

Laserfiche Hardware Planning and Specifications

White Paper

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Laserfiche®

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Introduction

This paper covers how to effectively gather requirements, survey existing resources, and plan system and hardware needs for a Laserfiche installation or integration. In addition, it details the considerations for supporting each component of the Laserfiche system, from the Windows Server, through every Laserfiche application, to storage and backup.

Specifying and selecting hardware is more an art than a science. There's no single answer to any given question, and hardware needs are never the same from company to company. Though this paper contains a broad overview of the questions to ask and the decisions to make, there will be many variations in customer setups that will require you to ask questions and make decisions not covered here.

Note: The estimates and advice in this paper are intended as guidelines only, not as rules. We cannot guarantee the hardware we suggest will always be sufficient for every organization's configuration.

Gathering System Requirements

The first step when planning the implementation of Laserfiche for an organization is to determine what the customer (or organization or department) expects from Laserfiche.

The most important question involves the user base. When considering your user base, remember that there is a difference between the total number of users and the number of users who might be logged into the system—and therefore using your hardware resources—at any single moment.

Because the number of active, concurrent users is incredibly important when considering appropriate hardware for an installation, we suggest an estimate of one-in-four—that is, for every four total users (licenses), one user is likely to be accessing the system at any given time. For a 200 user license enterprise implementation, you'll want to plan for your system to accommodate 50 simultaneous users at any given time.

Note: Throughout this paper, we will use the term "users" to refer to simultaneous, concurrent user load on the system. This term used here should not be confused with the number of named user

licenses or the Laserfiche Team/United licensing schema of [concurrent user licenses](#).

If your customer, organization, or department will deploy Laserfiche over the web (e.g., through the web client or WebLink), take note of the number of users who will use Laserfiche this way, in order to calculate the amount of traffic to your web servers.

After getting a sense of the user base, the next step is to determine their expected scanning volume. How many pages of documents will be going into the system on a daily and monthly basis? We recommend trying to predict or calculate this number for a three to four year timeframe (considering three to four years to be the typical lifespan of computer hardware). We will discuss storage implications and how to convert number of pages to GB below.

On a related note, you'll need to determine if image capture will primarily be done through an installed Laserfiche Scanning client on the same local area network (LAN) as the Laserfiche Server or if it will be done via [Web Scanning](#). This information will help you calculate web server loads, as well as any effect on network bandwidth.

Workflow and Quick Fields can be challenging applications to specify hardware for. However, for your initial requirements gathering, it's enough to know if the customer plans to use the products, how intense that use might be, and what, if any, Quick Fields add-ons they might employ.

System Storage Calculations

The table below provides guidelines for the amount of processing power and memory that might be required for an installation based on the number of concurrent users and the number of pages brought into the system each day.

- **The green area** represents user needs that can typically be supported by a single server running Laserfiche Server, the web client server, and Microsoft SQL Server. We suggest at least a quad-core processor with 16GB of RAM.
- **The pink area** represents needs that are best met by a dual-server configuration, with Laserfiche and the web client server on a single server, and Microsoft SQL Server on its own machine. For the Laserfiche/web client server, we recommend at least a quad-core processor with 8GB of RAM, and for the SQL server, the same processor with at least 8GB of RAM.

- With a system of this size, organizations may consider virtualizing the Laserfiche infrastructure. We recommend allocating four processor cores and 8GBs of RAM to a single virtual machine hosting both Laserfiche and web client servers.

Note: For the best possible performance, keep Microsoft SQL on its own physical machine, even if other applications are virtualized.

		Active Concurrent Users				
		10	25	50	100	200
PAGES/DAY 50kb ea	200	15GB*	30GB	45GB	60GB	75GB
	500	30GB	45GB	60GB	75GB	90GB
	1,000	60GB	75GB	90GB	105GB	120GB
	2,000	105GB	120GB	135GB	150GB	165GB
	3,000	150GB	165GB	180GB	210GB	240GB
	5,000	210GB	240GB	270GB	300GB	360GB
	10,000	450GB	495GB	540GB	585GB	660GB

*Please note that all storage estimates listed are for three years, which is the estimated life of current off-the-shelf hardware. The estimates also consider only the size of Laserfiche pages (8.5 x 11 inches, black/white, 300 dpi) and do not take into account the size of electronic files. If you have electronic files in your system, you should add your estimate of the collective size of these files to the numbers above.

