



# NetBrain<sup>®</sup> Integrated Edition 7.1 System Specification

# Introduction

NetBrain Integrated Edition features a completely new system architecture to enable robust scalability and flexibility. The architecture is horizontally scalable, allowing for servers to be added, subtracted or consolidated according to customer requirements. For larger network environments or if you need help in defining specs for high availability (HA) environments, please contact [NetBrain Support Team](#) for further assistance.

This document introduces the system overview and requirements in terms of:

- [System Architecture and Components](#)
- [Considerations for System Scalability](#)
- Reference Specifications:

**Note:** This table shows the number of reference machines that you need to deploy NetBrain system, depending on the number of devices and concurrent users.

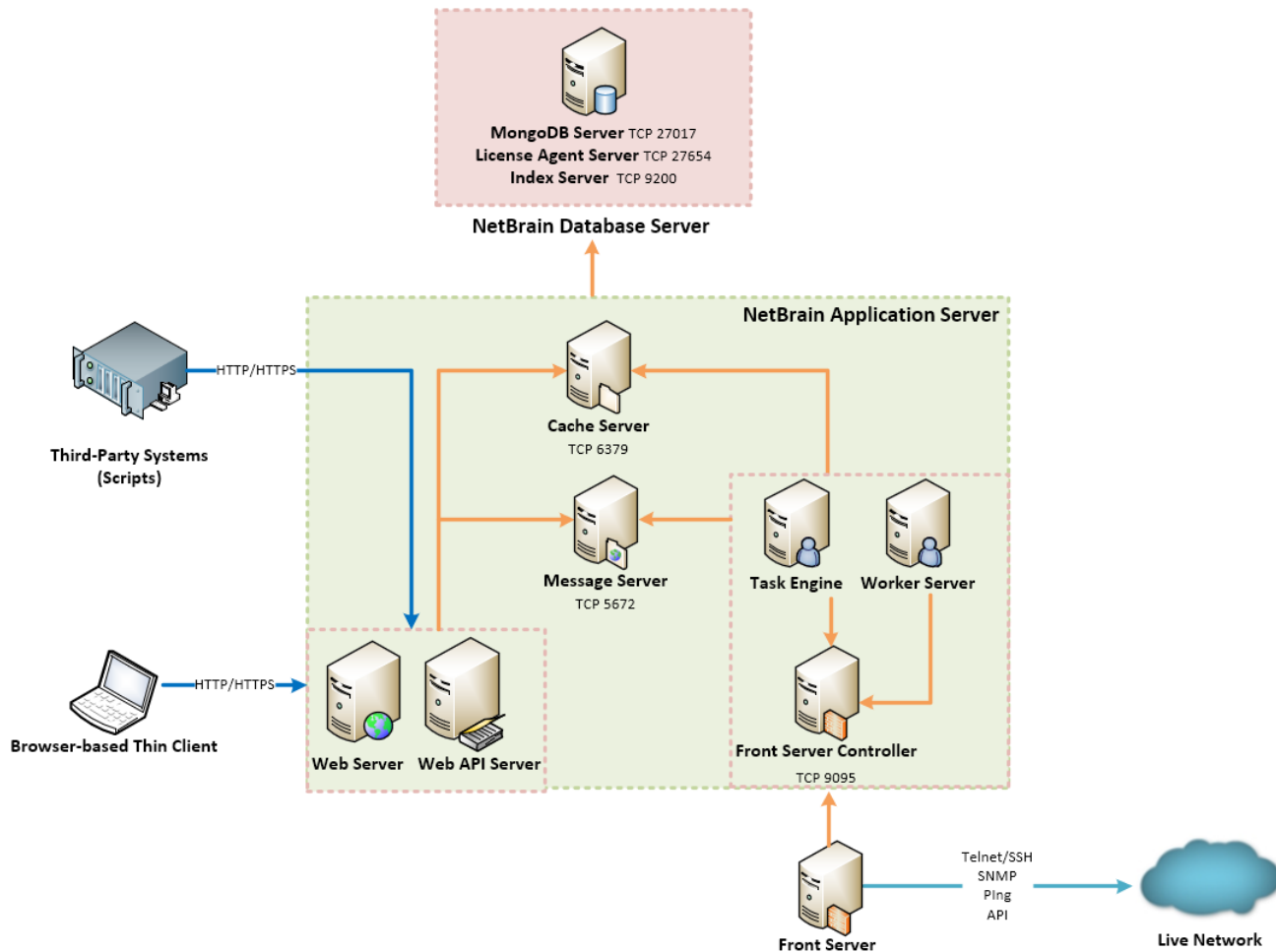
Node and Seat Size	Number of Physical Machines
≤1000 Nodes ≤10 Seats	<a href="#">2 Machines</a>
1001~2000 Nodes ≤10 Seats	<a href="#">2 Machines</a>
2001~5000 Nodes ≤20 Seats	<a href="#">4 Machines</a>
5001~10000 Nodes ≤50 Seats	<a href="#">6 Machines</a>
10001~50000 Nodes ≤200 Seats	<a href="#">&gt;8 Machines</a>

