DMFAS

DEBT MANAGEMENT AND
FINANCIAL ANALYSIS SYSTEM

Hardware, Software and Training Requirements for DMFAS 6

DMFAS

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FINANCIAL ANALYSIS SYSTEM

Contents

About this document

This document contains information about:

- The recommended hardware for workstations and servers running DMFAS 6 in an intranet/Internet environment.
- The recommended software requirements to run DMFAS 6.
- The recommended technical training for DMFAS 6 users and the database administrator (DBA).

This document will be updated whenever necessary to consider changes and developments in information technology. Considering that DMFAS 6 is continuously evolving, some hardware or software requirements may change over time. Nevertheless, the DMFAS Programme will do as much as possible to maintain the foreseen hardware and software platform.

The precise requirements for each institution to run DMFAS 6 will depend on the individual situation of the institution (number of users, number of debt instruments, available connections etc.).

It's also assumed in the present document that the users are working on the premises of the institution. In the case of teleworking or telecommuting, another hardware and software configuration may be needed.

Therefore, it is important to contact the DMFAS Programme **before** ordering equipment, software, or training to ensure that the latest and most appropriate specifications and working conditions are met.

Hardware requirements

DMFAS 6 ARCHITECTURE

The DMFAS 6 system has been designed using the multitier architecture specifically, the three-tier model. This type of architecture is made up of three separate processes typically composed of a presentation tier, a logic tier, and a data tier. A three-layer solution could easily be deployed on a single tier, such as a server. In an intranet/internet environment the final decision regarding the acquisition of hardware should consider the needs of the institution, for example, the number of debt instruments, the number of users, the workload of every tier, the projected use of the system, etc.

The present recommendations are based on a configuration where one server hosts the data tier and a separate one hosts the logic tier.

DATABASE SERVER

In general, the DMFAS system runs on every platform compatible with the latest Oracle releases:

Oracle Release	Operating System	
19c	MS WS 2016/2019	Oracle Linux 8 and 9/ Unix/Solaris/AIX/Red Hat 8 and 9/ SUSE 12 and 15

Please note **that the DMFAS programme only certifies MS Windows 2016/2019, Oracle Linux and Red Hat as operating systems**. For any other operating system, you must contact the DMFAS Programme for more information.

Additional memory, processor speed and disk space might be needed if other software is installed. Hardware specifications for servers running another network operating system should have equal performance and capacity and must be compatible with Oracle RDBMS. It is recommended to have an automatic detection software for monitoring updates and proactive support notifications for the operating system.

Component	Specifications
CPU[1]	Intel® / Core i(7/9) 9th to 11th Gen, 4 or more GHz Series Processor
Hard disks	3 x 480 GB or more SATA, NVMe, SSD or SAS 15K rpm with data striping through RAID X (Mixed drive types allowed matching type/speed/capacity)
DVD-ROM	DVD+/-RW
RAID/Internal Controller	PERC H(x)
Memory	From 32 GB up to 128 GB LRDIMM/RDIMM
Screen/Video adapter	17" Flat Panel with integrated video card with 1GB or more
Backup streamer	Digital tape streamer with the same capacity as the total disk space
NIC	1 or more network card(s) supported by the network installed with capacity of 100/1000 Mbps for best performance
Computer in general	If the server is a stand-alone computer, it could be a tower model or suitable for placement in a rack. Both, with a scalable internal capacity and flexibility to adapt to changing workload conditions. Local technical support is strongly recommended.

[1] Any 100% Intel compatible processor, such as AMD can be used as well, given that they deliver equal or better performance.

APPLICATION SERVER

DMFAS 6 is written entirely in Java™ and makes use of the services of JSP compliant Web application servers. As such, there are no specific requirements on the hardware platform other than those of the Web application server software itself. The following server configuration is based on Windows 2016/2019 or Unix/Linux servers functioning as a logic tier (application server) only. Additional memory and disk space might be needed if other software is installed (e.g. database or other applications running on the same application server).

It is recommended to have an automatic detection software for monitoring updates and proactive support notifications for the operating system.

Hardware specifications for servers running another network operating system should have equal performance and capacity.

