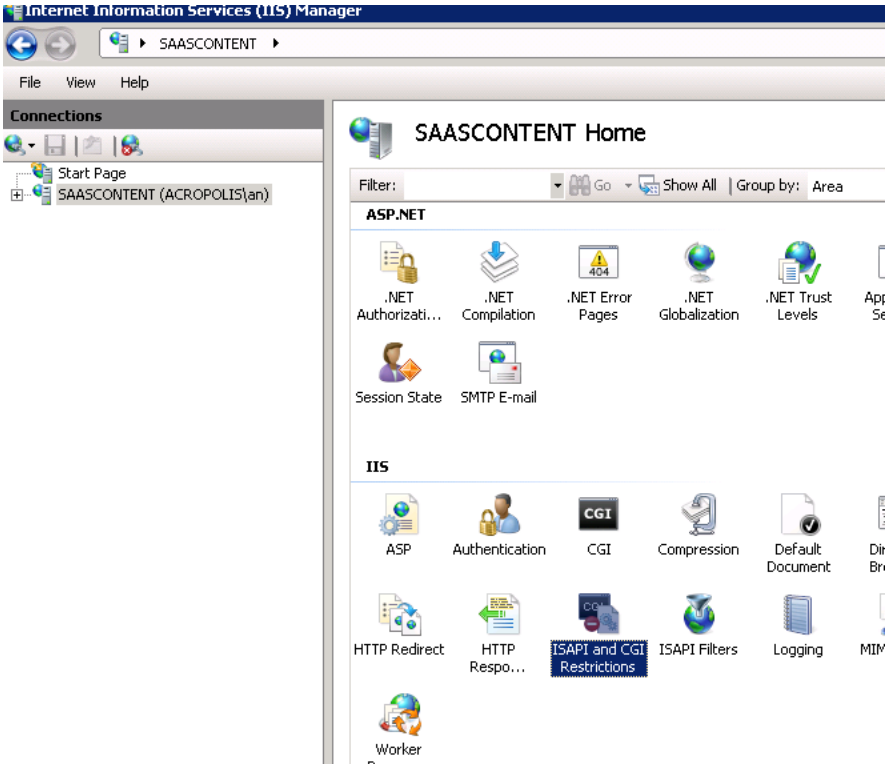


Figure 1: How to find the ISAPI and CGI Restrictions

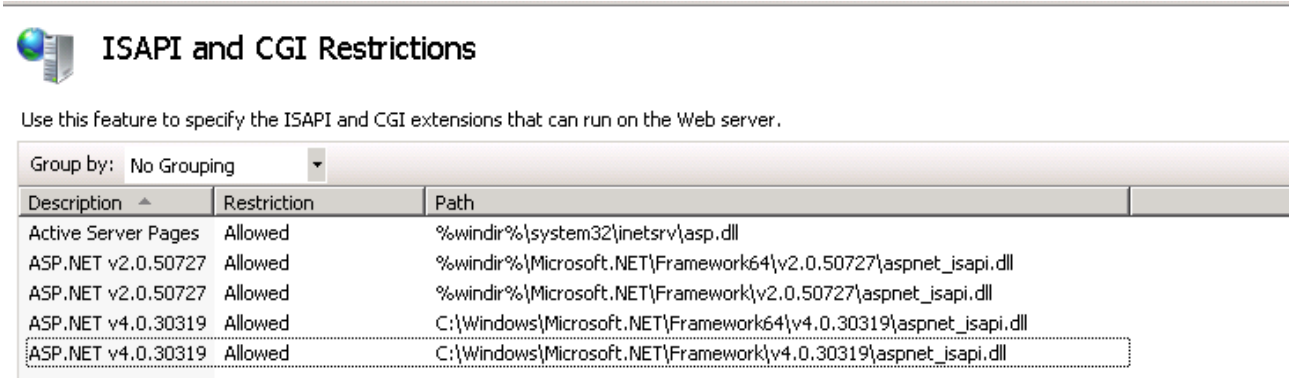


Figure 2: It's the two Restrictions in the bottom that needs to be Allowed

7.4 Step 4: Website preparation

Depending on the Architectural server setup that is decided it might be needed to prepare the Application server(s) for installation.

7.4.1 Split frontend and backend server setup

In a split frontend and backend server setup the frontend is on one server and the backend is on another. It does not matter if the SQL server is on a separate server or not.

The split setup works out of the box and the default setup for the installation does not needs to be changed.

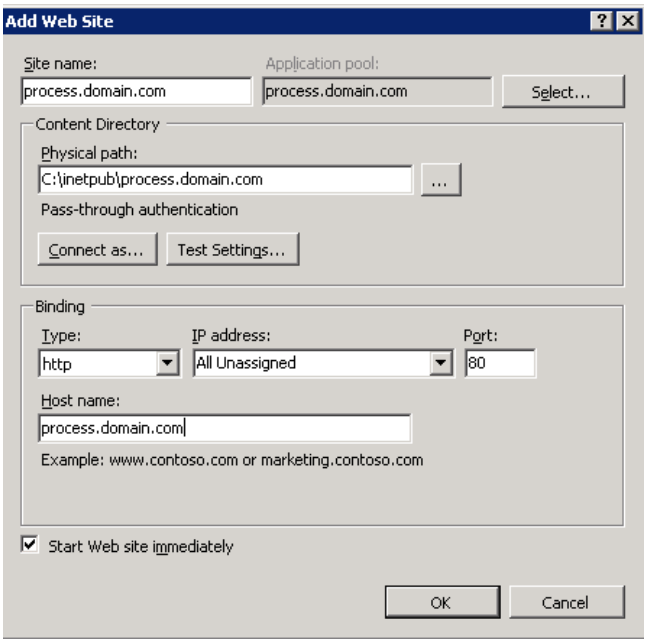
7.4.2 Combined frontend and backend server setup

When the frontend and backend server is on the same server the web application needs to be separated for security purposes. It should never be allowed for the end user to have access to the backend applications.