- **The blue area** represents configurations approaching "enterprise" level, for which we recommend a three-server configuration: Laserfiche Server, web client, and Microsoft SQL Server each on their own machine with a minimum of a dual-core processor and 8GB of RAM.

Note: With more than 100-150 concurrent users, a second web client server is recommended to support network load balancing.

- For virtualization, we recommend a similar configuration where each server (except for MSSQL) resides on a dedicated virtual machine. The virtual machines should be allocated four processor cores and 8GBs of RAM.
- **Optimal storage configurations** also depend on the size of the system. For smaller Laserfiche implementations, such as the green area in the chart, we recommend a single RAID 5 array. For the other estimated loads (pink and blue in the chart), the ideal configuration is three separate RAID arrays, one each for the Laserfiche volumes (RAID 5), Microsoft SQL Server data file (RAID 1 or RAID 1+0), and Microsoft SQL Server transaction logs (RAID 1 or RAID 1+0).

When dealing with a truly enterprise customer and system, there are some best practices to follow. Putting all Laserfiche components on separate servers is well worth the extra cost to avoid potential resource-sharing problems. Also, don't forget additional support environments when you plan for Laserfiche in production. Development, testing, training, and production environments may all be required for seamless performance, depending on your customer's requirements.

As you create a hardware plan for your customer, plan your hardware system to include multiple cores and sockets. This will allow you to take advantage of Laserfiche's multi-threaded processing capabilities, making your customer's operations run more efficiently and quickly.

Evaluate Current State

Hardware and Network

After gaining a thorough understanding of what the customer expects from their Laserfiche implementation, you should survey the current system, not only to understand what resources the customer may already have in place, and what they may need to upgrade, but also to be sure you're aware of existing processes and behaviors you need to accommodate.

To start, look at your customer's existing network infrastructure, beginning locally with the LAN. Evaluate network speed. If your customer has remote sites, how are they connected? By a wide area network (WAN) or by virtual private network (VPN)? If remote sites connect via a WAN, be sure to evaluate that network speed, which will factor into a number of decisions. Do remote sites use a Windows client to connect across the WAN to the Laserfiche Server or do they use the web client? If using the web client, will there be enough users and

network load to require more than one web client server? How is the installation distributed to remote users?

Note the specifics of the hardware in place, including the primary hardware vendor, as your customer may want to maintain existing contracts and/or relationships. Similarly, consider existing arrangements for storage, as enterprise customers usually have some sort of storage area network (SAN) in place. Again, access from remote business sites or partners will have an impact on retrieval times from storage. Another consideration is the customer's high-availability requirements: they may have service-level agreements for disaster recovery that must be met, governing failover locally or from site-to-site.

A final consideration, based on the current state of the hardware in your customer's system, is planning for growth. Laserfiche typically plans for three to four years of growth, which is considered acceptable life expectancy for off-the-shelf hardware.

Software

Laserfiche will not only need to work with existing hardware and networks, but also with existing customer software. Therefore, knowing what kind of software is already in use is also vital. What operating systems are supported? What database systems are in use already or are preferred? What backup software is being used with the customer's backup hardware configuration? You'll want to determine if your customer is planning to, or already does, virtualize their systems, and what virtualization software they use or prefer.

Planning

Hardware needs for each application component will be considered separately.

Windows Server

For the Windows Server 2016 Standard and Datacenter editions, the maximum server resources supported are 64 64-bit sockets and 24TB of memory.

Laserfiche Server

Generally speaking, having more cores is better for performance than having faster processors. This is particularly true for the Laserfiche Server, which is a multi-threaded application and can make use of multiple processors or cores.

Hardware Recommendations

Concurrent users	Cores	RAM
200-400 users	8-16	8-32GB
400-1,000 users	16+	32GB+
>1,000 users	Contact reseller or Regional Manager	

The above requirements assume that the Laserfiche Full-Text Search Service is installed on a separate computer from Laserfiche Server. If you plan to install Laserfiche Full-Text Search on the same computer as Laserfiche Server, you will need at least 12GB of RAM.