- [Important Notes Before Deployments](#)

# System Overview

NetBrain Integrated Edition is a browser-based interface backed by a full-stack architecture, adopting advanced distributed technologies to support large-scale networks with more expansion possibilities.

The distributed system architecture is as follows:



The system includes the following components:

- **Browser-based Thin Client** — provides a user interface for end users to access the system.
- **NetBrain Database Server**, including:
  - **MongoDB Server** — serves as system data repository. High availability is supported by primary/secondary/arbitrator nodes.
  - **License Agent Server** — provides services that validate and activate licenses. It must be installed on all MongoDB Servers except arbitrator node.

- **Index Server** — serves as a full-text search and analytics engine in a distributed multi-user environment. High availability is supported by master/master-only nodes.
- **NetBrain Application Server**, including:
  - **Web Server** — serves static content such as HTML, JavaScript and CSS resources, which serves as the user interface of the Thin Client. Multiple Web Servers can be installed and load-balanced under your load balancing infrastructure.
  - **Web API Server** — provides the front-end web applications to support the browser-based Thin Clients, and serves RESTful API calls from third-party applications for integration. Multiple Web API servers can be installed with Web Servers and load-balanced under your load balancing infrastructure.
  - **Message Server** — prioritizes and forwards requested tasks. High availability is supported by master/slave nodes.
  - **Cache Server** — provides memory cache for the system. High availability is supported by master/slave/sentinel nodes.
  - **Worker Server** — serves as a resource manager to support computing tasks. It relies on both Cache Server and Message Server to work. Multiple Worker Servers can be installed and load balanced.
  - **Task Engine** — coordinates computing tasks. High availability is supported by active/standby nodes.
  - **Front Server Controller** — serves to coordinate and communicate with Front Servers and other components. High availability is supported by active/standby nodes.
  - **Front Server** — serves as a polling server to collect and parse live network data. It is the only component required to access the live network. Multiple Front Servers can be installed and load balanced.

And two add-on components:

- **Service Monitor Agent** — monitors the health of your NetBrain Servers with operations management of related services. It is highly recommended to install Service Monitor Agent on your NetBrain Servers that require monitoring.
- **Update Server** — serves as a proxy to communicate with NetBrain Update Site and download the updates of built-in resources.

## Considerations for System Scalability

The following table introduces the considerations for system scalability:

