



Initial Hardware Estimation Guidelines

OnPremises and Private Cloud

AgilePoint NX v9.0, Software Update 1

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AgilePoint recognizes that viruses are a significant security consideration for our customers. AgilePoint takes the following measures to make sure our software is free of viruses upon delivery:

- AgilePoint is built on top of Microsoft .NET framework. The pre-compiled executable is a .NET Common Language Runtime (CLR) application, not a native machine binary. As far as is known at this time, there are no viruses that infect .NET CLR executables.
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Initial Hardware Estimation Guidelines

This document provides guidelines for hardware sizing and configuration for AgilePoint.

Note that these are general guidelines based on past experience with representative AgilePoint customers. AgilePoint can provide sizing guidelines for specific customers based on the information in this document. However, you must use these basic guidelines to complete your estimates.

Considerations

This document provides a baseline recommendation using a minimum recommended hardware configuration. The specific number of machines you require may vary based on a number of factors, which are discussed in this section.

System Usage

Three main factors go into determining system usage for AgilePoint:

- The number of concurrent users
- The number of process steps to be completed per day
- External system load

Note that again, the guidelines provided here apply in most cases. If you have questions regarding your specific configuration needs, contact an AgilePoint representative.

Concurrent Users

The number of concurrent users refers to both process participants and users who are not part of the process but access the system to gather information, such as process status. This number affects the number of front-end application machines you will need.

Process Steps Per Day

To determine your system capacity, you must determine your process steps per day.

Maximum Process Steps per Day for AgilePoint

Use the following formula to estimate how many steps can be completed per day:

Total steps that can be completed in 24 hours = ([Thread pool size] * 24 hrs * 60 min * 60 sec * 1,000 ms) / ([Average event processing time]*3)

Assume a typical server with 2 CPUs (Xeon 3.6 GHz), dual-core and 8 GB RAM, and connects similar configuration of database server. The average AgilePoint event processing speed is 321(ms)/per event (3 events for one step). Assume a thread pool capacity of 10.

Total steps that can be completed in 24 hours = $(10 * 24 * 60 * 60 * 1,000) / (321 * 3) = 897,196$ steps/day

Estimating Your Process Steps Per Day

The number of process steps you require per day can be determined using a worksheet and calculations provided by AgilePoint. In order to set up your worksheet, we require the following information:

- The number of years you would like to project
- The number of processes you foresee creating during that time span

Once we have calculated your estimated process load per day, we can compare it to the following calculations.

Once your process steps per day are calculated, we compare it to the maximum of 897,196. If your requirements are less than this number, the minimum hardware configuration is sufficient.

External System Load

External system load refers to any external systems that will access the AgilePoint system. External system load is a variable that can impact your performance, but it is difficult to calculate precisely what the impact will be.

AgilePoint recommends using either an educated guess based on your knowledge of the external systems to determine the impact, or to run test metrics to more precisely determine the load. If you have questions regarding your specific configuration needs, contact an AgilePoint representative.

Capacity of the Machines in your Environment

AgilePoint offers a baseline recommendation based on minimum recommended hardware. You may need fewer machines if each machine in your environment has a higher capacity. The main hardware considerations for an AgilePoint are covered in this section.

CPU Speed

Increasing the server's CPU speed will increase the amount of work that can be performed by the server within a given time frame. Therefore, faster CPUs will almost always improve performance. However, one

notable exception is that a faster CPU will not (necessarily) resolve performance issues that stem from performance bottlenecks.

Number of CPUs

Since AgilePoint Server is multi-threaded and is designed to support asynchronous processing, AgilePoint Server can take full advantage of the benefits of multiple server CPUs. Multiple CPUs will generally improve performance for any real-world AgilePoint system because it offers the greatest improvement for systems that will have concurrent usage by multiple users. However, it may not have as great an affect on the performance of an AgilePoint system that is only used by one or a few users at a time (such as a development or QA system). As with CPU speed, multiple CPUs may not (necessarily) resolve performance issues that stem from performance bottlenecks, although it may prevent a bottleneck from affecting some of the system's users.


