SCANTRON
ASSESSMENT SOLUTIONS

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System Requirements
v7.1

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Contents

1. Introduction....3
1.1. Type 1: Windows-Based Installation....3
1.2. Type 2: Server Installation....4
1.3. Type 3: Special Installation with Separate Online Server (Dual Server Option)....5
2. System requirements (Windows)....6
2.1. Workstation installation....6
2.2. Server Installation....6
2.2.1. Performance Parameters depending on the application area....6
2.2.2. IIS web server and MySQL database....10
2.2.3. Apache web server and MySQL database....12
2.2.4. Apache / IIS web server and MS SQL database....13
2.3. Dual Server Option (with IIS web server and MySQL database)....14
2.4. Support for Virtualized Environments....16
2.5. Supported Browsers....16
3. Notes on System Security....17
3.1. Configuration considerations....17
4. Printer and Scanner Requirements....18
4.1. Printer Requirements:....18
4.2. Scanner (TWAIN) Requirements:....18
4.3. Minimum System Requirements for Scanstations....19
4.4. Multifunction Devices....19

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1. Introduction

This document provides installation instructions for the following systems.

- Class Climate
- EvaExam
- EvaSys

All three systems share the same set of installation instructions.

It is not recommended to install or configure a system that will not meet the recommended performance parameters.[1]

Note:

Class Climate or EvaSys can be used to deliver paper or online surveys. EvaExam can be used to deliver paper or online tests. In this document, the term *assessment* is used to refer collectively to the instrument being delivered.

Note:

Copy protection is assured by electronic activation. Alternatively, a hardware key (dongle) is possible. To use a hardware key, a USB connection or a USB network solution is mandatory.

Hint:

As an alternative to operating your system yourself, it can be hosted by Scantron Corporation. If Scantron hosts your system, you do not have to provide server hardware or IT resources. Scantron provides the server and maintains the system. For hosted systems, only the local Scanstation needs to be installed on a local workstation. For more information, contact your vendor.

1.1. Type 1: Windows-Based Installation

For Windows-based installations, all major system components (Web server, Database and VividForms Reader) are installed on a single PC. Only the Scanstation can run on a separate PC.

Installation can be completed on Windows 8 or Windows 10.

As a rule, Windows-based installations are not recommended. Workstation operating systems are not suitable to run web services. For such installations, only a single user should

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work with the system, and only small volume, paper based assessments should be conducted.

Windows-based installations are useful if you want to run a test and development system, e.g. to test new software versions. To this end, Scantron Corporation offers special test licenses as part of the Enterprise Option.

1.2. Type 2: Server Installation

Note:
In general, server installations are installed by Scantron Corporation as part of a service. If desired, you can install your system yourself, however, this requires installation training through Scantron Corporation in advance.

All central system components (Web server, Database and VividForms Reader) are installed on a server. Only additional components like the Scanstation and VividForms Designer (if licensed) are installed on one or several workstations.

To restrict the access to data and differentiate between administrative users and participants of online assessments, you can use a second web server. Separating the load between two web servers provides performance improvements (see chapter 2.3 Type 3: Special Installation with Separate Online Server (Dual Server Option)).

The following table lists all necessary system requirements:

Component	Version	Server/Workstation
Existing Microsoft IIS Web Server	7.5 or higher	Server
MySQL Database	5.7	Server
System Server software	7.1	Server
VividForms Reader	2.2	Server
VividForms Designer	1.4	Workstation
Scanstation	3.6	Workstation

Table 1: System Components

	Supported Server Systems			
	Windows Server 2008 R2	Windows Server 2012	Windows Server 2012 R2	Windows Server 2016
Existing installations	☑	☑	☑	☑*
New installations		☑	☑	☑

Table 2: Supported Server Systems for server installations

*Existing installations must be updated to version 7.1 before migrating to Windows Server 2016.