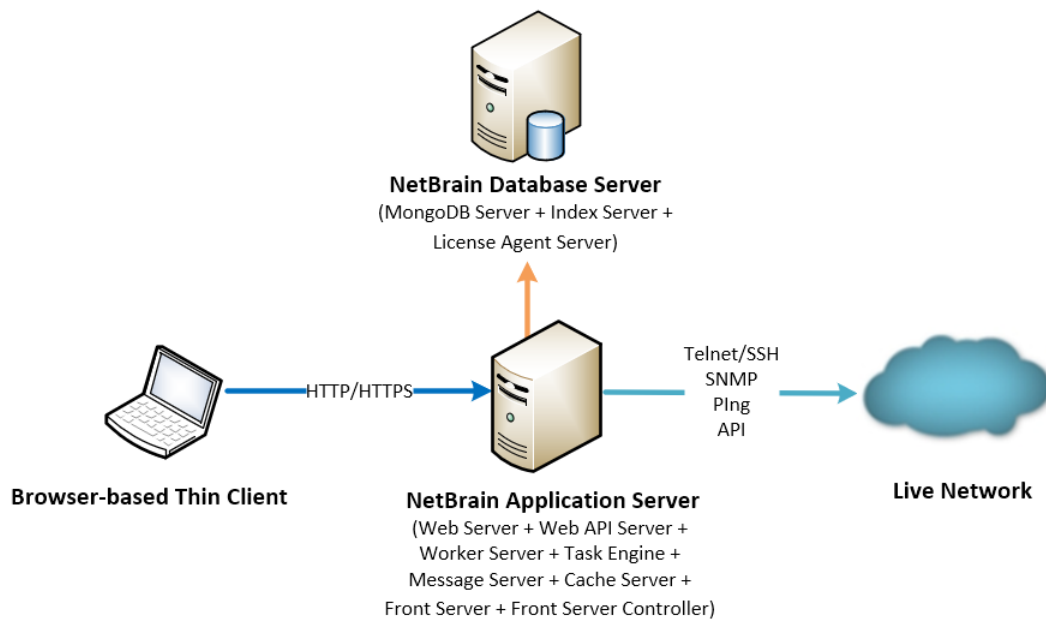
Server	Scalability
Web Server Web API Server	<ul style="list-style-type: none"><li>▪ Deploying more Web Servers as per data center locations is recommended to ensure the response time for accessing web pages of Thin Client.</li><li>▪ Deploying more Web API Servers is recommended when there is a large number of API calls for intensive API triggered diagnosis in large networks.</li></ul>
Worker Server	Deploying more Worker Servers is recommended for a large number of back-end network automation tasks, such as network monitoring, path discovery, runbook execution, triggered diagnosis.
Task Engine	Supports high availability with active/standby nodes.
Message Server	Supports high availability with master/slave nodes.
Cache Server	Supports high availability with master/slave/sentinel nodes.
MongoDB Server	Supports high availability with primary/secondary/arbiter nodes.
Index Server	Supports high availability with master/master-only nodes.
Front Server	Deploying more Front Servers is recommended for a large number of network nodes. Each Front Server is recommended to manage at most 5,000 nodes.
Front Server Controller	Supports high availability with active/standby nodes.

# System Requirements

The following specifications are only for reference. Make your selections based on your network scale and use case.

## Reference Specification for ≤1000 Nodes & ≤10 Seats

This deployment requires one Windows server for applications and one Linux server for the database. Both physical machines and virtual machines are supported.



Environment	NetBrain Component	Machine Count	CPU	Memory	Hard Disk <sup>1)</sup>	Operating System <sup>2)</sup>
≤1000 nodes ≤10 users	Application Server	1	4 Core/ 8 vCPU	16GB	200GB	<ul style="list-style-type: none"> <li>Windows Server 2012/2012 R2 (Standard/Datacenter Edition), 64-bit</li> <li>Windows Server 2016 (Standard/Datacenter Edition), 64-bit</li> </ul>
	Database Server	1	4 Core/ 8 vCPU	16GB	300GB	<ul style="list-style-type: none"> <li>Red Hat Enterprise Linux (RHEL) 7.0/7.3/7.5, 64-bit</li> <li>CentOS 7.0/7.2, 64-bit</li> </ul>

### Notes:

<sup>1)</sup> The required hard disk space must be exclusively reserved for NetBrain. For better performance, MongoDB Server is

recommended to be installed on a machine equipped with Solid State Drive (SSD), or Hard Disk Drive (HDD) RAID-10.

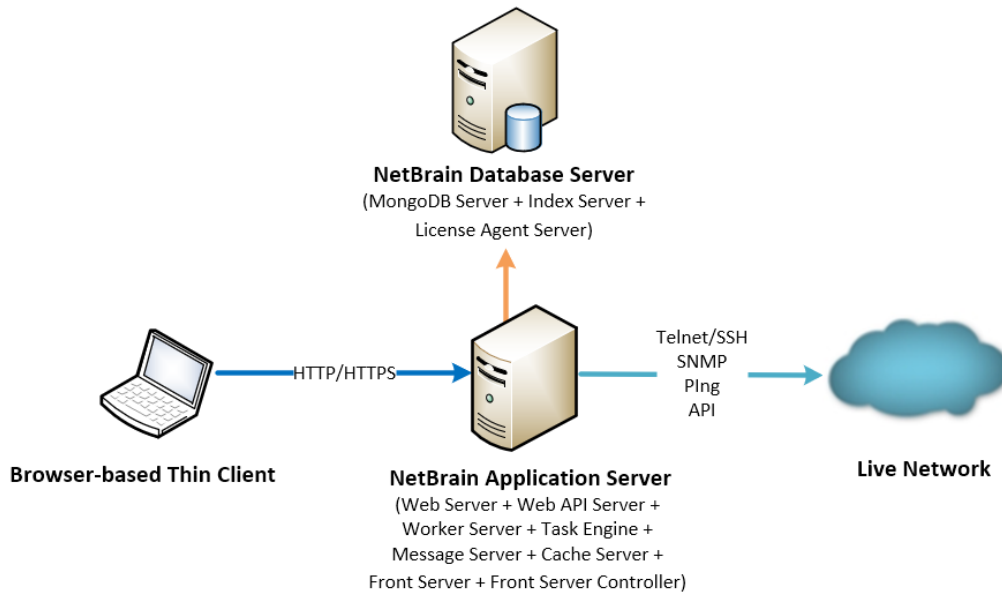
<sup>2)</sup> Individual Front Server is supported on Windows Server 2008 R2 SP1, 64-bit.