System Memory (RAM)

Unlike CPU speed, where slower CPUs will just require more time for the server to finish performing its work, the server's physical and available memory impose an upper limit to the size and quantity of the data and work that the server can be working on simultaneously. Therefore, for mission critical systems, maximizing the physical memory is always best.

Memory Utilization

Memory requirements for AgilePoint Server depends on several factors such as:

- Number of active process instances
- Typical amount of process instance size varies by amount of custom data carried along process
- Custom application data at each step
- Number of concurrent requests

 It is a best practice for memory utilization to have a dedicated Application Pool in IIS for AgilePoint Server.

Hard Disk Performance

Since data will be read from and saved to the server's hard disk, the hard disk's seek time, read response, RPMs, etc. will affect the performance of AgilePoint systems. Therefore, the faster your server's hard disk performs, the better your system's performance will be. However, hard disk performance generally has the greatest affect on database servers. For other servers (or for hard disks that don't contain a database),

hard disk performance is much less critical and unlikely to affect performance significantly, unless the server starts using virtual memory (see above), in which case it may become very critical.

Network Bandwidth

Network Bandwidth is determined by amount of data pulled/pushed per request. This is usually determined by the number of active requests at any particular instance. Please note, you need to consider bandwidth between client applications and the AgilePoint Engine as well as bandwidth available between the database and AgilePoint Server.

Rule of thumb for network bandwidth:

There should be at least 1 GB bandwidth between AgilePoint and Database Server and 10 – 100 MB is sufficient between client applications and AgilePoint Server.

Network Adapters

Usually network bandwidth is more of an issue than network adapters. However, the server's network adapters should be sufficiently fast and reliable to allow the server to make maximum use of the full bandwidth provided by the networks the server is connected to. Anything slower (or an unreliable adapter) could represent a potential performance bottleneck.

Availability Requirements

High Availability (HA)

AgilePoint recommends a High Availability (HA) configuration for maximum uptime. However, you will need to consider whether HA is required for your organization.

Network Load Balancing (NLB)

AgilePoint recommends Network Load Balancing (NLB) to ensure maximum resource availability. However, you will need to consider whether NLB is required for your organization.

Disaster Recovery (DR)

If your organization requires a disaster recovery (DR) strategy, additional hardware is required.

For more information, refer to [Contact AgilePoint Customer Support](#).

The Number of Environments You Want to Create

AgilePoint recommends having a Development, Test, Staging, and Production environment. However, some customers opt to forgo one or more of these based on their organizations' requirements.

Virtual Environments

Using a virtual environment for AgilePoint is much cheaper than physical servers, although performance tends to be slower.

Because of the reduced performance, it is not possible to run load tests on a virtual environment, but if load testing is not required, AgilePoint recommends using a virtual environment. This is an especially effective approach for development environments.

Even if you use a virtual environment, physical database servers are recommended.

Support for Virtual Environments

AgilePoint is committed to fully supporting AgilePoint running on virtualization technologies.

Physical servers have requirements for computational capacity that are appropriate for physical data center deployment. Virtual servers have their own computational requirements to facilitate the type of digital infrastructure needed for dynamic adaptation and scale. Virtual servers offer a cloud-oriented service that allows for innovation and business agility. AgilePoint is supported in a virtual machine (including NLB). For more information about the installation requirements, refer to [System Requirements](#) under the Installation section for details on the hardware, OS and software requirements for AgilePoint components.

AgilePoint NX v8.x and lower are based on Microsoft .NET. Thus, any virtualization products that have specifically passed Microsoft's requirements for virtualization support are also officially supported with AgilePoint NX. This includes Microsoft Windows virtualization platforms, such as Hyper-V, Microsoft Virtual Server and Microsoft Virtual PC virtualization technologies, as well as any other virtualization platform that has passed the Microsoft requirements for virtualization. This includes VMWare, Oracle, and cloud providers such as Azure, AWS, GCP and many more.

For more information about non-Microsoft virtualization products that meet the Microsoft OS requirements, refer to: <https://www.windowsservercatalog.com/results.aspx?&bCatID=1521&cplID=0&avc=0&ava=0&avq=0&OR=1&PGS=25&ready=0>

AgilePoint recommends the following as a minimal configurations to make sure proper performance of the AgilePoint in a virtual environment:

These are minimal requirements. For optimal requirement, please refer to System Optimization to size your environment to optimally handle expected workload and/or grow.