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	Supported Workstation Systems		
	Windows 7	Windows 8.x	Windows 10
VividForms Designer	☑	☑	☑
Scanstation	☑	☑	☑

Table 3: Supported Server Systems for Workstation Components

Notes:

- Multiple Scanstations (at the same location or different locations) are supported. In general, data transfer takes place via HTTPS. In exceptional cases, data can also be transferred via FTP, or by writing to a directory.
- Preinstalled software (Web Server, Database server, etc.) running on the server hosting your system may cause problems during installation. We strongly recommend using a dedicated server. If this is not possible, notify Scantron Corporation.
- As an alternative to an existing MS IIS 7.5 (or higher) web server, your system can be installed on an Apache web server. However, we advise against doing so because this leads to performance decrease and technical limitations. Please refer to the system requirements in chapter 2.2. If you still wish to install Apache, please contact ScanTron support.
- Using a MS SQL Database instead of a MySQL Database is technically possible, however, it is not recommended. Under normal usage, it leads to a performance decrease of about 20-25%. Under high system load, the performance decrease is even higher. If you still wish to install a MS SQL Database, please contact our Professional Service team.

1.3. Type 3: Special Installation with Separate Online Server (Dual Server Option)

This installation type uses two servers. The second server is provided only for online assessments.

This type of installation allows you to restrict access to data on your internal network. Only online assessments are accessible internally and externally. This improves data security, as well as performance, due to the double web servers and resources on both servers. Each server must be scaled according to the requirements. For further information on load balancing, please refer to chapter 2.2.

Scantron Corporation, together with your IT professionals, will provide advice to determine the best configuration for your needs.

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2. System requirements (Windows)

2.1. Workstation installation

Performance parameters for your system are used only for low volume paper based assessments.

Recommended performance parameters:

- Intel ® compatible CPU with at least 2.5 GHz
- 100 GB Hard drive (HDD with 7200 rpm or SSD)
- 4 GB of RAM
- 1 Gbit / s network

2.2. Server Installation

Performance parameters depend upon both the intended use, and the intended intensity of that use. If you only need paper assessments, the performance parameters are lower. Adding intensive use of online assessments increases the performance parameters. Performance capability also depends on the web server and database system.

2.2.1. Performance Parameters depending on the application area

The following graphs illustrate performance parameters appropriate for a server, in accordance with the application area resp. evaluation period. Within each graph, the x-axis represents the time frame and the y-axis shows the server load. Performance parameters must be defined according to the expected load, taking into consideration the CPU cores and internal memory of the servers.

If you only conduct paper assessments, the load on the server can be estimated as low. Before data capture begins, small peaks caused by administrative tasks occur. The data capture itself, i.e. the scanning and processing of forms, does not cause much load on the server.

When creating reports and aggregating data, the load on the server rises slightly. In this case, the size of your organization and the number of persons creating reports are the decisive factors.

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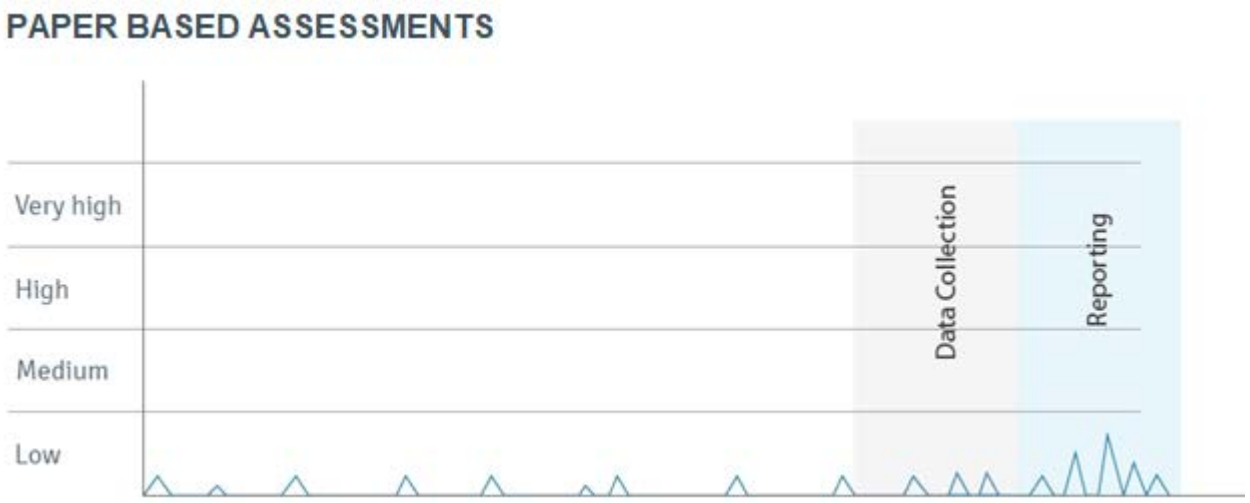