If your users are using the Laserfiche Server mostly for retrieval purposes, you can lower the hardware requirements.

Laserfiche Directory Server

The minimum requirements for Laserfiche Directory Server are 2 cores and 2GB of RAM.

SQL Server

When specifying hardware for your Microsoft SQL Server, we recommend allocating a separate physical machine. This protects other component resources and confines SQL to only the resources you designate. Internal Laserfiche tests have shown SQL performs better on a physical machine than on a virtual machine.

Physical machine requirements will vary depending on Laserfiche load estimates, as well as the version of SQL Server. SQL Server 2017 Standard edition supports up to 4 sockets provided that the total number of cores is 24 or less. It also supports up to 128GB of memory. The Enterprise version supports more sockets and memory, up to the maximum numbers supported by the operating system.

SQL Server Express is suitable for small repositories that meet the following conditions:

- Fewer than 1 million pages or entries
- 5 or fewer concurrently connected users

If you exceed these limits while using SQL Server Express, you may trigger out of memory errors, because SQL Server Express has a memory limit of just 1410MB. Your Laserfiche Server will perform poorly and operations may appear to randomly fail with 9008 errors.

Hardware Recommendations

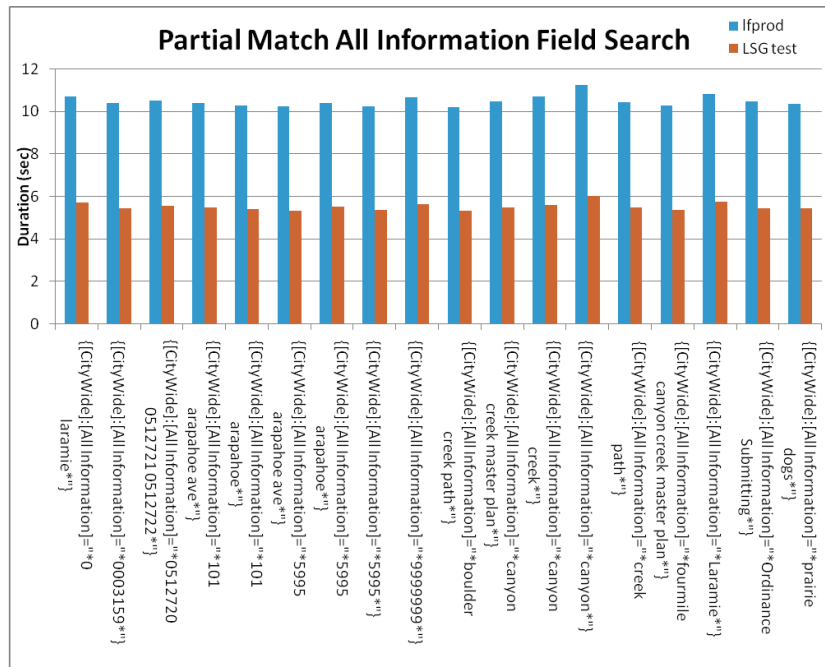
The numbers required for the Laserfiche Server SQL database fall within the limits of the Standard and Enterprise SQL versions.

Concurrent User Load (user access, not user licenses)	Recommended Configuration
200-1,000 users	16-32 core, 32-64GB of RAM
1,000+ users*	32+ core, 64GB+ of RAM
*See your Laserfiche reseller or regional manager for more details or guidance.	

A best practice when planning and purchasing your system is to invest in multiple processors. In-house tests performed in two environments (one with SQL Server with one processor, and another with two processors) show similar search durations if there is only one concurrent search. But if more users sign in to the system to search at the same time, the system with more processors is faster.

Another best practice is to buy fast processors. Searching, indexing, and full-table scans all benefit greatly from increased processor speed. In a test performed with an in-house system versus a production system configured by Laserfiche, we observed the difference in search result speed that a single gigahertz of processor speed can make. Both systems had identical specifications, except that the production site had a 2GHz processor, and our test system had a 3GHz

processor. As the graph below indicates, the in-house test bed (red bars) returned the same search results in half the time of the production system (blue bars).



