DataWorks Hardware Configuration and Requirements

This document is provided to answer questions regarding the hardware and software requirements necessary to support a successful DataWorks Inventory Application installation. Supported hardware and software have been tested with DataWorks Inventory Application and are expected to function properly. DataWorks will address any questions or problems that you encounter when you use this product version with the supported hardware and software. Individual configuration issues (e.g., number of users) can affect actual requirements. The proof is always in the pudding, not the recipe.

DataWorks can provide application hosting for you via our datacenter if you do not have the resources to procure and manage a server located at your facility.

DataWorks Inventory Application Server Hardware Requirements

Component	Requirement
Server and Processor	Intel or Intel Compatible Server with two dual-core 2-GHz processor required; 2.0-GHz or faster dual or quad core processors recommended
Memory	8GB minimum, additional per the IT evaluation.
Hard Disk	20-40 GB of available local hard-disk space. Hardware redundancy recommended
Display	Super VGA (1024x768) or higher resolution video adapter and monitor
Network	1 Gigabit LAN connection or higher

This document gives our best knowledge of what has worked for other sites: this document should be seen as a starting point in designing and implementing your specific implementation. During the Site IT Survey, we will provide our best judgment regarding how these details might be altered to fit your situation. Nothing that we suggest should be taken as a promise on our part that what we suggest will definitely work. What we promise is that we will work with you to provide your users with the best retail inventory management experience we, DataWorks and you working together, can provide them.

Deployment

DataWorks Inventory Application can be installed on a Microsoft Windows Server running Terminal Services or in a Citrix farm configuration. In this environment a single copy of the program is installed on the server. Users will access the application via Microsoft Remote Desktop Connection or a Citrix Client. Fat clients (desktop PC's) may also be used to access the application. Below are the specifications for a fat (desktop PC) configuration.

DataWorks Inventory Application Server Software Requirements

Component	Requirement
Microsoft Windows Operating System	Windows Server: any current server version under Microsoft Mainstream Support.
Internet Explorer	Microsoft Internet Explorer 9.0 or later
Other Software	{Microsoft Driver 11 for SQL Server} or later in the same series. Acrobat Reader (or higher)

DataWorks Inventory Application Desktop Hardware & Software Requirements

Component	Requirement
Server and Processor	Intel or Intel Compatible PC with a dual-core 2-GHz processor required; 2.0-GHz or faster dual or quad core processors recommended
Memory	4 GB of RAM required; power users will benefit from a 64-bit OS
Hard Disk	20-40 GB of available local hard-disk space.
Display	Super VGA (1024x768) or higher resolution video adapter and monitor
Operating System	Any current Windows version under Microsoft Mainstream Support
Internet Explorer	Microsoft Internet Explorer 9.0 or later
Other Software	{Microsoft Driver 11 for SQL Server} or later in the same series. Acrobat Reader (or higher)
Network	100MB or Gigabit LAN connection or higher

SQL Server Database Hardware Requirements

Component	Requirement
Server and Processor	Server with two quad-core 2.0-GHz processors required, dependent on hardware evaluation
Memory	8 GB and above for 64bit operating systems. Additional memory dependent on usage, per hardware evaluation
Hard Disk	20-40GB of available local hard disk space. Hardware redundancy recommended.
Optical Drive	CD-ROM or DVD-ROM drive
Operating System	Windows Server any current version still in Microsoft Mainstream Support
Display	Super VGA (1024x768) or higher resolution video adapter and monitor
Network	1 Gigabit LAN connection, or higher, required between application server and SQL server
SQL Requirements	SQL Server: Standard or Enterprise, any current version under Microsoft Mainstream Support

Additional Considerations

■ It is highly recommended to deploy the DataWorks Inventory Application on its own hardware platform. A lot of times, it is requested that the DataWorks Inventory Application be able to run on existing servers. This is possible; however, this usually results in increased problem resolution should a problem occur.

■ For customer sites that have 5 or less users, the DataWorks Inventory Application and SQL database can reside on a single server. For any sites over the 5 user limit, the application server and SQL database server must reside on two separate servers.

■ From the user's perspective, a 17 inch monitor with a 1024 x 768 resolution should be used at minimum.