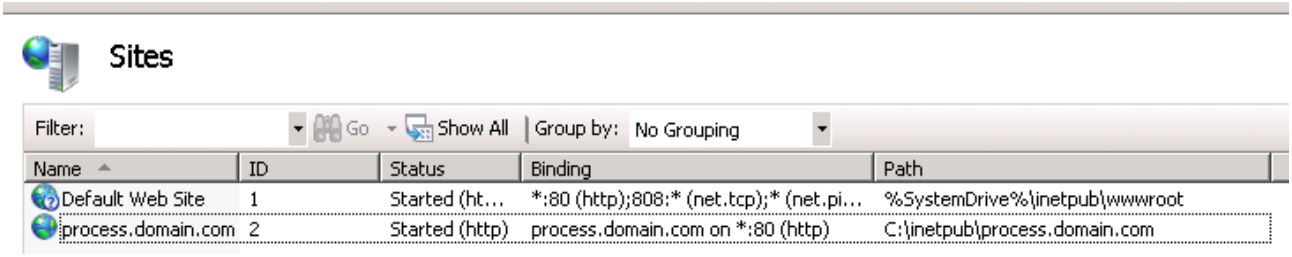
7.4.3 Creating a new web site

Please use the following procedure when creating a new web site.

Go to IIS > Sites > Add Web Site… > Fill out the dialog



Please note that the best practice is to use the same folder name as the web site name. Host name binding is optional and depends on setup. How to bind web site to host names is not covered by this manual. After clicking OK, the following information will be shown.



Please note that **only** port 80 is supported for backend applications and both port 80 and 443 (https) for frontend applications.

7.4.4 What the Installation specialist needs to know

The Installation specialist needs to have full information about all the web sites in the installation

- Web site Id
- Web site Name
- Web site default folder
- Host name used to access the site

7.4.5 Adding security

If the backend and frontend are on the same server, IP security should be added so only the server itself (via frontend calls) can access the backend applications.

This is done at [Web site name] > IP Address and Domain Restrictions

This is explained in more details at **Installation of Resultmaker applications and databases > Step 4: Optional: Setting up web site security**

7.5 Step 5: Microsoft SQL Server

Resultmaker Process Platform supports SQL Server 2012 and 2014, 2016. It runs on the Standard, Web and Enterprise editions. The SQL Server must be installed in Mixed Mode and there is no requirement for what the *sa* password is. There are also no requirements for what user the SQL Server runs under. It is recommended to run it under Local System for easy installation. The collation must be set to ***Danish_Norwegian*** to make sure that the system and user databases are in sync.

The following features must be enabled during the installation

- Database Engine Service
- Client Tools Connectivity
- Client Tools Backwards Compatibility
- Management Tools – Basic
- Management Tools – Complete
- Recommended: SQL Server Books Online

The Process Platform™ supports any file setup for databases and they can be at any drive. For installation purposes the installation specialist needs full information about the location of the databases.

- Data location, e.g. D:\SQLData
- Log location, e.g. D:\SQLLogs
- Backup location, e.g. D:\SQLBackup

With this information, the installation specialist can prepare automated scripts that will install the databases in correct locations. SQL instances are also supported, and information about this should also be given before installation.

To make sure that the SQL Server runs a smoothly as possible it is advised to setup backup maintenance jobs. These should backup the user databases and logs. Afterwards the transaction log should be truncated. Failing to do this may have the server run out of hard disk space too fast.

After initial installation, make sure to update it to the latest version (check https://buildnumbers.wordpress.com/sqlserver/)

7.6 Step 6: Optional: Installation of SMTP Service

Resultmaker applications will need a SMTP Server to work properly. The mail sending is used for invitation mails and other system mails. This step is optional because it is not required that the SMTP service is installed on the server itself. Another way of handling mail sending is by using a company mail server. If using a company SMTP server make sure that it do not require authentication, that it allows mail relaying and that there are no firewall blocking the traffic to the SMTP server from the server holding the Resultmaker applications.

If you instead choose to install SMTP service on the same server you should follow this procedure. To install smtp service go to ***Server Manager > Add Features > SMTP server***.

When this is completed you will have a working SMTP Service with default settings. Please be aware that some recipient mail servers do not allow this simplified way of installing a SMTP server which may lead to blocking of mails. If this procedure does not work it is advised to use a company SMTP server instead.

7.7 Step 7: Handling Windows Updates

Default installations of the operating system will have Windows Updates to automatically download and install updates. This will also result in an automatic restart of the system which might come at an inconvenient time of the day and week. It is considered best practice on a production environment to have a fixed service window for installing the update and for restarting the server thus disabling automatic installation and restart. It is not recommended to just disable restart and continuing updating since this might clutter the server in the long run.