Another consideration with regard to your SQL server is how to handle multiple databases. In the Laserfiche Suite, the following products each require a database of their own:

- Workflow
- Audit Trail
- Forms
- Directory Server
- Quick Fields Server
- Laserfiche Server
- Discussions

The databases don't all have to be located on separate computers—they can be hosted on the same SQL Server. However, the Audit Trail database in particular will benefit from being separated onto its own SQL Server, due to its resource-intensive reporting function. Some organizations with Laserfiche even replicate all Laserfiche audit data into a separate reporting environment to minimize interference from other system demands and to maximize performance.

Tip: Through customer site tests and our own in-house tests, we have determined that buying the second-fastest processor available may actually be the best practice. The second-fastest processors can cost as much as 20-30% less than the fastest processors on the

market, and the speed differential is typically not substantial enough to warrant the premium.

Some customers may choose to utilize an existing SQL server installation for Laserfiche SQL needs. Up to a certain number of concurrent users and/or system load, this can be a cost-effective solution. We recommend a dedicated Laserfiche SQL installation for more than 50 concurrent users. Beyond that, we advise consistent monitoring of SQL usage and loads, to ensure enough resources are allocated for optimum Laserfiche performance.

SQL Server Storage

The [tempdb database](#) on the SQL Server that is used by Laserfiche Server can grow very large. It is important that you leave enough free disk space on the SQL Server computer to allow tempdb to grow. For folder browsing alone, tempdb takes up about 10GB per 100 users. However, searches by many users over a large repository can cause tempdb to grow rapidly. We recommend monitoring the size of tempdb once your installation has been running for some time, and allocating space for it accordingly.

Laserfiche Full-Text Search

The [hardware recommendations for Laserfiche Server](#) assume that the Laserfiche Full-Text Search Service is installed on a different computer from the one hosting the Laserfiche Server. If this is the case, the recommendations for the Laserfiche Full-Text Search Service are the same as those for Laserfiche Server.

If Laserfiche Full-Text Search is to be installed on the same computer as Laserfiche Server, you should have at least 12GB of RAM.

Memory Usage Limit

You can [use the Search Engine Configuration Utility](#) to cap memory usage, restricting the amount of memory the Laserfiche Full-Text Indexing and Search engine can use on the computer on which it is installed.

By default, the memory cap will be set to 0, which has the following effects:

- If the Search service detects that the Laserfiche Server service is installed when it starts up, one quarter of the computer's memory (up to 3GB) will be reserved for the Server, and the Search Engine will be able to use the remainder.

- If the Search service does not detect that the Laserfiche Server service is installed when it starts up, the Search Engine will be able to use all memory on the computer.

We recommend using these default settings if the Laserfiche Search service has a dedicated computer, or if it is sharing the same computer with the Laserfiche Server but will always start after the Laserfiche Server.

If the Laserfiche Search service will start before the Laserfiche Server, we recommend capping the Search service's memory to half the available memory of the computer, to ensure that the Server will have sufficient memory to run.

If the machine is not dedicated to the Laserfiche Full-Text Indexing and Search Service, you may need to cap memory if you encounter performance issues with your other applications, or if recommended by Support.

Full-Text Search Storage

The amount of space required to store the search index can be estimated as follows:

$(3 \times \text{total size of text pages}) + \text{size of indexed electronic documents}$

You can find out which types of electronic documents are indexed in the Laserfiche Administration Console. After signing in to a repository in the Administration Console, click on the repository's name, right-click on **Index** in the main pane, and select **Properties**. Click on the **Electronic Text Extraction** tab to see a list of file types that are indexed.

Search Index Optimization

If you want to optimize your search index, you should make sure that you have storage equal to twice the size of the search index.

During optimization, the search engine reads data from the index files and caches some of this data. This data is not released until optimization is complete. The cached data takes up some memory, but it is released when the memory being used exceeds the [memory usage limit](#).

General Storage

The type of storage system connected to a Laserfiche implementation doesn't matter; whether it's a storage area network (SAN), direct attached storage (DAS), or network attached storage (NAS), Laserfiche can be configured to store volumes on any drive that can be referenced by a UNC storage path. Most enterprise systems, however, establish a SAN dedicated to storage needs.