■ Printers – Reports generated from the application print to the clients default printer. The appropriate printer drivers should be installed on the server. The ticket printers use the printer drivers.

■ A mapped network drive will need to exist between the point of sale server and the DataWorks Inventory Application server.

- If it is decided that hosting is a more efficient option, an FTP connection to the point of sale will be required for data transfer.

- Users must be assigned adequate permissions to create, alter, and delete records on the SQL database, as well as access extended properties of the database.

- Users on Server 2008 systems (or later) must have adequate permissions to access Win32Api/WMI functions on that server, in order to perform actions like knowing which version of DataWorks Inventory Application they are using, or identifying the username and server in order to point to the right printers for that user from with NeXT.

- The DataWorks Inventory Application Service performs needed actions in support of retail activities (e.g., interfacing with the POS system). This Windows service should be installed on a server that has continuous access to the SQL Server, and is directly accessible to DataWorks Support. Where DataWorks Inventory Application is presented through Terminal Services/Citrix, the service can reside on the same machine.

- Virtual Machines - As an application that is both transactional (data entry) and data analysis (reporting) DataWorks has very heavy data demands. These data demands often do not make the DataWorks system an ideal candidate for Virtual Machine environments. DataWorks continues to explore Virtual Machine environments, and can make best practice recommendations but please be advised that should your configuration cause issues, you will be asked to move to a physical configuration.

  VM technology has limits, and those limits specifically include handling large database applications.

  We will be supplying additional information as it becomes available, in terms of parameters that affect performance.

  1) For a VM that will have more than 3 concurrent users, there should be a 4 GB RAM disk installed in the VM. We will point to it for writing temporary files, which are created with every query to SQL Server. Effectively, this means an x64 OS with a minimum of 8GB of memory.

  2) In addition, it is important to realize that DataWorks Inventory Application needs a processor for every 2-3 users, plus one for the OS. If there will be 9 (maximum) concurrent users, there must be 4 cores assigned. If there will be 15 users, 6 cores must be assigned.

  3) The DataWorks Inventory Application service should run on a different VM than the application server if there are more than 9 users. It needs its own 4GB RAM drive in either case. If on the same server as the application server, it will still have its own install directory, in order to point to its own RAM drive. For the DataWorks Inventory Application service on its own VM, only two cores are needed and 8GB of memory, with 4GB of that a RAM drive. For the 20 to 25 users that will fit on an application server (RDP or ICA), a 20GB ephemeral ramdisk should be installed.

  4) The SQL Server cannot be on a VM: there is nothing in the VM literature that suggests this works except for minimal usage instances. Best practices for SQL Server must be followed: DataWorks Inventory Application should be on its own SQL Server with > 9 users, if the other databases are lightly used. If the other databases are constantly used, DataWorks Inventory Application should be on its

own server.

- enough memory -- for > 5 users, 16 GB; for 6-20 users, 32 GB, etc. Given memory costs, there is no reason not to put in the 128GB max that applies to SQL Server 2014 Standard.
- for 5 (maximum) users, 2 processes minimum; 6 to 10 users, 4 processes minimum; for 21 to 40 users 12 processes minimum; for 40 to 80, 16 processes; etc.
- separate local drives, or clean luns on a SAN (and a very fast wide pipe, typically fcoe), for data, logs, and tempdb files. Logs and tempdb files should be RAID6 or RAID10 to maximize write speed. Data can be RAID5 or RAID6 or RAID10: DataWorks Inventory Application does many more reads that writes, so RAID10 would be preferred. Each local drive should have its own controller, as the controller is most often the bottleneck once SSD drives have been installed.
- a tempdb file per MSDN specs (same size, etc.) for each process (see above for number of processes needed).
- minimum 1GB ethernet, directly routed, between the app server(s) and the sql server. For > 40 users, 10GB is highly recommended.