### Network connectivity requirements for ≤1000 nodes

Source	Destination	Protocol and Port Number
Thin Client	Application Server	HTTP/HTTPS (80/443)
Application Server	Database Server	TCP 27017/27654/9200
Application Server	Live Network	ICMP/SNMP/Telnet/SSH/REST API

### Reference Specification for 1001~2000 Nodes & ≤10 Seats

This deployment requires one Windows server for applications and one Linux server for the database. Both physical machines and virtual machines are supported.



Environment	NetBrain Component	Machine Count	CPU	Memory	Hard Disk <sup>1)</sup>	Operating System <sup>2)</sup>
1001~2000 nodes ≤ 10 users	Application Server	1	4 Core/ 8 vCPU	32GB	200GB	<ul style="list-style-type: none"> <li>Windows Server 2012/2012 R2 (Standard/Datacenter Edition), 64-bit</li> <li>Windows Server 2016 (Standard/Datacenter Edition), 64-bit</li> </ul>

Environment	NetBrain Component	Machine Count	CPU	Memory	Hard Disk <sup>1)</sup>	Operating System <sup>2)</sup>
	Database Server	1	4 Core/ 8 vCPU	32GB	300GB	<ul style="list-style-type: none"> <li>Red Hat Enterprise Linux (RHEL) 7.0/7.3/7.5, 64-bit</li> <li>CentOS 7.0/7.2, 64-bit</li> </ul>

**Notes:**

<sup>1)</sup> The required hard disk space must be exclusively reserved for NetBrain. For better performance, MongoDB Server is recommended to be installed on a machine equipped with Solid State Drive (SSD), or Hard Disk Drive (HDD) RAID-10.

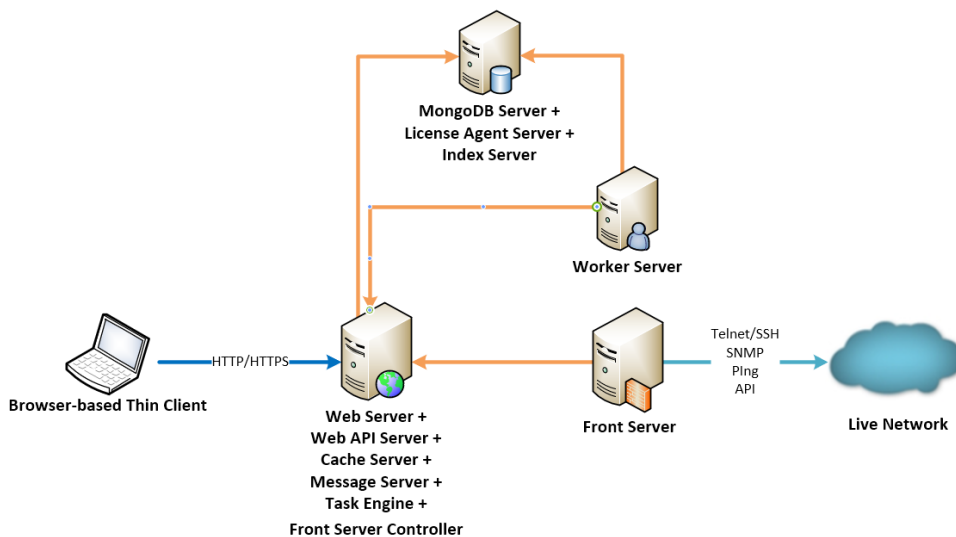
<sup>2)</sup> Individual Front Server is supported on Windows Server 2008 R2 SP1, 64-bit.