The key metric for estimating storage capacity is how many images the system will house. As shown in the table below, Laserfiche recommends estimating 75GB per one million images, where each image consists of one page that is 8.5x11 inches in size, black and white, and of 300dpi resolution. The amount of storage space required will increase in ways that aren't easy to predict when working with large and/or color images. In addition, if you have electronic files associated with documents, you should add the sizes of these files to your size estimate—the per-page estimate above is only for Laserfiche image pages. Storage required for SQL data and log files can be estimated as a percentage of total volume storage. These estimates are shown in the table below.

Recommended configurations for storage arrays are also detailed in the table below. For volume storage, we recommend at least a RAID 5 array, specifically for its redundant data storage (parity), which employs at least three disks to protect against total failure of any one. Note that for RAID 5 arrays larger than 2TB, we recommend RAID 6, with two parity disks, due to the increased possibility of a failed disk. For SQL data and log files, we recommend either a RAID 1 array, for its mirroring function, or a RAID 1+0 array, which distributes data storage and mirrors data across four or more disks.

	Sizing calculations	Storage arrays
Laserfiche volume storage	75GB per 1 million images (8.5x11 inches, 300dpi, black/white) for Laserfiche pages. Additional storage needed for electronic files, which are stored as-is.	RAID 5 Serial Attached SCSI recommended Serial ATA OK
SQL data file	10-15% of total volume storage	RAID 1 or RAID 1+0 Serial Attached SCSI recommended with fast drives
SQL log file	5-10% of total volume storage	RAID 1 or RAID 1+0 Serial Attached SCSI recommended with fast drives
tempdb	10GB per 100 users; more if users are conducting frequent searches over a large repository.	Shared with SQL log file

Note that the ratio between the SQL data file and the transaction log can vary greatly between “simple” and “full” recovery modes. In simple mode, the transaction log will stay quite small, and as per the table above, we recommend closer to 5% of total volume storage for the SQL log file. In full mode, however, the transaction log can become very large, depending on how often you perform backups, and we recommend closer to 10% of estimated total volume storage.

Backup

Most organizations will have backup procedures in place, so planning for a Laserfiche system backup has more to do with determining the potential amount of data that will need to be backed up in addition to the current load. If a backup system isn’t robust enough for the additional load or isn’t completely set up, Laserfiche recommends a disk-to-disk-to-tape process: backing up to disk first—which can usually be the SAN, NAS, or DAS device—and then backing up the disk to a rotating set of tapes. If storing on a DAS, we recommend a large RAID 5 array with a number of SATA disks, or at least enough capacity for one month’s worth of grandfather-father-son rotation. Larger systems should use LTO-standard backup tapes. Smaller systems with less data to back up can use smaller-capacity DAT drives.

Some enterprise deployments of Laserfiche use snapshot functionality available as standard hardware with disk backup to streamline the processes of backing up large data stores.

Other Component Servers

Web Client, WebLink, and Laserfiche Mobile Server

More cores can mean better performance from your web server because of the way ASP.NET handles input/output threads in IIS. RAM usually is not as important or as relevant as the number of cores, with the exception of support for certain processes, such as PDF generation (for printing or exporting). You should plan to allocate more memory if you are serving high-resolution images regularly.

Web configuration offers unique flexibility in the Laserfiche system. As the load on the web server increases, you can scale out and add more web servers, even after initial implementation. To support web-based load balancing, you must be able to establish server affinity to incoming client requests at the TCP/IP level. An example of this is Microsoft Network Load Balancing, which will dynamically allocate requests across multiple web servers in a cluster.

Hardware Recommendations

Concurrent User Load (user access, not user licenses)	Recommended Configuration
<150 users	8 cores, 8GB of RAM
>150 users	More web servers, network load balancing

Forms

The recommended configuration for Forms is 4 cores and 8GB of RAM. Better specifications are required as you increase the number of concurrent users or the number of fields in your forms. Internal tests have shown that the performance of Forms (in terms of transactions per second or page load time) increases non-linearly as the number of cores is increased—for larger numbers of concurrent users (30 or more), the performance difference between an 8-core machine and a 32-core machine is much larger than at smaller numbers of concurrent users.

If you expect to have a large number of simultaneous connections to Forms Server, add more cores or RAM. [Network load balancing](#) is also possible for Forms.

Documents that are uploaded to Forms are stored in the Forms database, so you will want to ensure that you will have enough storage on the computer hosting the Forms SQL Server database.