In most cases the server will be part of a domain which probably will control the updates. It is the policy for the server these setting must be changed. For servers outside domains changes to registry might be needed. How to setup domain policy or server registry is not covered by this document.

8 Installation of Resultmaker applications and databases

The installation process is divided into steps, and it is important that the steps are followed one by one and that a step is not skipped. Failing to execute the installation in the defined steps may lead to an unsuccessful installation.

8.1 Step 1: Resultmaker databases

First step is to install the Resultmaker databases which all come in a single SQL script. This script will create a series of databases and assign a user to them. All the access rights from the applications to databases are handled in the script.

The SQL Server gives several options for what recovery mode the databases should run under. We recommend using the *Full recovery mode* as this will give the best data security.

8.2 Step 2: Resultmaker applications

The next step after a successful installation of databases is to install all the Resultmaker applications. To aid you with this the Resultmaker applications is prepared with a proprietary tool which generates deployments packages. A package is a folder containing a series of scripts in a hierarchy of folders. A package for an environment thus will consist of a folder containing subfolders. The following procedure must be followed when installing a package.

1) First copy the folder to the server. It may be a good idea to also copy the folder to other storage facilities for record keeping purposes.
2) Run the file ***_setup.cmd*** by ***right clicking*** it and selecting "Run as administrator" or running it from the command prompt, which must also be "Run as administrator".
    a. This *must* be done from the server itself. You cannot run the script from a share due to security settings in windows. Also make sure that you have full administrative rights to install on the server.
    b. The file must be run in its own file context. This means that you cannot copy the path to the file and run it from "Run" in the start menu, or in a command prompt (without being in the folder where the file is). The reason for this is that the _setup.cmd file contains relative references which might not work.
    c. A command prompt will show, and the script will start executing. Most of the time you will see something happening from installers running in passive mode (without user interaction) but you might also experience no response from script at all. In these situations, just wait, or see step 4 for a way to determine if the script is still running.
    d. The script is designed not to require user interactions but there are two exceptions.
        i. When applications are being uninstalled the script may be set to prompt the user. This will require an OK from the Okay/Cancel box. In these situations, you must be suspicious of three things. Are there multiple applications in the dialog? Are one or more of the applications to be uninstalled not a Resultmaker product? Does the uninstall action seem unintended?
        ii. External applications may not support passive installations which may require user interactions.
3) During the execution of the script a log file will be generated. If in doubt if the script is running the log file size can be monitored, if it increases the script is running for sure. If it's not increasing at all for a longer period (10 minutes) the script could be failing and Resultmaker should be consulted. Otherwise, you can uninstall all applications and start over again.
4) When the script is done the installation log will be presented to you. The log is raw and unformatted regarding error handling. Searching for the word ***fail*** gives a good impression whether the script ran successfully, but the word fail can appear in the log without the script having failed. If there is reason to believe that the script has failed, the log can be sent to Resultmaker for analysis.

When all scripts are completed on all servers, the base installation is complete.

8.3 Step 3: Optional: Setting up web site security

If you are installing the Process Platform backend applications on the same server as the frontend application, you potentially have a security issue. Even though it is best practice to install on multiple servers with high quality firewall as security it is not required. In many setups it is decided to use a ***single-server-setup***. In this kind of setup, it is highly recommended to implement a security scheme which shields the backend applications from the end user. The simple way to do this is to setup an extra web site so you would have the ***Default Web Site*** and a custom web site holding the frontend applications.

8.3.1 Requirements

- The deploy tool scripts must be setup to use multiple web sites
- A dedicated hostname for the frontend site

Deploy tool scripts

Before installation of the Process Platform applications, make sure that you have is correct and multiple web site supported scripts. If not the frontend might redirect to a false URL when called.

Dedicated hostname

You will need a dedicated hostname for the frontend site to implement this security scheme. This is needed for the IIS to route the traffic to the correct web site. The Process Platform will try to call the backend applications on http://127.0.0.1/ meaning that the Default Web Site must have a blank header section meaning no required hostname filter. The dedicated hostname, which could be looking like this “process.mydomain.com”, is applied in the deploy tool scripts by Resultmaker or the associated partner.

8.3.2 Setting up the Frontend site (IIS 7.x – Windows Server 2008 R2)

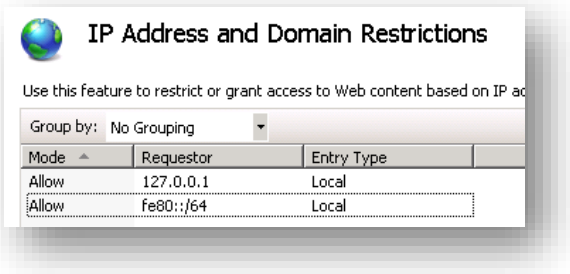
First you must create a new web site. This is done from the IIS management console. You will be able to specify the host header for the site which must be the same as the name described above. The usual name for the web site is the same name as the hostname. Set the web site to use .NET 4.0 runtime (integrated pipeline mode) when defining the Application pool.

You will now have two web sites where the frontend web site is empty and needs to be filled up.

Setting up IP security

Go to the Default Web Site, double click IP Address and Domain Name Restrictions.