Host OS Architecture	X64
Host Machine Processors	4+
Host Machine Memory	8+ GB
Bandwidth	1 Gb Network connection to the host machine
Virtual Machine Memory	<ul style="list-style-type: none"> • Allocation/Limit – Based on AgilePoint requirement or sizing. • Reserved – Recommended AgilePoint minimum memory requirements. • Minimal – Half of the allocation/limit.
Virtual Machine Memory	<ul style="list-style-type: none"> • Allocation/Limit – Based on AgilePoint requirement or sizing. • Reserved – Based on AgilePoint minimum CPU requirements, and no lower than 1 core.
AgilePoint Database	Follow with Database recommendation and best practices with regards to version, edition, infrastructure and expected workload.

Development in Virtual Environments

In particular, virtualization is advantageous for development environments because it enables isolation (sandboxing) between development environments to prevent them from impacting one another. Using virtualization technology also speeds up the process of environment configuration. It is a best practice to keep copies of each version of development environment for future enhancement.

When running AgilePoint on a Virtual Environment, and specifically, when target for production environment, it is essential to keep and follow key Virtual Environment best practices for deployment, optimization, and the ongoing monitoring and operations.

Note: The below is just a handful of key consideration and metrics. Please follow with the complete recommendation and best practices of your virtualization platform.

Plan the Deployment within your Virtual Environment

The biggest challenge in virtualization is still the sharing of resources across your infrastructure and applications. It is essential to plan VM deployment properly to assure and make sure proper and balanced resources allocation, prioritization and sharing across the different VMs, from both host resources perspectives, such as CPU and MEM as well as the underlying infrastructure, such as network, storage etc. can handle the load.

Proper Size the AgilePoint Machines for the Expected Workload

The biggest challenge in virtualization is still the sharing of resources across your infrastructure and applications. It is essential to plan VM deployment properly to assure and make sure proper and balanced resources allocation, prioritization and sharing across the different VMs, from both host resources perspectives, such as CPU and MEM as well as the underlying infrastructure, such as network, storage etc. can handle the load.

Reserve Resource Allocations for AgilePoint Server VMs

AgilePoint Server's core engine is normally active and running at all times, even if no users or external systems are currently interacting with AgilePoint. This engine is responsible for various functionality, such as handling requests to the Workflow API and for scheduling and coordinating time-dependent events (e.g. reminder emails) and many more. The core engine is optimized to consume as little of the server's resources as possible, but it will require some portion of the server's CPU cycles and system memory.

For this reason, it is important to make sure AgilePoint is reserved with compute resources, memory, and CPU.

As a sample reference:

Production server deployment.

Bases on sizing: 24GB Mem, 8 Cores

Based on [System Requirements for AgilePoint Server](#): 8GB RAM, 2 Cores.

As a rule of thumb, the following would be the recommendations:

1. When applicable – reserve all required resources based on the server sizing, i.e. 24GB Mem, *8 vCPU.
2. When full reservation is not applicable: Reserve based on server minimum requirements.
 - When #2 is not applicable as well: reserve minimum of 4 GB RAM and *1 core.

* Different virtualization platform may use different technics and practices for reservation, with more difference approaches for CPU, i.e. – some support reserve a vCPU, while other support reserve CPU cycles and some other options. Please follow with the specifics and best practices of your virtualization platform in place.

Monitor Ongoing Key Virtual Metrics for Healthy Performant Environment

As mentioned, proper planning of the virtual deployment, sharing, prioritizing, and balancing resources, is the key challenge with virtual environments.

For this is it critical to have ongoing monitoring and health checks for the virtual environments for key performance metrics to make sure they are within the normal ranges.

This will include the following:

- VM CPU Wait and VM CPU Ready
- Memory Swapping
- Memory Ballooning
- VM Disk Read/Write IOPS and Throughput
- Network Connectivity
- Datastore capacity usage and availability

Monitoring these metrics are essential to keep healthy, performant, and optimized virtual environment (not just for the AgilePoint VM but for the complete virtual environment).