**Network connectivity requirements for 1001~2000 nodes**

Source	Destination	Protocol and Port Number
Thin Client	Application Server	HTTP/HTTPS (80/443)
Application Server	Database Server	TCP 27017/27654/9200
Application Server	Live Network	ICMP/SNMP/Telnet/SSH/REST API

**Reference Specification for 2001~5000 Nodes & ≤20 Seats**

As the number of network devices and concurrent users increase, the system requires a distributed environment, which is flexible based on your network scale and requires more machines to provide scalability and resiliency. Both physical machines and virtual machines are supported.





Environment	NetBrain Component	Machine Count	CPU	Memory	Hard Disk <sup>1)</sup>	Operating System
2001~5000 nodes ≤ 20 users	Web Server Web API Server Cache Server Message Server Task Engine Front Server Controller	1	4 Core/ 8 vCPU	32GB	200GB	<ul style="list-style-type: none"> <li>▪ Windows Server 2012/2012 R2 (Standard/Datacenter Edition), 64-bit</li> <li>▪ Windows Server 2016 (Standard/Datacenter Edition), 64-bit</li> </ul>
	Worker Server	1	8 Core/ 16 vCPU	32GB	200GB	
	Front Server	1	4 Core/ 8 vCPU	8GB	200GB	<ul style="list-style-type: none"> <li>▪ Windows Server 2008 R2 SP1, 64-bit</li> <li>▪ Windows Server 2012/2012 R2 (Standard/Datacenter Edition), 64-bit</li> <li>▪ Windows Server 2016 (Standard/Datacenter Edition), 64-bit</li> <li>▪ Red Hat Enterprise Linux (RHEL) 7.0/7.3/7.5, 64-bit</li> <li>▪ CentOS 7.0/7.2, 64-bit</li> </ul>
	MongoDB Server License Agent Server Index Server	1	4 Core/ 8 vCPU	32GB	500GB	<ul style="list-style-type: none"> <li>▪ Red Hat Enterprise Linux (RHEL) 7.0/7.3/7.5, 64-bit</li> <li>▪ CentOS 7.0/7.2, 64-bit</li> </ul>

**Note:** <sup>1)</sup> The required free space must be exclusively reserved for NetBrain on your hard disk. For better performance, MongoDB Server is recommended to be installed on a machine equipped with Solid State Drive (SSD), or Hard Disk Drive (HDD) RAID-10.

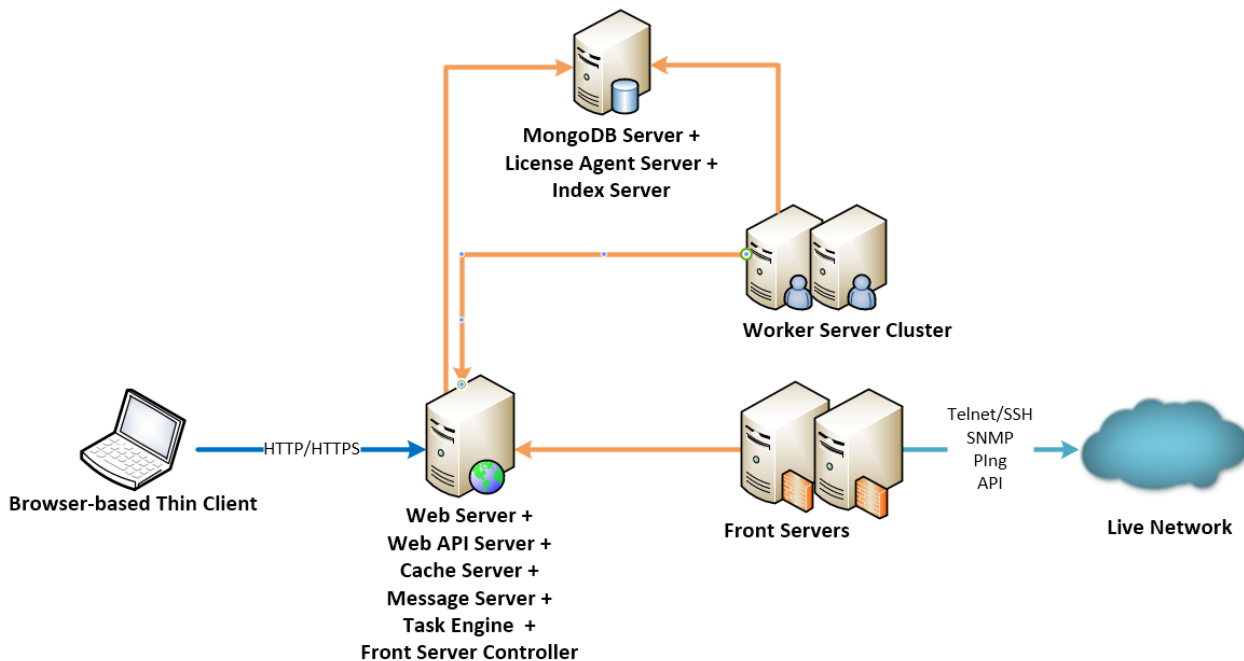
### Network connectivity requirements for 2001~5000 nodes