- Right click, select **Edit Feature Settings…** and set the value for **Access for unspecified clients** to **Deny**.
- Right click, select **Add Allow Entry…**, set **Specific IP address** to **127.0.0.1**, click **OK**
- Right click, select **Add Allow Entry…**, set **IP address range** to **fe80::** and **Mask or Prefix** to **64**, click **OK** *(this is a IPv6 address with a mask). The latter is found by doing an IPConfig from a command prompt.*



Figur 3 - End result

8.3.3 Setting up the server's Internet Explorer to enable browsing "localhost" (127.0.0.1) without prompting for credentials (when not needed)

When you are testing a local Web site using Internet Explorer on a server, and you attempt to connect to http://127.0.0.1, you may be prompted for a password, even if no logon is required.

This occurs because Internet Explorer does not recognize http://127.0.0.1 as a local intranet site. Internet Explorer regards 127.0.0.1 as an Internet site, and therefore does not send your credentials automatically to the site.

To correct this problem, use http://Localhost to connect to the site or change the settings in Internet Explorer by performing the following steps:

- Open **Internet Explorer** and click **Tools**.
- On the Tools menu, click **Internet Options**.
- In the Internet Options window, click on the **Security** tab.
- In the list, click **Local Intranet**, and then click **Sites**.
- In the Local Intranet window, click **Advanced**.
- In the Add This Web Site To This Zone box, add "**http://127.0.0.1**" and click **Add**.
- Click **OK**.
- Click **OK**, and then click **OK** again (to get back to the browser).
- Restart Internet Explorer and try to browse the site again.

8.4 Step 4: Install an SSL certificate

When the first two steps have been completed the platform has been installed but you may want to enhance the user experience by installation a SSL Certificate as well. This part is optional but will make sure that the use of the platform is secure to the end user.

In this document we will describe two ways on how to request and install a SSL certificate. When obtaining a new certificate, a request file must be generated from the server. First go into the ***Internet Information Server Management Console*** and locate the ***Default Web Site***. ***Right click*** and choose ***properties*** and select the ***Directory Security*** tab.

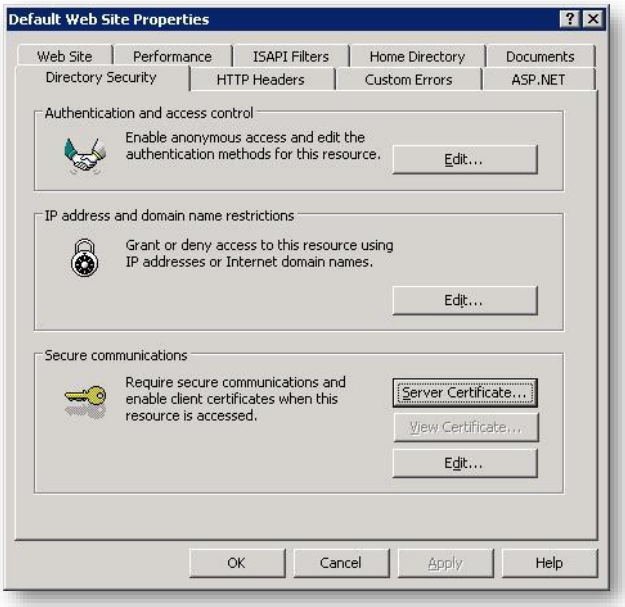


Figure 4: Directory Security in IIS. Click Server Certificate to start the installation process

After clicking the button as displayed above go through the guide as displayed in these two images.

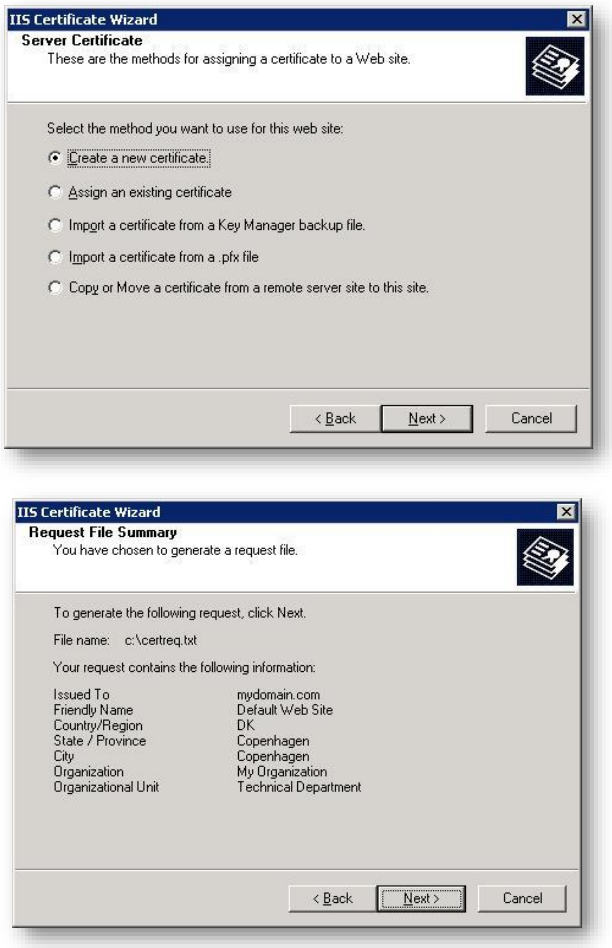


Figure 5: Displayed two of the dialogs in the Request a new SSL certificate process

As you can see, we have put in dummy info in this request. You should be aware that the *Issued To* (called common name in the process) is a very important field. This field denotes what domain the server should hold. Failing to do this correctly may lead to false certificate that will display an error for the end user.