Note: When issues arise with one of these metrics, this may be transparent from within the AgilePoint VM, i.e. – corresponding to the specific issue, task manager may show 30% CPU or 50% MEM etc. and for that reason this needs to be monitored from the hypervisor and virtual environment perspective.

Hot Migration of VM Between Hosts

Some virtual platform support and provide the tools to hot migrate a machine from one host to another according to specific rules and triggers such as auto scale, such as VMWare vMotion or Hyper-V Live Migration etc.

Though technically, this is supported from AgilePoint, for production environments, it is important to plan ahead and decide whether to enable this or not, as depending on the environment deployment, topology, workload etc., this may impact on the environment availability for few seconds and up to few mins. This is especially true for clustered environments.

Proper planning can allow proper rules and practice setting for live migration and make environment sustainable during the live migration.

Test and lower environment such as development etc., and generally, environment which are not required for continuous availability, can be ignored for this.

Note: There is no risk of data loss or corruption due to live migration. The risk is just with few seconds to minutes of availability.

Specific AgilePoint Configuration to Optimize for Virtual Environments

When running AgilePoint on a virtual environment, some AgilePoint configuration should be configured with more grace to support typical known virtual environment latencies, due to load on the host resulting in shortage with resources for the AgilePoint server.

Following are some configurations to be considered and adjust:

- InitialLeaseTime

For more information, refer to [Configuring Ascentn.AgilePoint.WCFService.exe.config](#).

- RenewOnCallTime

For more information, refer to [Configuring Ascentn.AgilePoint.WCFService.exe.config](#).

- Retry-policy (Ascentn.AgilePoint.WCFService.exe.retry-policy.xml)

In addition to the different configuration adjustments, for clustered environment it is also recommended to evaluate and consider externalizing the CSM out from the AgilePoint Server service into its own dedicated service and possibly on a separate machine.

As there would be different form factors and consideration involved into this tuning which will be specific to target environment, please consult your AgilePoint integrator or AgilePoint Professional services.

Conclusion

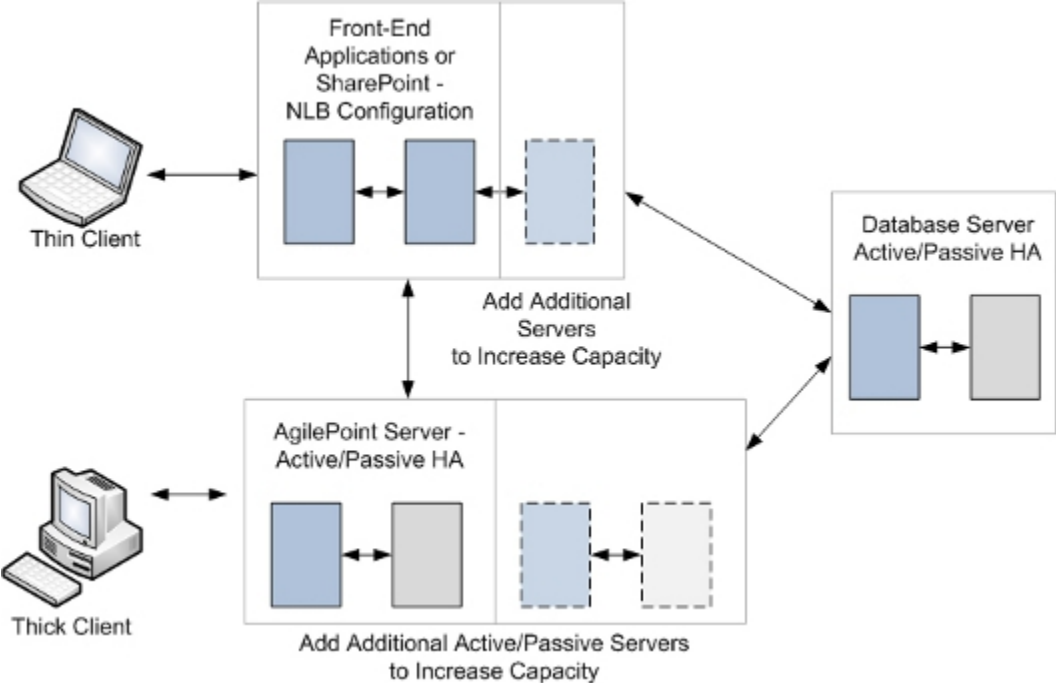
Virtual Environment are not just highly popular, but a standard practice, and provide variety of values with digital infrastructure needed for dynamic adaptation and scale, offer development teams, operation teams and the businesses as whole a cloud-oriented, innovative—and agile managed—service for the future.