Figure 1: Server load caused by paper based assessments throughout the evaluation period

When conducting online assessments with PSWD dispatch, i.e. when participants are invited by email to take part in the online assessment, the system load in the preparation period equals that of paper assessments.

During data capture, system load increases. Typically, there is an initial peak after participants are invited, and a second peak after they have been reminded to take part in the assessments. Load peaks decrease during additional reminders (unless assessment time frames overlap and new invitations are sent out).

During data capture, load depends on the distribution of assessment invitations and reminders over time, as well as the number of participants. During the reporting period the load decreases, so there is only an increased demand during data capture. Consequently, the server can be scaled dynamically. Outside data capture, you only need resources for low workload (normal operation). During data capture, the server must be upgraded according to your needs.

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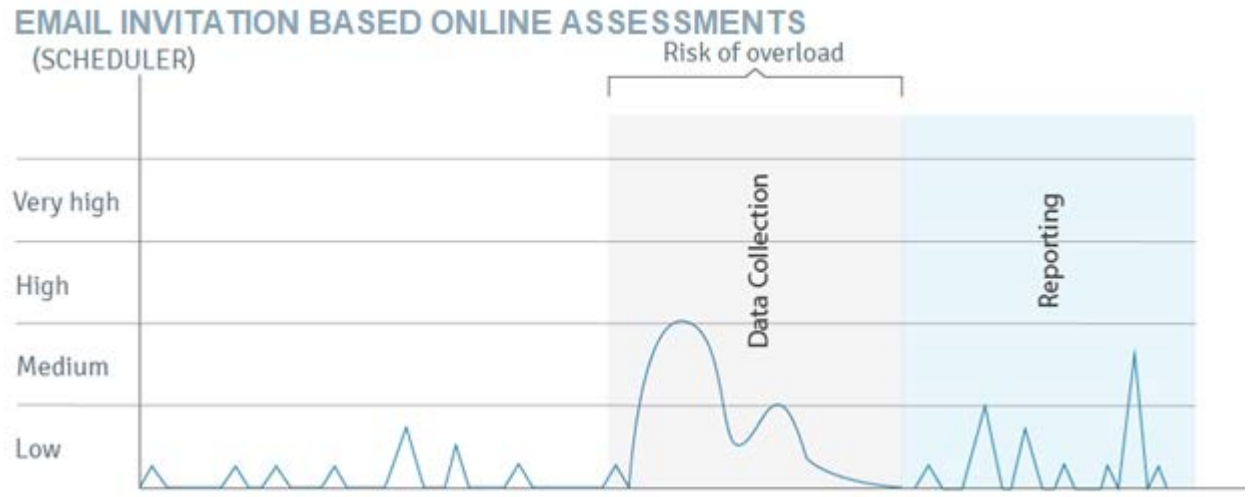

Figure 2: Server load caused by online assessments with email invitations throughout the evaluation period

If you conduct online assessments during courses (i.e. if you do in-class online evaluation), in general the server load over the time is similar to the one described above. However, as time required for the assessment is defined by course time, the load increases during these periods and leads to significantly increased server resource demand.