When the request has been completed and the SSL certificate of choice have received the request, they will generate a certificate response. This is processed through the same interface as where you requested the certificate, but now the options will look like the below image.

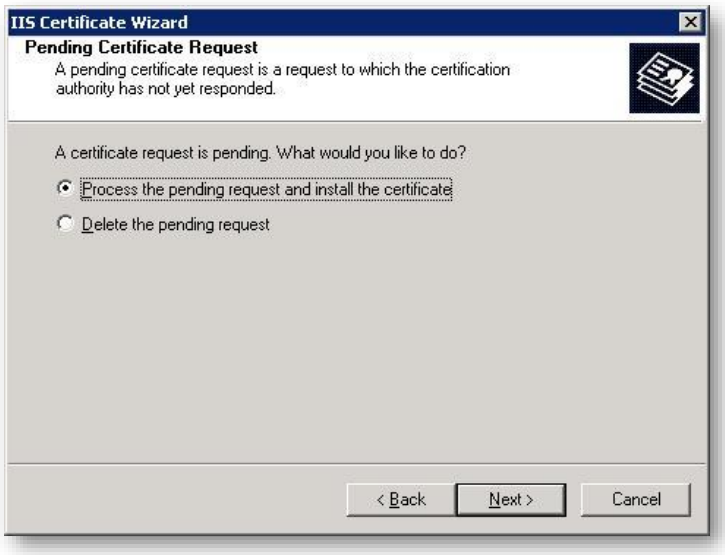


Figure 6: Shows the Pending Certificate Request dialog

The process is straight forward now, and you should use the default port for SSL. When the process has been completed the SSL certificate is ready to use by typing ***https://servername*** in the browser.

To sum up the following needs to be done

- Deploy Resultmaker databases
- Use the installation script to install all the Resultmaker applications
- Setting up web site security
- Install an SSL Server Certificate to facilitate secure browsing (https)

9 Deploying content

After the installation is complete the server needs some content to work. Instead of deploying content the client tools can be used directly to develop content. The latter is not recommended though.

9.1 Process Platform X installation

After version 6.2 R3 a new tool for handling content has been introduced. This tool is called Pex (Process Engine X) is a command line interface and handles the import, export and compile operations that are needed to work with content.

9.1.1 Step 1: Deploying content

The content deployment on Process Platform happens with the Pex tool.

Pex is used on the Test/development server to extract Process Platform content and save this in a zip file.

On staging/production servers Pex ins used to import the content into the server. This normally happens by placing the extracted zip in a folder – usually “C:\Instances\[InstanceName]\Transport\” and executing the “Pex push -zip” command in that folder. That command will check for existing content elements with the same names and perform a backup before importing/pushing the content into the server.

[InstanceName] is the name of one of potentially several Process Platform installations. Please consult Resultmaker for detailed documentation of the Pex tool.

10 Testing the installation

After the installation has been completed it is recommended that the environment is tested. This is done by going through each of the Software Test workflows. By directing your browser to the frontend of the server you will see several Software Test workflows. Each sample project displays some functionality of Resultmaker Process Platform™. Each test case is not described here, but the procedure is straight forward. Start each workflow and try it out to the end. After you have gone through all Software Test workflows you have tested the primary functionality.

11 Upgrading an existing server

If you are in a situation where the server, you are installing already contains a Resultmaker Process Platform™ you can choose to try upgrading the server instead. If you do not want to save any data, it is advised that you reinstall the operating system and start from the beginning of this document. If you instead would like to save your existing data proceed reading the section for a procedure. You should know that upgrading a server where it is required to keep data is not always successful since both custom actions could have been made since last reinstall and that the structure of the data you backup may not match the structure of what the new software expect. Furthermore, the procedure will not handle all data in all databases. This is done to make the procedure simpler. In special cases this procedure cannot be used.

11.1 Content files

The folders *C:\FileRepository* and *C:\Instances* contains most of the content files in the system. The folder needs to be backed up to ensure rollback procedure.

11.2 Registry

The registry key *HKEY_LOCAL_MACHINE\SOFTWARE\Resultmaker* should be backed up and the deleted.

11.3 Remove applications

Before removing applications, you should backup the two folders *C:\inetpub\wwwroot, C:\inetpub\sub.domain.com and c:\program files\Resultmaker*.

Ensure that older versions before 6.0 are removed. These older versions use Windows Installer technology, so go to add/remove programs and uninstall the following programs:

All versions

- Every program starting with **Resultmaker** (i.e., Resultmaker BlueBox)
- ABCpdf .Net
- Microsoft Web Service Enhancements
- PdfServer2

Then all Resultmaker web applications should be deleted from *IIS Manager*. The content of *c:\inetpub\wwwroot* and *c:\program files\Resultmaker* should be almost empty. The remaining items should be deleted manually.

11.4 Databases

There are several databases in Resultmaker Process Platform™, which all needs to be backed up first. This is to ensure a rollback procedure in case any problems should occur during the upgrade.