Yet, as virtual is based on art of sharing and balance, it is important to follow on best practices, to make sure proper optimal sustained operation and health. Please advice your virtualization platform recommendations, best practices, and professionals to maintain a healthy and happy environment for the above mentioned consideration and metrics and many other needed.

Hardware Configuration

The following diagram shows the basic AgilePoint hardware architecture approach. The precise number of machines you may need for your environment may vary based on your requirements. Also, NLB and HA are recommended, but optional.

AgilePoint NX Hardware Configuration



Hardware Sizing

The recommendations in this section represent the current, baseline recommended hardware requirements. You may need additional machines or higher performance based on your system requirements.

AgilePoint Server

Processor (CPU)	64bits Dual Physical Processor, dual-core and clock speeds of 3.2 GHz or higher.
Memory (RAM)	6 GB RAM or higher
Available Hard Disk Space	150 MB for AgilePoint installation and plus an additional 1GB for log files and cache
Other Hardware or Devices	1 Gigabit Network Interface Card (NIC) Share Device required by cluster service

Front-Tier Application

Processor (CPU)	32bits or 64bits Dual Physical Processor, dual-core and clock speeds of 3.2 GHz or higher.
Memory (RAM)	4 GB RAM or higher
Available Hard Disk Space	150 MB for AgilePoint Installation or SharePoint
Other Hardware or Devices	1 Gigabit Network Interface Card (NIC) Network load-balance device.

Database

In most organizations, the AgilePoint database is installed on a machine that includes databases for other applications. AgilePoint only provides sizing recommendations for the database upon request. Please discuss your organization's requirements with your database administrator.

Hardware Configuration Example

The following table provides the hardware configuration for an actual AgilePoint customer. The customer was a large-scale implementation of AgilePoint NX, so the configuration specifications are higher than the baseline.

Environment is hosted by the customer in a private cloud using AWS.

<p>Front End Server 1: AgilePoint NX Portal</p>	<p><u>OS</u> Windows Server 2016 Datacenter</p> <p><u>Processor</u> Intel Xeon CPU E5-286 v4 2.30GHz 2.30 GHz</p> <p><u>Memory</u> 8GB</p> <p><u>NIC</u> AWS PV Network Device</p> <p><u>Disk</u> EBS - AWS PVDisk SCSI Disk Device, 80 GB</p>
<p>Front End Server 2: AgilePoint NX Portal</p>	<p><u>OS</u> Windows Server 2016 Datacenter</p> <p><u>Processor</u> Intel Xeon CPU E5-286 v4 2.30GHz 2.30GHz</p> <p><u>Memory</u> 8GB</p>

	<p><u>NIC</u></p> <p>AWS PV Network Device</p> <p><u>Disk</u></p> <p>EBS - AWS PVDisk SCSI Disk Device, 80 GB</p>
Back End Server 1: AgilePoint Server	<p><u>OS</u></p> <p>Windows Server 2016 Datacenter</p> <p><u>Processor</u></p> <p>Intel Xeon CPU E5-286 v4 2.30GHz 2.30GHz</p> <p><u>Memory</u></p> <p>8GB</p> <p><u>NIC</u></p> <p>AWS PV Network Device</p> <p><u>Disk</u></p> <p>EBS - AWS PVDisk SCSI Disk Device, 150GB</p>
Back End Server 2: AgilePoint Server	<p><u>OS</u></p> <p>Windows Server 2016 Datacenter</p> <p><u>Processor</u></p> <p>Intel Xeon CPU E5-286 v4 2.30GHz 2.30GHz</p> <p><u>Memory</u></p> <p>8GB</p> <p><u>NIC</u></p> <p>AWS PV Network Device</p> <p><u>Disk</u></p> <p>EBS - AWS PVDisk SCSI Disk Device, 150GB</p>