Source	Destination	Protocol and Port Number
Thin Client	Web Server Web API Server	HTTP/HTTPS (80/443)
Web API Server Worker Server Task Engine Front Server Controller	MongoDB Server License Agent Server Index Server	TCP 27017 TCP 27654 TCP 9200

Source	Destination	Protocol and Port Number
Worker Server Front Server Controller	Cache Server	TCP 6379/7000
Worker Server Task Engine Front Server Controller	Message Server	TCP 4369/5671/5672/15672
Worker Server Task Engine Front Server	Front Server Controller	TCP 9095
Front Server	Live Network	ICMP/SNMP/Telnet/SSH/REST API

## Reference Specification for 5001~10000 Nodes & ≤50 Seats

As the number of network devices and concurrent users increase, the system requires a distributed environment, which is flexible based on your network scale, and requires more machines to provide scalability and resiliency. Both physical machines and virtual machines are supported.



Environment	NetBrain Component	Machine Count	CPU	Memory	Hard Disk <sup>1)</sup>	Operating System
5001~10000 nodes ≤ 50 users	Web Server Web API Server Cache Server Message Server Task Engine Front Server Controller	1	8 Core/ 16 vCPU	32GB	200GB	<ul style="list-style-type: none"> <li>Windows Server 2012/2012 R2 (Standard/Datacenter Edition), 64-bit</li> <li>Windows Server 2016 (Standard/Datacenter Edition), 64-bit</li> </ul>
	Worker Server	2	8 Core/ 16 vCPU	32GB	200GB	
	Front Server	2	4 Core/ 8 vCPU	8GB	200GB	<ul style="list-style-type: none"> <li>Windows Server 2008 R2 SP1, 64-bit</li> <li>Windows Server 2012/2012 R2 (Standard/Datacenter Edition), 64-bit</li> <li>Windows Server 2016 (Standard/Datacenter Edition), 64-bit</li> <li>Red Hat Enterprise Linux (RHEL) 7.0/7.3/7.5, 64-bit</li> <li>CentOS 7.0/7.2, 64-bit</li> </ul>
	MongoDB Server License Agent Server Index Server	1	8 Core/ 16 vCPU	64GB	1TB	<ul style="list-style-type: none"> <li>Red Hat Enterprise Linux (RHEL) 7.0/7.3/7.5, 64-bit</li> <li>CentOS 7.0/7.2, 64-bit</li> </ul>

**Note:** <sup>1)</sup> The required hard disk space must be exclusively reserved for NetBrain. For better performance, MongoDB Server is recommended to be installed on a machine equipped with Solid State Drive (SSD), or Hard Disk Drive (HDD) RAID-10.