Post the install, database versions must be checked. If the installation files did not upgrade the databases, they need to be upgraded manually. The required database version depends on the installed software version. Current database that needs to be checked are the following.

Version 6.2

- [Prefix]_ProcessEngine
- [Prefix]_Ats30
- [Prefix]_FileStore
- [Prefix]_TokenServiceData

Make sure the databases are also verified that they have data in them. Missing data could mean that the upgrade was not successful and Resultmaker should be consulted.

The database [Prefix]_TransactionData might exist, but it has been taken out of use in version 6.2 R3 and later.

11.5 The installation

If the above steps went well, you are now ready for installing the upgraded software. This is done in the same way as when installing from scratch.

12 Monitoring Process Platform™

This section describes in general terms how to monitor a Resultmaker Process Platform™ in relations to operations. Firstly, we describe how to monitor the basics and after how to monitor the Resultmaker applications. To use these guidelines in operation an external tool should be used. There are no recommendations to what tools can be used at this point.

12.1 Platform, environment, and instance structure

We define that a *Platform* consists of *Environments* and that an environment consists of servers. The environments are typical named production, staging/qa, test and development. Each of these environments consist of the server types PPFE, INTEGRATION, PPBE and one or more database servers. However multiple environments can be installed on the same server, we call each one an instance.

As this document is a generic document no actual server names are mentioned. Instead, we work with generic logical names. These are PPFE, INTEGRATION and PPBE. Please refer to customer specific platform documentation for a mapping between these names and the actual server names.

To simplify the monitoring process only the server types are used here. The mapping between server types and server names should be used when implementing monitoring. Furthermore, the below descriptions only cover a single environment but can be used on every environment that the platform consists of.

12.1.1 Multiple network adapters

Many servers today come with more than one network adaptor. Depending on how the server is setup monitoring through the incorrect network adaptor may lead to false results. Consider this if the server has a main network adaptor and a service adaptor. Monitoring through the service adaptor may not reveal problems with the main adaptor. Best practice is to monitor through the same adaptor as the end user uses.

12.2 Monitoring of hardware and basic operative system applications

This section describes general approach on how to monitor the system hardware and system applications. It should be taken as recommendations since an operation department might have completely other ways to monitor a system. This section also uses the terms *Warning Flag* and *Consult Resultmaker.* These might be handled completely different from customer to customer. The warning flag is a way to say that something is not critical or fatal for the Resultmaker applications. Several warning flags should result in a Resultmaker Online Consultant event. The Resultmaker Online Consultant event is used when it is not expected that operation personnel can handle the errors by themselves. When operation personnel get more familiar with the Resultmaker applications they might be able to solve more and more issues without needing external help. Also depending on the support agreement with the Resultmaker or other partners *Consult Resultmaker* might mean that a partner should be consulted instead of Resultmaker directly.

12.2.1 System and Application memory

Process Platform™ version 6 runs on Windows Server 2012 and 2008 R2 64 bit thus removing the discussing of the 2GB memory limit. This doesn't remove the possibility of out of memory exceptions since the system can be installed with little memory still.
It is advisable to both monitor the IIS worker process and the system memory usage. On high load setups the process may run out of memory and an IISRESET is required to fix the problem. To counter this issue the Process Engine has a scheduled IIS worker process recycle each day at 4am. Tweaking the system should be not being done without consulting Resultmaker.

The Resultmaker databases may run on (and is advised to run on) Windows Server 2003 (2008 or 2012 for PP6) 64bit and SQL Server 2005 (2008 or 2012 for PP6). When running on 64bit the 2GB process limit is removed. The

SQL server process and system memory should still be monitored but Resultmaker have no incidents of the SQL server running on Windows Server 2003 (2008 or 2012 for PP6) 64bit has run out of memory. Monitoring can be used for optimizations though.

12.2.2 Processor load

Platforms with high load which are running smoothly will have a variable CPU load of up to 80% and 100% in peak times. CPU loads of 80% or more for longer periods (minutes) should result in a warning flag. This goes for both application servers and the database servers. If the CPU hits 100% load errors may start to occur for the end users. These errors can be common timeouts or more unexpected errors. In both cases the load should be recorded in such a way that appropriate measures can be taken. It might lead to a requirement of upgrading the CPU of that specific server.

12.2.3 Hard disk space

By far the hard disk space is the biggest reason for system break downs. This often is the case where the system is highly used. Initial allocations are too small and are not reevaluated during operations. The recommendations in this paragraph should be followed to ensure high uptime.

Hard disk space can be divided into two categories, application needs and database needs. The database will increase in size depending on load. The more workflow instances that are made the more space will the databases take up. The space used should be monitored and recorded at least once per day. This recording should be both of the database file and the drive where it resides. If the database cannot expand the database file, it will lead to errors. Based on the average increase in space usage a calculation can be made that estimates when the system runs out of space. A warning flag should be raised if this is within three months.

All other servers, the application servers, will not grow in disk space usage in the same way. Only log data and other temporary data will be stored here. The space should still be monitored, and a warning flag should be raised if they go under 10 GB free spaces. If a server has less than 1GB of space it is considered critical and actions must be taken. In that case Resultmaker should be consulted or if possible, just assign more hard disk space to the system.