Component	Specifications
CPU[2]	Recommended 4+.
Hard disk	3 x 100 MB or more SSD or SAS SSD with data striping through RAID Xa
DVD-ROM	DVD+/-RW
RAID/Internal Controller	PERC H(x)
Memory	From 32 GB up to 128 GB LRDIMM/RDIMM
Screen/Video adapter	17" Flat Panel with integrated video card with 1 GB or more
Backup streamer	Digital tape streamer with the same capacity as the total disk space
NIC	1 or more network card(s) supported by the network installed with capacity of 100/1000 Mbps for best performance
Computer in general	If the server is a stand-alone computer, it could be a tower model or suitable for placement in a rack. Both, with a scalable internal capacity and flexibility to adapt to changing workload conditions. Local technical support is strongly recommended.

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[2] Any 100% Intel compatible processor, such as AMD can be used as well, given that they deliver equal or better performance.

WORKSTATIONS (DESKTOPS/LAPTOPS)

The following table indicates the workstation requirements. The "Specifications" column specifies the components for running DMFAS effectively.

Component	Specifications
CPU[3]	11th Generation Intel® Core™ i7-11700 (8 Cores, 16 MB Cache, 2.5 GHz to 4.9 GHz, 65W)
Hard disk	512 GB PCIe NVMe/SATA/SSD or more
DVD+/-RW	16 speed or faster
Memory	16 GB, 2x8 GB, DDR4
Screen/Video adapter	1 GB RAM or more 17/19" Flat Panel 1280*1024 or more VGA/DVI
NIC	Network card supported by the network installed 1/10 GB bps or more for best performance
PC in general	Plug and Play ready (Windows 10 or Mac not using Safari), Flash BIOS, local service available

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[3] Any 100% Intel compatible processor, such as AMD can be used as well, given that they deliver equal or better performance.

PRINTER

Component	Specifications
Type	OS compatible laser printer
Format[4]	A4 (210 mm x 297 mm), duplex printing and A3
Language	PCL6e or newer and Postscript
Capacity	12–16 ppm
Resolution	600 dpi

ACCESSORIES

Component	Description
UPS	For the servers (and, if necessary, for the workstations)
Hub or, even better, a switch	For connecting the server, workstations, and printer If 1/10 GB network cards are used, check that the hub also supports 10 GB.
Backup Media	For the streamer(s) The number of digital disks is dependent on the back-up strategy.
Cartridges	For the printers
Paper	For the printers

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[4] All **standard** DMFAS 6 reports fit on A4 paper (210 mm x 297 mm) in portrait or landscape orientation. For country-specific or customized reports, a printer with a capacity for larger paper sizes provides more flexibility.

Software requirements

Network operating system

For the database server, any network operating system that supports the Oracle RDBMS (relational database management system) version is accepted. The expertise for administering and maintaining the network should already exist at the installation site. Up to now, the Oracle DMFAS 6 database has been installed and tested under Windows 2016/2019 (64 bits), Oracle Linux 8 and 9 and Red Hat 8 and 9. The DMFAS Programme in Geneva uses Windows 2016/2019 and Linux servers as reference platforms.

Oracle Release	Operating System	
19c	MS WS 2016/2019	Oracle Linux 8 and 9/ Unix/Solaris/AIX/Red Hat 8 and 9/ SUSE 12 and 15

The DMFAS programme certifies the platforms MS Windows 2016/2019, Oracle Linux and Red Hat as operating systems. For any other operating system, you must contact the DMFAS Programme for more information.

It's strongly recommended to install an antivirus and malware protection software.

Oracle database software

DMFAS 6 is targeted for platforms using the Oracle RDBMS version 19c. In line with this, two RDBMS products are available: Standard Edition 2 or Enterprise Edition. So far, the product that we recommend buying for a new installation or for an upgrade from a previous DMFAS installation is Oracle 19c Standard Edition 2 because of its favourable price. The Enterprise Edition would be suitable for installations supporting more than 25 users or when specific features of the product are needed to comply with specific requirements.

Application server software

DMFAS 6 is targeted for platforms using any of the following application servers:

- Apache Tomcat V9.0.80 (open source, free to use)
- Open JDK 11

SOFTWARE FOR WORKSTATIONS

Operating system

DMFAS 6 runs as any standard web-based application, making use of current market standard web browser software, which support the latest HTML standards and include support for multilanguage character sets (considering that the system needs to support English, French, Spanish, Russian and Arabic[5] character sets) such as Mozilla Firefox or Google Chrome. In line with this, there should not be restrictions in terms of operating system (MS Windows 10/Mac/Linux) if it provides support for the above-mentioned features.