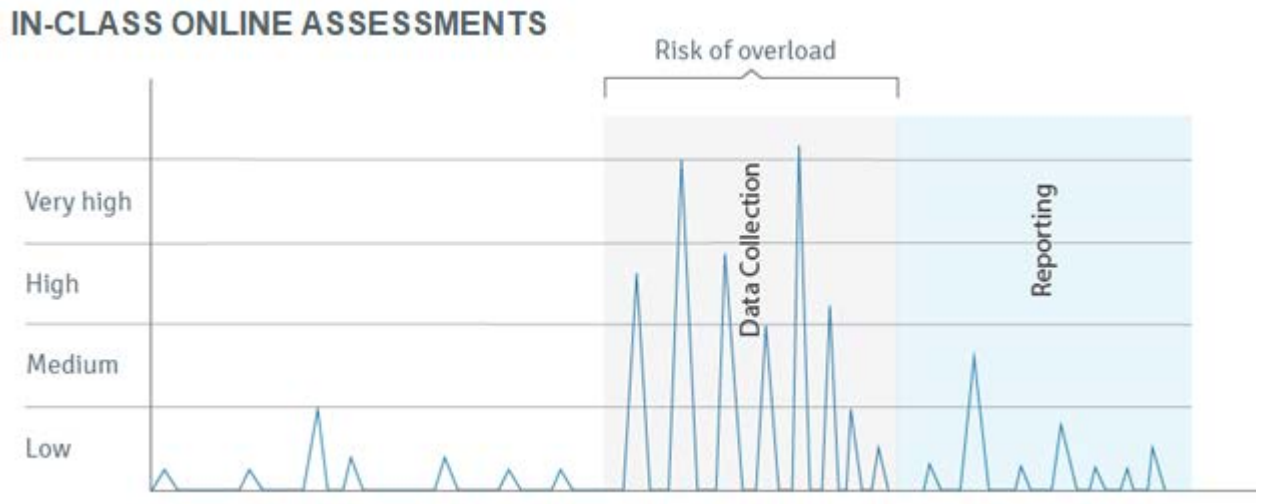

Figure 3: Server load caused in-class online assessments throughout the evaluation period

In this scenario, there is a significantly greater difference between phases of low and high load. It is highly recommended to apply low performance parameters outside data capture, increasing parameters according to requirements during data capture.

The number of participants accessing online assessments concurrently can be very high for large courses with evaluations during the same period. Therefore, it is highly recommended to avoid parallel assessment access.

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Administrators are advised to avoid initiating system actions (such as data imports, report creation, and batch events) during periods of high load. Also, avoid using high resolution image files in online assessment templates or questionnaires.

To ensure successful data capture, the technical infrastructure (i.e., wireless network access points) for online assessments must meet the requirements.

Another important server load factor is integration with Learning Management Systems. Depending on the type of integration, loads can vary greatly. If for example a message on open online assessments is shown each time a person logs into the Learning Management System, server load is increased. When using online assessments extensively with Learning Management System integration, it is advisable to allocate more resources than recommended in the table.

How the Learning Management System communicates with your system also plays an important role. During SOAP communication, only data is transferred. With LTI communication, the HTML template is adapted and HTML files are delivered.