12.2.4 SQL Server

Resultmaker uses the Microsoft SQL Server 2016, 2012 or 2008 to store databases. The SQL Server service must be always running. Failing this will lead to a fatal break down of the Resultmaker applications. For a more thorough test of the SQL Server periodic queries can be made. The response times for the queries should be logged.

On the PP_OC (OC for ProcessEngine) database this query can be made:

```
SELECT TOP 1 * FROM WorkflowInstances.
```

Optionally all other databases can be monitored using the same procedure. Response times longer than short (below 500ms) should result in a warning flag.

If the build in SQL Server Agent is used for backup this should also be running. Backups should be monitored to make sure that they are executed correctly after schedule. Failure to backup correctly may lead to loss of data.

12.2.5 Network and firewall openings

Communication between the servers in an environment and external systems should always be intact. The internal communication in an environment can be handled by e.g. ICMP packets. Even when done with a fair size (like 1000 bytes) the connected server should respond within 1 ms. ICMP packets with larger response for a longer period (several periodic tries) should raise a warning flag.

Communication to external systems is very custom and different from platform to platform. This doesn't mean that this should be left out as a part of the monitoring setup as this may be critical for the setup. A common way to check if it is possible to make a connection to an external system is by making a *telnet* session. This is done from a command prompt by writing

"telnet HOSTNAME PORTNUMBER"

where the hostname is the domain name/IP address of the external system and port number is the port number. Common port numbers are 80 for http and 443 for https connections. Due to firewall setups at both the platform level and the external system this must be done from the server which is normally performing the requests otherwise this may not show the correct results.

12.2.6 Internet Information Server

The IIS is a critical application for the Resultmaker Process Platform™. Without that working the platform will not work. At all times the IIS must be running and be in full function. Resultmaker applications use ASP.NET which means that the .NET framework must be installed and working. The IIS will be monitored implicit when monitoring the Resultmaker applications as described later in this document.

12.2.7 Mail server

Many of the Resultmaker applications can send emails as a part of the error handling system. Furthermore, as a part of the customer solution itself it is often very important that mails can be send without problems. In both cases a SMTP server is needed. The basic way to monitor this is to check if the SMTP service is running. The more advanced way and a better way is to periodical send emails through the system. This way delivery time can be measured and if mails are not delivered right away (within a minute) a warning flag should be raised. Doing this might catch some problems in the send mail functionality. Mail sending can be hard to verify since there may be many recipients. A periodical check should be done to see if the STMP server is put on any spam lists. This could be a daily check. A mail server which is put on spam lists can be unable to send mails to any number of recipients and is therefore fatal for the system.

12.2.8 Event Log

The system Event Log can reveal problems with the Resultmaker applications and other operating system issues. Because of this the Event Logs should be monitored. Since the Warnings and Errors which are seen in the Event Log may vary a lot, technical personal should investigate each one and clarify if the warning or error should be handled or can be left alone. Based on this Resultmaker can be consulted for further actions. One that needs to be taken seriously is the .NET 4.0 Warnings. These are warnings because it's not a fatal event for .NET, but it is probably a fatal event for the application itself. Since many of the Resultmaker applications run under .NET 4.0 these Event Log records should be acted on. The procedure is to collect the error and consult Resultmaker.

13 Monitoring of Applications

This section describes Resultmaker specific applications that need to be monitored. The following tables describe the applications that as a minimum should be monitored. We have divided the applications in three different types, Web services, Web applications and Windows services. For Web services and Web applications the following can be used in case of an error. The error will probably be the typical "yellow page" .NET error and actions must be taken. Normally the system is set to "CustomErrors=RemoteOnly", which means that the actual error is not displayed in the response. For .NET 4.0 applications the error is logged to the EventLog.

The tables are divided into ID, Server, Application Path, Depends on and Action.

ID column
ID denotes an identifier for other documents and communication among involved parties.

Server column
The Server column contains what server type on which the application is located. You should refer to customer specific documentation for mapping to what the specific server name is called.

Application Path column
Application Path holds information on where the application is located.

Depends on column
Depends on is displaying what other applications the application is depending on. For most parts a database server has been specified.

When checking if a database server is running the following should be carried out.

1. Verify that SQL server service is running
2. Check server CPU usage (very high usage may lead to timeouts)
3. Check disc space. Do the databases have enough space to expand?
4. telnet from the application server to the database server – use the command prompt "telnet [DBServer] 1433" where [DBServer] is the hostname / IP address of the database server
5. Restart the SQL Server service and recheck 1 through 4

When a FileRep needs to be checked the following procedure should be carried out.

1. Verify that the folder C:\FileRepository exists and contains subfolder with files
2. Make sure that that they are reachable by using e.g. \\localhost\private

If any of the depending application is failing Resultmaker should be contacted for further actions.

Action column
Action describes what actions should be taken in case of a problem. Each action is separated by a comma, and should be carried out in the order in which they are listed. If no specific server or application is mentioned the action should be carried out on the server where the application resides. Before executing any of the actions the Event Log should be viewed to find possible answers to the problem. This information must also be supplied in case of contacting Resultmaker.

We work with four different action types: *AppRestart*, *ServiceRestart* and *ConsultRM*.

AppRestart covers multiple steps. These steps will hopefully result in the web application becoming fully functional again.