It's strongly recommended to install an antivirus and malware protection software.

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[5] For the Arabic interface, the system must also consider the data entry from right to left and the inversion of data entry forms.

Reporting software for DMFAS clients

Considering the change of technology, the DMFAS 6 software makes use (internally) of the open-source Business Intelligence and Reporting Tool named Eclipse BIRT, which provides a more professional set of reporting features (e.g. the possibility to produce graphs, exporting to Portable Document Format, etc.). This open-source software can additionally be installed with DMFAS version 6.

Under the terms and conditions of any open-source tool, Eclipse BIRT installation is allowed on any DMFAS client to create reports. However, it is advisable to install it on the computer of a technical or advanced functional user to prepare the set of reports required by the debt office. These reports can be later centralized on the application server and executed from any DMFAS client.

Note that to continue using any Oracle reporting tool, a license fee is required whereas for the use of BIRT no license fee is required.

Additional software for workstations

The following additional products are needed to integrate the DMFAS 6 software with reporting tools:

- Adobe Acrobat Reader (TM) (may be required for viewing/printing reports)
- Office tools (spreadsheets, word processors, etc.)
- Java SE (JRE) version 7 or 8 up to update 251

PRICES AND LICENSING

The following table details the Oracle products needed to run DMFAS 6 and their respective prices as indicated on the Oracle website. Prices are based on the latest price list[6] of Oracle products for the Oracle 19c database.

Price of Oracle products

The prices below may vary subject to changes in the licencing policy of Oracle Corporation.

Product	Price for a perpetual licence (in US dollars)	Maintenance per year (in US dollars)
Oracle19c Standard Edition 2 (servers up to 2 sockets and a maximum of 16 CPU threads)	10 users minimum: 3 500 (Named User Plus: 350) OR Per processor: 17 500	10 users minimum: 770 (Named User Plus: 77) OR Per processor: 3 850
Oracle19c Enterprise Edition 2 (servers up to 2 sockets and a maximum of 16 CPU threads)	10 users minimum: 9 500 (Named User Plus: 950) OR Per processor: 47 500	10 users minimum: 2 090 (Named User Plus: 209) OR Per processor: 10 450

Example

The following example is for 1 server at the Ministry of Finance or Central Bank with up to 2 sockets, a maximum of 16 CPU threads and 10 DMFAS users (with perpetual licenses).

Product	Price (in US dollars)
1 Oracle Database 19c Standard Edition 2	(350 USD x 10 Named Users) = 3 500
1 year of maintenance	(77 USD x 10 Named Users) = 770
Total Licenses	**4 270**

It's strongly recommended that each institution refer to a local Oracle sales representative before purchasing any Oracle software product.

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[6] *Oracle Technology Global Price List*, 7 December 2023.

Hardware warranty and Oracle maintenance agreements

All critical hardware and software should be covered by a warranty or maintenance agreement (also known as a service agreement).

All hardware components and software are acquired under a warranty for a period during which their repair or replacement is the responsibility of the supplier, so long as defects occur during normal use. You usually have the option of extending the warranty when you buy a product, especially with larger hardware items.

For every Oracle product license bought, it is recommended to obtain an annual maintenance agreement. Depending on the type of maintenance support purchased, this agreement may cover hotline telephone support or web support. In addition, a maintenance agreement automatically gives the right to a free upgrade of the Oracle product.

Training requirements

It is the policy of the DMFAS Programme that the DMFAS software should be installed on an intranet/internet. Consequently, the following information focuses on other recommended training activities that should be carried out **before** DMFAS 6 software is installed. Normally, training activities of this type are conducted locally by a software vendor, technical institute, etc. The suggested training modules are:

1. **Training in Oracle database administration** – The training component would concern only one or two selected staff members who would be responsible for the database administration part of the DMFAS 6 installation. This training should at least include i) Oracle database installation and upgrade ii) the physical structure of an Oracle RDBMS and iii) the administration and tuning of an Oracle database.

2. **Training in application server administration** – The training component would concern only one or two selected staff members who would be responsible for the maintenance and administration of the application server selected for the DMFAS 6 installation. This training, building on the above-mentioned training, should at least include i) the physical structure of the application server components, and ii) the administration and maintenance of the application server itself.

Finally, it is worth mentioning that, normally, during DMFAS 6 technical training, many relevant database administration tasks will also be carried out by UNCTAD after the system installation.