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2.2.2. IIS web server and MySQL database

The following table provides a structured overview of various parameters for your system when used with an IIS web server and a MySQL database. Use the highest expected load to determine the recommended parameter for your system. Note that performance parameters can be adapted dynamically according to data capture periods, as described above:

		Intensity of Use			
		Low	**Medium**	**High**	**Very High**
Parameters of use*	Number of active users within 30 minutes**	0 - 10	11 - 40	41 - 100	101 - 300
	Number of online assessment participants per hour	0 - 500	501 - 1.000	1.001 - 5.000	5.001 - 10.000
	Number of returns within one minute	0 - 20	21 - 50	51 - 100	101 - 150
Recommended performance parameters during normal operation	Number of CPU cores	2	4	6	8
	RAM	4 GB	8 GB	10 GB	12 GB
	Capacity of the hard drive	100 GB		200 GB	
Recommended performance parameters during data capture	Number of CPU cores	4	8	12	16
	RAM	8 GB	16 GB	20 GB	24 GB
	Capacity of the hard drive	100 GB		200 GB	

*The highest expected parameter of use determines the recommended performance parameter for the system.

** Active users include admins, report creators and instructors using active accounts.

Example:
Low amount of users at the same time

+ medium amount of returns at the same time

+ high amount of online assessments per hour

= recommended performance parameter: high system usage

Table 4: Recommended performance parameters depending on the intensity of use for IIS web server and the MySQL database

Estimates for participants per hour are based on an even distribution. If you expect peaks, increase the CPU cores and RAM, or even switch to the Dual Server Option (see chapter 2.3 Type 3: Special Installation with Separate Online Server (Dual Server Option)).

Normally, an even distribution of participants and returns is not likely. However, the number of each in relation to the generated PSWDs can give an overview. Also note how long participants take to complete the assessment after initially receiving it.

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At the end of each limit (e.g., 5,000 participants with 12 CPU cores and 20 GB RAM), expected idle times can be up to 20 seconds.

In general, additional CPU cores and RAM increase system performance. If integration with Learning Management Systems creates additional load, or if the system has to accommodate many concurrent users, you may need to raise the performance parameters beyond those specified in the table. However, this also depends upon the parameters in use. Monitor CPU and RAM usage, then increase resources as needed. Please contact your vendor for further information.

Note: The ratio of CPU cores to RAM should be approximately 1:1.2 for large systems and 1:2 for smaller systems.

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2.2.3. Apache web server and MySQL database

If an Apache web server is used with a MySQL database, performance will be lower compared to a system using an IIS web server. When using an Apache web server, the highest usage levels are not supported. Also, you may encounter error messages when trying to connect to the web server.

		Intensity of use			
		Medium		Mittel	
Parameters of use*	Number of active users within 30 minutes**	0 - 5	6 - 20	21 - 50	51 - 125
	Number of online assessment participants per hour	0 - 250	251 - 500	501 – 2.500	2.501 - 4.500
	Number of returns within one minute	0 - 10	11 - 25	26 - 51	51 - 75
Recommended performance parameters during normal operation	Number of CPU cores	2	4	8	Not supported
	RAM	4 GB	8 GB	10 GB	Not supported
	Capacity of the hard drive	100 GB		200 GB	Not supported
Recommended performance parameters during data capture	Number of CPU cores	4	8	16	Not supported
	RAM	8 GB	16 GB	20 GB	Not supported
	Capacity of the hard drive	100 GB		200 GB	Not supported

*The highest expected parameter of use determines the recommended performance parameter for the system.

** Active users include admins, report creators and instructors using active accounts.

Example:
Low amount of users at the same time

+ medium amount of returns at the same time

+ high amount of online assessments per hour

= recommended performance parameter: high system usage

Table 5: Recommended performance parameters, depending on intensity of usage, for a single server with an Apache web server and MySQL database

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2.2.4. Apache / IIS web server and MS SQL database

If an MS SQL data base is used, you must take into account further performance decreases. The performance depends on the specification of the database server and the latency between the two servers. The values in the table below include safety buffers.