1. Recycle the AppPool of which the application is a part of. The associated AppPool is found by entering the IIS manager and choosing properties on the application. The field "Application_pool" in the bottom displays what AppPool the application is running under. The Recycle is done by right clicking the AppPool from the Application Pools overview in the IIS manager and choosing recycle. Please note that recycling is fairly graceful to the system. No end users will be influenced by it.
2. After recycling wait a short while and retry the application again. Make sure that you start a completely new browser before doing this.
3. If the application is still not up, there might be an underlying problem that needs to be resolved. Resolving the problem might need another recycle of the application.
4. If no solution can be found e.g. due to incident happening outside normal working hours an *IISRESET* should be executed. Also if the system is completely down for a majority of end users IISRESET should be executed as well. This is done to avoid extending the environments down time period. IISRESET is done

by first stopping the IIS ("iisreset /stop" from a command prompt). You will need to verify that the IIS is stopped. This can be done from the IIS manager. In some cases, the command needs to be executed more than once to stop the IIS. After the IIS has been stopped the IIS can then again be started ("iisreset /start" from a command prompt). Beware that IISRESET will affect all user currently connected to the environment and therefore should not be done without second thoughts.

5. If the above steps do not resolve the problem, wait a few minutes and try the steps again.
6. If the application continues to be down, next step will be restarting the server itself.
7. If the application is still down Resultmaker should be consulted.

ServiceRestart is done by opening the services overview and then choosing the restart option of the service in question.
ConsultRM means consult Resultmaker and is put in action in case debugging of the application will demand too much knowledge of the application. Before consulting Resultmaker the problem should be described as well as possible. Common questions that need to be answered are:

1) Who/what discovered the problem
2) When did the problem first occur
3) What error message is returned from the system
4) What was the expected normal behavior
5) How can Resultmaker replicate the error

Failing to describe the above points will make the problem handling process more difficult. Most helpful is to supply a detailed error report to Resultmaker. Problems described as "Error occurred" or "It just doesn't work" is not beneficial for the process.

13.1.1 Web services

ID	Server	Application Path	Depends on	Action	Version
WS1	PPBE	/OC4/OC.asmx	OCDB	AppRestart	All
WS2	PPBE	/ExportServer/Export.asmx	FileRep , OCDB	AppRestart	All
WS3	PPBE	/ExportServerAdminService/ExportServerAdminService.asmx	FileRep , OCDB	AppRestart	All
WS4	PPBE	/PdfServer2/PdfServer2.asmx	FileRep	AppRestart	All
WS5	PPBE	/Resultmaker/Filestore/Server/Download.asmx	OCDB	AppRestart	All
WS6	PPBE	/TokenService/TokenService.asmx	OCDB	AppRestart	All

Request and response
To check if a web service is up and running use the following format for the URL: http://[Server][Application Path].
All the web services should respond with the standard .NET web service page.

13.1.2 Web applications

ID	Server	Application Path	Depends on	Action
WA1	PPFE	/Resultmaker/Filestore/Client/UploadFile.aspx	[WS6]	AppRestart
WA2	PPFE	/RMFrontend/Default.aspx?userisloggedintovirk=false	FileRep, [WS1]	AppRestart

Request and response
To check if a web application is up and running use the following format for the URL: http://[Server][Application Path]. They should all respond with the standard respond code 200.

14 Backup and recovery

Here are the recommendations for backup and recovery when operating a Resultmaker Process Platform™.

14.1 Databases

The databases are the most essential part of the platform. This is where all user data resides and for this reason backups should be handled with high priority.

14.1.1 Database Recovery Models

The SQL Server comes with three different type of recovery models: Simple, Full and Bulk-Logged. We recommend using the Full Recovery Model for the Production environment and Simple for all other environments. This will save some maintenance in test and development environments but still ensure that the Production environment has the optimal Recovery Model.

14.1.2 Database Backup Scheme

For all other environments than Production we recommend making a weekly full backup. This is done outside work hours preferable in weekends. In some cases, customers might have a need for having a higher data security on the development environment in order to minimize loss of work. In this case we recommend following the scheme for Production environments.

In Production environments, it is highly important that no data is ever lost. As mentioned above the Full Recovery Model is recommended. This gives the possibility for making incremental backups and recovering to a specific time. We recommend making a full backup Sunday morning at 03:00, an incremental backup every night at 03:00 except Sunday. If the platform is under high load hourly backup of the Transaction log can also be used.

Default setup for all databases that comes with Resultmaker Process Platform™ is set to Full Recovery Mode which has the effect that the Transaction log will increase in size over time. If no backup scheme is used at all the Transaction log will eventually take up all disk space leaving the system inoperable.

14.1.3 Process Platform databases

The following databases are installed with Resultmaker Process Platform™ and should all follow the same backup scheme. Please note that every installation might have been altered to match customer demands and might not include all the databases and might include custom databases not listed here.

- Ats
- FileStore
- PE
- TokenService

The databases might be appended with **RM_** or **PP_** for overview purposes in shared database servers.

14.2 File system

To ensure the possibility of disaster recovery parts of the file system needs to be backed up. In a default installation of Resultmaker Process Platform™ the following folders on all servers except database server needs to be backed up.

- C:\Instances
- C:\FileRepository
- C:\Deployments
- C:\Logs

All the folders except Logs will only change as a part of a software or content deploy to the environment while the Logs folder may change all the time during usage of the environment. We recommend using a nightly backup of the changes in all the folders.