Workflow

Laserfiche Workflow is a challenging product to specify hardware for, because the resource use of Workflow is determined by the number of workflows running, not the number of users. Moreover, workflow running speed is limited by the number of threads Windows Workflow Foundation can run.

Part of the load on the Laserfiche Workflow system is predictable; we can reliably estimate how many users are configuring workflows and starting rules in the Workflow Designer. From a planning perspective, Workflow most impacts the system when system actions are performed by workflow instances being triggered. It's hard to know how resource intensive an individual workflow will be when creating it, much less when planning for a future system.

There are some guidelines and tips to follow for maintaining Workflow performance. Installing your Workflow Server in a virtual environment allows you to add (or remove) cores as necessary as you monitor production performance. In addition, using a machine with a faster processor with many cores allows the Workflow Server to take advantage of as many threads as the Windows Workflow Foundation can handle. Workflow allows a maximum of 4 running instances of a workflow per core, so adding more cores is highly advantageous.

If your Workflow database gets too large, you should [create a Workflow Statistics Report](#) to see how many instances are running for each workflow definition. If you have more instances than expected for any workflow definition, then you might have a faulty starting rule.

Another way to reduce the size of the Workflow database is to reduce the number of days for which the histories of completed workflows are kept in the database. By default, this is set to 30 days. You can change this setting in the [Advanced Server Options](#) section of the Workflow Administration Console.

Hardware Recommendations: Workflow Designer

Concurrent User Load (user access, not user licenses)	Recommended Configuration
<200 users	1GB RAM or higher

Hardware Recommendations: Workflow Server and Subscriber

Concurrent User Load (user access, not user licenses)	Recommended Configuration
<200 users	4 cores, 12GB of RAM

For Laserfiche Workflow in particular, we recommend ensuring your test systems are similar to your production systems, so you have the best data possible for system load and resource allocation.

Quick Fields

The hardware recommendations for Quick Fields listed below are for light usage of Quick Fields. If any of the following conditions apply to your usage of Quick Fields, you should plan for more RAM:

- You are using processing-intensive features like OCR and Zone OCR, or frequently generating image pages from PDFs.

- For Quick Fields but not Quick Fields Scanning: You are manually reviewing documents in Quick Fields, and either:
 - You have a large number of metadata fields on each document, or
 - You are scanning many documents at a time.

If you plan to run many simultaneous Quick Fields sessions in parallel, you may need to increase the number of logical cores you have. The maximum number of simultaneous sessions you can run is equal to the number of logical cores you have.

Hardware Recommendations: Quick Fields

Quick Fields Product	Recommended Configuration
Quick Fields	4 cores, 4GB of RAM
Quick Fields Server	2 cores, 2GB of RAM

Quick Fields temporarily creates a copy of documents on disk. If you are processing many documents at one time, ensure that your hard drive is large enough for this temporary storage. To estimate the storage you need, consider that each single-page, 8.5x11 inches, 300dpi, black-and-white image takes up around 75KB of storage.

The considerations and recommendations above apply as much to Quick Fields as to Quick Fields Agent. You should plan to scale up your RAM or cores for Quick Fields Agent based on the same considerations listed for Quick Fields.

Quick Fields Server is fairly lightweight and can often be hosted on the same computer as other application servers.

Audit Trail

Audit Trail can be tricky to specify hardware for; its impact on the system depends on the events being logged. Audit Trail reporting can be an extremely resource-intensive process. In addition, Audit Trail event tracking can generate huge amounts of data, which can compete for storage space with other applications.

As a best practice, if you know that Audit Trail will be an important part of your system, you should replicate audit logs into their own reporting system in a completely separate environment. Many customers have found this to be the most efficient means of maintaining performance across their Laserfiche installation.

Conclusion

As you plan for a new Laserfiche installation, estimate hardware needs generously. Hardware needs will only increase as time goes on and as resources are added to the system. Once hardware has been purchased and put into production, you should continuously monitor the performance of products and operations across your system and add or reallocate resources as required. If you need help, ask for advice from Laserfiche and other customers.



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Description:

This paper will walk you through the major steps you'll need to take when planning hardware needs for a Laserfiche installation and integration, from small-scale to enterprise installations.

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