These specifications stem from our widely varying experiences with VM installs of NeXT. For large installs, problems are more frequent than successes. As indicated, VM's do not fare well with large database applications without very special care: the technical literature is replete with instances of VM attempts rolled back to bare metal installs. Following the specifications above will increase the likelihood of success, but will not guaranty them. Factors such as the capability of the SAN, if one is in use, can have a large effect. And given the state of the art in using VM's with large database applications, there is likely to be more that will be learned. Once you have followed the specifications above, we are willing to learn with you. But even then, we cannot guaranty that your VM installation of DataWorks Inventory Application will succeed.

- For configurations where users will run DataWorks Inventory Application from their desktop computers (contrasted with Terminal Services/Citrix), in order to reduce problems associated with updates within Versions and upgrade between versions, DataWorks makes available automatic updates from within your network. Once you have approved the update or upgrade, a single install to a network-accessible Update Point is made, and all machines will update automatically as users log in. This is a great time saver for site IT personnel, as well as a convenience for users.

- Every 100 facilities receiving inventory exports requires a separate instance of the DataWorks Inventory Application service, in typical usage. These can reside on a single server, depending on the server capabilities.

Maximum Users Per Application Server

The maximum number of users that can be successfully (i.e., have a good software user experience while accessing DataWorks) will vary dependent on hardware, operating system, and network variables. Because the main DataWorks application is a 32-bit application (although it works against x64 data sources), users' memory access will be limited to the first 2GB of memory. In addition, the application is a STA (Single Threaded Apartment) application, meaning that the number of cores available is key: there should never be more than 3 users on a particular core (counting physical and virtual -- hyperthreading -- cores). *Effectively, this means than you are likely to find that 40 to 50 users is the maximum that very good hardware, OS and network conditions will support.* We set maximum user memory of the DataWorks application to a balance between effective operation (the application is very good at caching frequently-used resources) and efficient operation (maximizing the number of users able to use the server).

The number of users who can use our application concurrently on a server is much fewer than with other applications. Although our application might seem like just another application, it is in fact one of the largest database applications likely to run on your network, unless you are running something the size of SAP ERP. Our database has over 650 tables, and is highly relational. That's how we can do so much to help your retail people monitor and plan their retail activities: we have the sliced and diced data that allows them to do their jobs well.

You should, or course, monitor your servers in the normal ways to determine whether slowdowns are occurring. In addition, we have metrics for several important operations in DataWorks central application, and will use our access to your app servers to ensure that software is running smoothly. *You should, of course, set up your application servers to log users out of disconnected operations after a set amount of time.* This frees up memory, which along with core/process availability is what determines good user experience in our application.

If you find yourself with more than 40 or 50 concurrent users, you should put your app servers in a farm. How you do that is entirely up to you, keeping in mind that configuring printers to users is a key component of using the DataWorks application. Our experience with Citrix/XenApp has convinced us that this is a great way to provide a good users experience. You might find that Windows 2012 Enterprise has the features you need, as printing support has reportedly been improved for farm installations.

Hardware Requirements for Servers with Multiple Service Instances

Summary: The number of cores available should be at least equal to the number of service instances plus 2.

Details: DataWorks runs as a Single-Threaded Application (STA). Because STA apps can only run a "statement" in an app one-at-a-time on a single core, any additional instances that are assigned (by the operating system) to that core will have to wait until that statement is completed before running their next statement.

In User applications this rarely creates any slowdowns. User applications wait more than they work. Services, however, work continuously, especially in the DataWorks context of importing sales and exporting various files in the "off" hours when retail sites are closed for the day and employees who need this data are not yet at work. Putting two services

on one core will often result in their slowing down each other when they end up assigned to the same core. Thus the need, in busy environments, to have one core available for each service instance.

In addition, of course, the Operating System requires a core or two to operate, along with the various helper apps like endpoint security, etc. Hence the addition of two cores to the number of services.

Note that in the case of Virtual Machines it is important to monitor the pressure the VM is placing on the underlying physical cores.

Finally, one additional way to have services play nice with each other is to speed up what is often the slowest link in the chain, the pulling of data down to temporary tables on the local file system. As described in the Hardware/Software Requirements documentation, a RamDisk (yes, a ramdisk) can relieve I/O wait times on the sql server, and possibly on the services application server, while also shortening the time to completion for the command statement pulling down that data.