		Intensity of use			
		Medium		Mittel	
Parameters of use*	Number of active users within 30 minutes**	0 - 5	6 - 20	21 - 50	51 - 125
	Number of online assessment participants per hour	0 - 250	251 - 500	501 – 2.500	2.501 - 4.500
	Number of returns within one minute	0 - 10	11 - 25	26 - 51	51 - 75
Recommended performance parameters during normal operation	Number of CPU cores	2	4	Not supported	Not supported
	RAM	4 GB	8 GB	Not supported	Not supported
	Capacity of the hard drive	100 GB		Not supported	Not supported
Recommended performance parameters during data capture	Number of CPU cores	4	8	Not supported	Not supported
	RAM	8 GB	16 GB	Not supported	Not supported
	Capacity of the hard drive	100 GB		Not supported	Not supported

*The highest expected parameter of use determines the recommended performance parameter for the system.

** Active users include admins, report creators and instructors using active accounts.

Example:
Low amount of users at the same time

+ medium amount of returns at the same time

+ medium amount of online assessments per hour

= recommended performance parameter: medium system usage

Table 6: Recommended performance parameters depending on the intensity of use for single server with Apache web server / IIS and MS SQL database

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2.3. Dual Server Option (with IIS web server and MySQL database)

If you wish to restrict access to data on your internal network, but allow access to online assessments from outside your internal network, we recommend using a Dual Server Option. The performance of the frontend server, on which the online assessments are carried out, is raised in comparison to a single server solution, even with the same number of CPU kernels, as the load is shared between the servers. The database runs on a server within your internal network. The frontend server only processes requests from online assessments.

The following table gives a structured overview of various parameters when using your system with an IIS web server, a MySQL database and the Dual Server Option. The highest expected parameter determines the recommend parameter for your system:

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		Usage Intensity			
		Low	**Medium**	**High**	**Very high**
Parameters of use*	Number of active users within 30 minutes**	0 - 10	11 - 40	41 - 100	101 - 300
	Number of online assessment participants per hour	0 - 500	501 - 1.000	1.001 - 5.000	5.001 - 10.000
	Number of returns within one minute	0 - 20	21 - 50	51 - 100	101 - 150
Recommended performance parameters main server	Number of CPU cores	2	4	4	4
	RAM	4 GB	8 GB	8 GB	8 GB
	Usage for online assessments	Yes		No	
	Capacity of the hard drive	100 GB		200 GB	
Recommended performance parameters Dual Server Option (Normal Operation)	Number of CPU cores	-	-	4	6
	RAM	-	-	8 GB	10 GB
	Capacity of the hard drive	-	-	50 GB	
Recommended performance parameters Dual Server Option during data capture	Number of CPU cores	-	-	8	12
	RAM	-	-	16 GB	20 GB
	Capacity of the hard drive	-	-	50 GB	

*The highest expected parameter of use determines the recommended performance parameter for the system.

** Active users include admins, report creators and instructors using active accounts.

Example:
Low amount of users at the same time
+ medium amount of returns at the same time
+ high amount of online assessments per hour
= recommended performance parameter: high system usage

Table 7: Recommended performance parameters depending on the intensity of use for Dual Server Option with IIS web server and MySQL database

Performance can be raised by adding additional CPU kernels and RAM. Adapt the performance parameters dynamically according to your evaluation periods. (Note the additional information in section 3.2.1.)

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2.4. Support for Virtualized Environments

Your system supports virtualized environments such as ESXi, Hyper-V or XenServer. Virtual servers must comply with the performance parameters described in these system requirements.

Note:

Preinstalled software (Web Server, Database Server, etc.) running on the server hosting your system may cause problems during installation. We strongly recommend using a dedicated server. If this is not possible, notify Scantron Corporation.

2.5. Supported Browsers

The following table lists all important browsers and differentiates between system users and online assessment participants:

Browser	System user (Backend)	Online assessmentm participants (Frontend)
Internet Explorer 7	Not supported	Not supported
Internet Explorer 8	With limitations	Supported
Internet Explorer 9	Supported	Supported
Internet Explorer 10	Supported	Supported
Internet Explorer 11	Supported	Supported
Edge 20	With limitations	Supported
Chrome 54	With limitations	Supported
Firefox 50	Supported	Supported
Safari 10	With limitations	Supported
Opera	Not supported	Not supported

With limitations: Browsers are tested with your system. However, there can be optical limitations and system performance might decrease.