#### Network connectivity requirements for 5001~10000 nodes

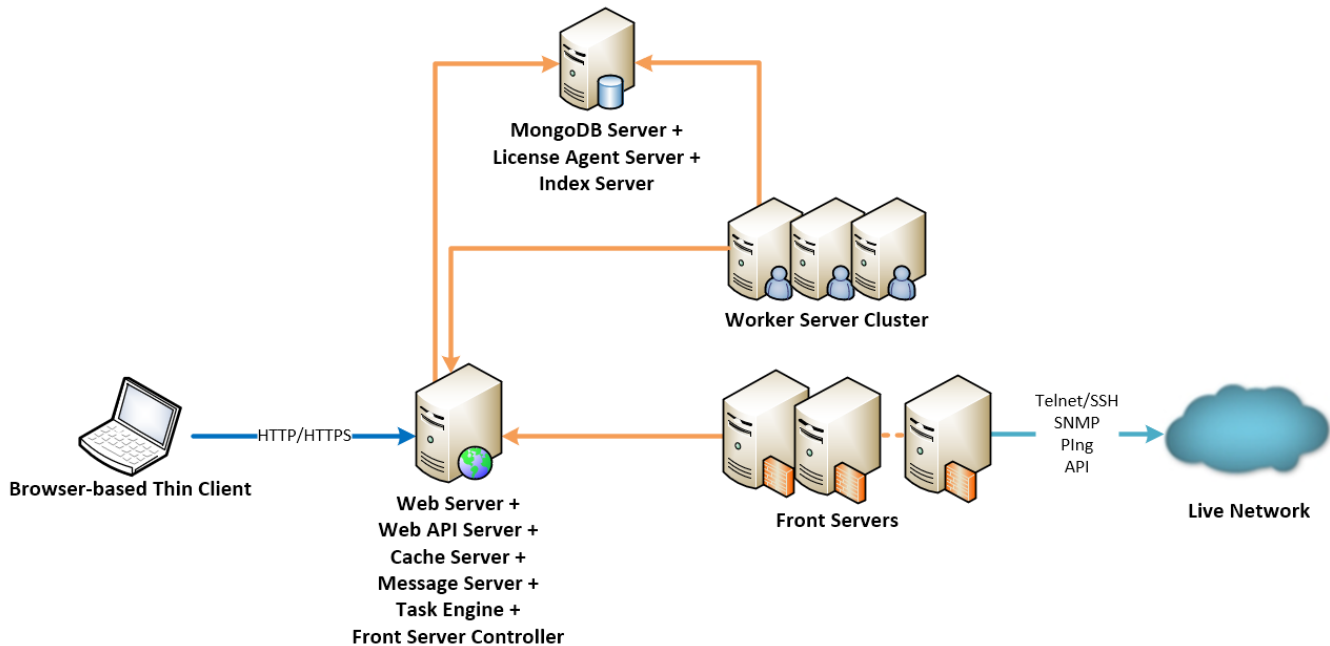
Source	Destination	Protocol and Port Number
Thin Client	Web Server Web API Server	HTTP/HTTPS (80/443)
Web API Server Worker Server Task Engine Front Server Controller	MongoDB Server License Agent Server Index Server	TCP 27017 TCP 27654 TCP 9200

Source	Destination	Protocol and Port Number
Worker Server Front Server Controller	Cache Server	TCP 6379/7000
Worker Server Task Engine Front Server Controller	Message Server	TCP 4369/5671/5672/15672
Worker Server Task Engine Front Server	Front Server Controller	TCP 9095
Front Server	Live Network	ICMP/SNMP/Telnet/SSH/REST API

## Reference Specification for 10001~50000 Nodes & ≤200 Seats

As the number of network devices and concurrent users increase, the system requires a distributed environment. The distributed deployment method is flexible based on your network scale, requiring more machines to provide more scalability and resiliency. Both physical machines and virtual machines are supported.

For HA deployments, please contact [NetBrain Support Team](#) for customization assistance.



Environment	NetBrain Component	Machine Count	CPU	Memory	Hard Disk <sup>1)</sup>	Operating System
10001~50000 nodes ≤ 200 users	Web Server Web API Server Cache Server Message Server Task Engine Front Server Controller	1	8 Core/ 16 vCPU	32GB	200GB	<ul style="list-style-type: none"> <li>Windows Server 2012/2012 R2 (Standard/Datacenter Edition), 64-bit</li> <li>Windows Server 2016 (Standard/Datacenter Edition), 64-bit</li> </ul>
	Worker Server	3	8 Core/ 16 vCPU	32GB	200GB	
	Front Server	3~10 <sup>2)</sup>	4 Core/ 8 vCPU	8GB	200GB	<ul style="list-style-type: none"> <li>Windows Server 2008 R2 SP1, 64-bit</li> <li>Windows Server 2012/2012 R2 (Standard/Datacenter Edition), 64-bit</li> <li>Windows Server 2016 (Standard/Datacenter Edition), 64-bit</li> <li>Red Hat Enterprise Linux (RHEL) 7.0/7.3/7.5, 64-bit</li> <li>CentOS 7.0/7.2, 64-bit</li> </ul>
	MongoDB Server License Agent Server Index Server	1	8 Core/ 16 vCPU	128GB	2TB	<ul style="list-style-type: none"> <li>Red Hat Enterprise Linux (RHEL) 7.0/7.3/7.5, 64-bit</li> <li>CentOS 7.0/7.2, 64-bit</li> </ul>

**Notes:**

<sup>1)</sup> The required hard disk space must be exclusively reserved for NetBrain. For better performance, MongoDB Server is recommended to be installed on a machine equipped with Solid State Drive (SSD), or Hard Disk Drive (HDD) RAID-10.

<sup>2)</sup> Each Front Server is recommended to manage 5,000 network nodes at most.