Support Considerations

- DataWorks provides telephone and email access for problem reporting on a 24/7 basis. Problems are handled on first-come, first-served during the business day and are prioritized for after hours support.

- Remote access to the DataWorks Inventory Application server or the Point of Sale Server is established using Citrix's GoToAssist and GoToMyPC products provided by DataWorks. Other access methods may hinder problem resolution and will be subject to additional fees. GoToMyPC allows immediate access by Support, while other methods requiring actions by site personnel may well lead to delays in resolving issues.

- DataWorks Inventory Application proactively sends error reports for the DataWorks Inventory Application program and service, and for missing sales receipts, on a daily basis, using an email account at dataworksinc.com, and sent to an email account at dataworksinc.com. If these emails are blocked by security filters on site, the ability of Support to solve issues in the most timely fashion is hindered: thus we recommend that security filters be configured, if possible, to allow these emails to be sent. If that cannot be done, Support has the ability to turn off automatic support emails.

- A high speed permanent internet connection is required.

- DataWorks support will need to have administrative rights on the DataWorks Inventory Application server.

- DataWorks support login must have the ability to access the SQL Database with a default dbo schema, in order to run upgrades within versions, and between versions.

- DataWorks support will need access to SQL Server Management studio with permissions to create the DataWorks Inventory Application database, perform backups, perform restores, and create and alter extended properties.

If you have any questions regarding hardware or software requirements please contact our customer support center at 239-444-1030 and choose option 1.

Appendix A

SQL Server Performance Modifications

Modifications made to the Application Server OS (Server 2003 only):

Change system page file from dynamic to static (4092MB)

Turn off DEP via boot.ini modification (NoExecute=AlwaysOff)

Physical Address Extension activated via boot.ini (/PAE)

Antivirus turned off - modifications can be made to AV to ignore certain SQL processes

Change OS priorities for Programs and best performance

SQL 2005 Native Client will need to be installed for ODBC connection to SQL server data

Modifications to SQL Server (2005 only)

Enable AWE (32-bit only)

Set minimum and maximum SQL memory standards depending on physical memory in server.

Set database and log file to 1GB for initial size

Transaction Log set to "AutoGrow"

Database set to "AutoGrow" in 100MB increments

The account(s) accessing the SQL database will need (dbo) rights to the database

Other Modifications:

The following registry settings are to be applied to both the SQL server, and all application servers. This is a Microsoft Knowledge Base Article (KB319502) explaining the registry modification cause and resolution:

Increase the port range that is used for anonymous ports to approximately 20,000 ports (for example) by modifying the MaxUserPort registry key. Windows uses the conventional BSD range of 1024 to 5000 for its anonymous (ephemeral) port range. You can set only the upper bound of the ephemeral port range. To modify the MaxUserPort registry key, follow these steps:

a.   Start Registry Editor (Regedt32.exe).

b.   Locate the MaxUserPort key in the registry:

   HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters

c.   On the Edit menu, click Add Value, and then add the following registry value:

Value Name: MaxUserPort

Data Type: REG_DWORD

Value: 65534 (for example)

Valid Range: 5000-65534 (decimal)

Default: 0x1388 (5000 decimal)

Description: This parameter controls the maximum port number that is used when an application requests any available user port from the system. Typically, ephemeral (that is, short-lived) ports are allocated between the values of 1024 and 5000 inclusive.

d.   Change the timeout on the connections from 240 seconds (the default) to any length from 30 seconds to 300 seconds (30 seconds recommended). Use the TcpTimedWaitDelay registry parameter to change this value. To do this, start Registry Editor (Regedt32.exe), locate the following key in the registry, and then modify the value:

HKEY_LOCAL_MACHINE\System\CurrectControlSet\services\Tcpip\Parameters

TcpTimedWaitDelay

Key: Tcpip\Parameters

Value Type: REG_DWORD-time in seconds

Valid Range: 30 (decimal)

Default: 0xF0 (240 decimal)

Description: This parameter determines the length of time that a connection stays in the TIME_WAIT state when the connection is being closed. While a connection is in the TIME_WAIT state, the socket pair cannot be reused.