Supported: The corresponding browser can be used without further limitations.

* The most recent versions of these browsers were tested. Manufacturers regularly update their browser versions, and Scantron Corporation makes no guarantees about the compatibility of newer versions.

Table 8: Supported browsers

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Furthermore, Adobe Acrobat Reader must be installed on the clients (PCs) of the users who open the questionnaires and PDF reports. Do not use browser plugin-ins to open PDF documents. Browser plug-ins may not display a true image of the PDF document, which can cause issues when printing PDF questionnaires. The browser should be configured in a way that allows for opening PDF documents in Adobe Acrobat Reader.

3. Notes on System Security

Your system is a web based application. Access may be required for both internal (intranet) and external users. If a separate online server is not provided (see chapter 2.3 Type 3: Special Installation with Separate Online Server (Dual Server Option)), you must ensure that the operating system configuration of the server meets the current security standards for internet servers.

In larger institutions and enterprises, there are often special guidelines in place. For questions about network security, contact your IT administrator or internet service provider.

3.1. Configuration considerations

Operating system:

- Implement current security updates.
- No unnecessary services running on the server which could pose additional security risks.
- Separate network cards for internal and external network connections. No routing in the NT kernel.
- Mail service via an external mail server/relay.
- For additional information, please refer to the Data Security Paper for your system.

Firewalls:

- Block all ports except the following:
    - Port 80 and 443
    - Port 3306 when using Dual Server Option
    - Port 1433 when using MS SQL
- Where applicable: NAT or Reverse Proxying

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4. Printer and Scanner Requirements

4.1. Printer Requirements:

- Laser Printer
- Plain White Paper
- Paper weight (24 to 39# Bond)
- We recommend printing the PDF document direct to a printer (Photocopies may result in non-scannable forms)
- Do not use printer economy mode (produces grey values)
- Duplex printing is preferred

4.2. Scanner (TWAIN) Requirements:

The following scanners have been certified with VividForms Reader.

- iNSIGHT 20, iNSIGHT 30, iNSIGHT 4, Insight 4ES
- Canon DR 3080CII, DR 3080C, DR 3060, DR 9080, DR 5080, DR 5010
- Panasonic KV-S2055, KV-S2065, KV-S3065
- Fujitsu 4120 (5120 is not supported)
- Kodak i40 (special configuration of driver is required)
- Avision AV 220

Modern document scanners are usually adequate, if they meet the following requirements:

- Duplex scanning in black and white with 200 dpi resolution
- Multipage TIFF files with group IV compression
- Twain driver
- A scanner with a document feeder is required (flatbed scanners are not supported)

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4.3. Minimum System Requirements for Scanstations

- Intel® compatible processor with a minimum of 1.5 GHz
- 40 GB Hard Disk
- 2GB Memory
- 100 MBit/s Network
- USB port

4.4. Multifunction Devices

It is possible to use multifunction devices to scan paper questionnaires. However, the use of a document scanner connected to the Scanstation is highly recommended. Document scanners can be better configured for the task, and a Scanstation provides comprehensive trouble shooting functions.

If you wish to use a multifunction device, please note the following:

- Multifunction devices must be able to create flawless multi page TIF files, and automatically write them to a predefined directory. The Scanstation automatically triggers further processing and passes the documents on to the VividForms reader.
- Prior to use, multifunction devices should be extensively tested for quality, brightness, contrast, color depth and resolution.
- As a rule, multifunction devices do not have TWAIN drivers, and therefore, cannot be operated directly with the Scanstation.

Note:

Before using multifunction devices, contact Scantron to ensure correct operation.

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