**Network connectivity requirements for 10001~50000 nodes**

Source	Destination	Protocol and Port Number
Thin Client	Web Server Web API Server	HTTP/HTTPS (80/443)

Source	Destination	Protocol and Port Number
Web API Server Worker Server Task Engine Front Server Controller	MongoDB Server License Agent Server Index Server	TCP 27017 TCP 27654 TCP 9200
Worker Server Front Server Controller	Cache Server	TCP 6379/7000
Worker Server Task Engine Front Server Controller	Message Server	TCP 4369/5671/5672/15672
Worker Server Task Engine Front Server	Front Server Controller	TCP 9095
Front Server	Live Network	ICMP/SNMP/Telnet/SSH/REST API

## Important Notes Before Deployments

---

In addition to the above referenced hardware specifications, the following requirements must be satisfied before deployments.

### ▪ Windows Server:

- NetBrain Integrated Edition should not be installed on the same server as an existing NetBrain Enterprise Edition (6.2 or earlier version), except that Front Server (IEv7.1) and Network Server (EEv6.2) can be installed on the same machine.
- The operating system must be installed with an English-language version (not language packs).
- There must be more than 3GB free space in the system drive (for example, C drive) to complete the installation no matter which drives NetBrain system will be installed on.
- Users with administrative privileges of the machine are required to implement the installation.
- Temporarily disable antivirus software during the installation process.
- If the machine's firewall is turned on, make sure the firewall rules allow traffics to all the ports and protocols that will be used by NetBrain system.

### ▪ Linux Server:

- The operating system must be installed with an English-language version (not language packs).
- It is highly recommended to store the data files and log files of NetBrain Servers into separated disk partitions. Make sure each partition has enough disk space.
  - ✓ More than 50GB free space in the directory where the data files of MongoDB/Index Server will be saved.
  - ✓ More than 10GB free space in the directory where the log files of MongoDB/Index Server will be saved.
- Users with root privileges of the machine are required to implement the installation.
- If the machine's firewall is turned on, make sure the firewall rules allow traffics to all the ports and protocols that will be used by NetBrain system.

### ▪ Supported Web Browser:

- Google® Chrome™ version 51 or higher.
- Apple® Safari® version 10.0.1 or higher on macOS.
- Mozilla® Firefox® version 57 or higher.

### ▪ Third-Party Dependencies:

**Note:** If the third-party dependencies are not installed on your machines, they will be installed with NetBrain components together. However, **numactl-2.0.9** needs to be manually pre-installed.

NetBrain Component	Third-party Dependencies
MongoDB Server	<ul style="list-style-type: none"> <li>▪ numactl-2.0.9</li> <li>▪ lsof-4.87</li> </ul>
License Agent Server	lsof-4.87
Index Server	<ul style="list-style-type: none"> <li>▪ JDK 1.8.0_131</li> <li>▪ lsof-4.87</li> </ul>
Cache Server	<ul style="list-style-type: none"> <li>▪ Microsoft Visual C++ 2017 Redistributable</li> </ul>
Message Server	<ul style="list-style-type: none"> <li>▪ Microsoft Visual C++ 2017 Redistributable</li> </ul>
Web Server Web API Server Worker Server	<ul style="list-style-type: none"> <li>▪ Microsoft Visual C++ 2017 Redistributable</li> <li>▪ Microsoft .NET Framework 4.5</li> <li>▪ IIS 8</li> <li>▪ Python 3.6.2</li> </ul>
Task Engine	<ul style="list-style-type: none"> <li>▪ Microsoft Visual C++ 2017 Redistributable</li> <li>▪ JDK 9.0.1</li> <li>▪ Microsoft .NET Framework 4.0 or higher versions</li> </ul>
Front Server Controller	Microsoft Visual C++ 2017 Redistributable
Front Server (Windows)	Microsoft Visual C++ 2017 Redistributable
Front Server (Linux)	<ul style="list-style-type: none"> <li>▪ glibc-2.17-222.el7.i686</li> <li>▪ glibc-2.17-222.el7.x86_64</li> <li>▪ libstdc++-4.8.5-28.el7.i686</li> <li>▪ libstdc++-4.8.5-28.el7.x86_64</li> <li>▪ libuuid-2.23.2-52.el7.i686</li> <li>▪ libuuid-2.23.2-52.el7.x86_64</li> <li>▪ pam-1.1.8-22.el7.i686</li> <li>▪ pam-1.1.8-22.el7.x86_64</li> </ul>
Service Monitor Agent	Python 3.6.2