Microsoft Active Directory Integration and SQL Server Access:

The following guidelines will outline the Microsoft Active Directory integration and SQL Server database access for users accessing the DataWorks Inc. database. The preferred method is Active Directory integrated logins as it is easier from an administrative standpoint to add/ remove users from a particular Active Directory Group.

The SQL Server database server roles should be set to <public> while the Active Directory Group should have db_owner rights to the DataWorks Inc. database.

The Active Directory Group will need to be setup prior to installation so the correct access will be in place for the installation.

DataWorks Inc. DataWorks Inventory Application requires a network file sharing location accessible to all users of the DataWorks Inventory Application. This directory is required for DataWorks Inventory Application to operate as it holds all internal security tables for the DataWorks Inventory Application. This file share location should be centrally located for all users, and all DataWorks Inventory Application users must have <FULL> rights to that location.

For Windows Server 2008 implementations, users will need to be given explicit access to the DataWorks folder. This can be assigned using the same Active Directory Group that will be used to SQL database access. This group will need <Full> rights to the folder.

Citrix/Terminal Services Configurations:

Citrix Printing: A policy for printing should be setup to allow auto-creation of all printers on the workstation. This policy should try and use the Windows Native driver, but then use the Citrix Universal driver if the Windows Native driver is unavailable.

Terminal Services: Terminal Services will need to be setup prior to installation with the appropriate rights for users accessing the DataWorks Inventory Application. Access can be granted via the Environment Tab in the users Active Directory properties. A terminal server-licensing server will also need to be active with the appropriate number of terminal server CAL's for the number of users.

DataWorks Inc. is not responsible for setting up and configuring the application delivery method (Microsoft Terminal Services or Citrix), but we can provide tips and best practices as to what works well with our application. We have developed benchmarks for performance that we know provide a good window into performance for any installation. In the end, therefore, it will be the performance of the application against those benchmarks that determine whether we can certify a given installation as supportable by our support staff.

Customer Checklist of Responsibilities Prior to DataWorks Inventory Application Installation:

All modifications listed in Appendix A must be performed on designated servers by customer IT staff. This covers the following changes/modifications:

     i.   All operating system modifications.

    ii.   All SQL access and Active Directory access groups.

    iii.   Any SQL performance and registry modifications.

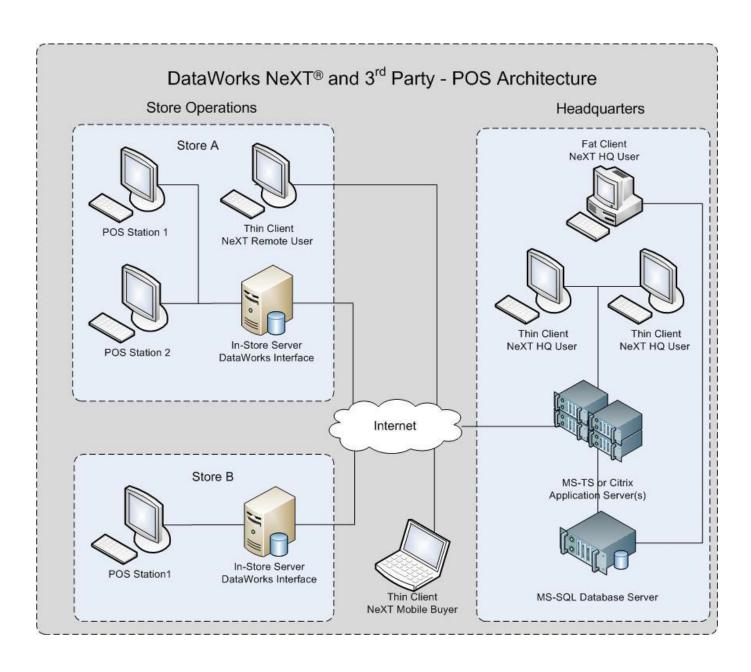   iv.   All network access and file shares required by the DataWorks Inventory Application.

v.   Application delivery method such as Microsoft Terminal Services or Citrix.

Appendix B

Representative DataWorks Inventory Application Network Configuration

DataWorks NeXT® and 3rd Party - POS Architecture