

Technical Hardware Requirements for Elements installation



Elements can be installed on the supported Brainlab hardware, 3rd party platforms or virtual machines, as long as the software and hardware requirements listed in this document are fulfilled. For further questions or assistance please contact Brainlab support

SUPPORTED BRAINLAB HARDWARE PLATFORMS

Radiotherapy

Advanced Planning Computer 9 and newer
Planning Station 8.0 RT
(Planning Workstation for RT)
Planning Station 7 Workstation
(Planning Workstation Premium)
Node Server Hardware 4.0
Node Server Advanced 5.1 and newer
Node Server Essential 5.1 and newer

Surgery

Planning Workstation Premium
Node Server Hardware 4.0 & newer
Buzz In / On-Wall
Kick Navigation Station
Curve Navigation Station

RECOMMENDED HARDWARE SPECIFICATIONS*

**For 3rd party planning workstation or single session server*

CPU: Intel XEON CPU with Skylake Microarchitecture (released August 2017) or newer

Radiotherapy: 12 physical cores

Surgery: 6 physical cores

Example: Intel Xeon W 2195
Intel Xeon Gold 6148

Memory: **Radiotherapy:** 64 GB
Surgery: 16 GB
Server Environment: see section “Concurrent user sessions”

Graphics: DirectX 12 compatible NVIDIA workstation graphics card with at least 4 GB graphics memory and hardware feature level 11

High memory bandwidth between accelerator memory and accelerator and at least 640 GPU cores

Examples for supported NVIDIA Quadro GPUs with the respective recommended minimum driver version:

GPU	Recommended Minimum Driver Version
K2200	361.91
M2000	377.11
P4000	385.41, 411.63
RTX4000	426.32

Note: GPU is required for all Radiotherapy workflows.

Screen Resolution:	1920 x 1200 (WUXGA) 2560 x 1140 (only for Radiotherapy)
Network connection:	1 Gbit/s
Hard Drive:	Solid State Drive (SSD) recommended with 250 GB disk space for Windows installation and third party applications At least 250 GB additional disk space on SSD for Brainlab applications and patient data

SOFTWARE REQUIREMENTS

Planning Workstation

Operating System:	Windows 10 Enterprise 1507 LTSC Windows 10 Enterprise 1607 LTSC Windows 10 Enterprise 1809 LTSC
-------------------	---

Planning Server

Operating System (OS):	Windows Server 2012 R2 Standard 64bit Windows Server 2016 Standard 64 bit Windows Server 2019 English OS language
OS Roles & Services:	The server shall be installed with the default configuration without any additional Roles or Services
Power Shell:	Version 3.0 or newer
SSL Certificate:	Fully Qualified Domain Name SSL certificate.

** The Windows Server license as well as the RD Client Access Licenses (RD CALs) and the SSL certificates have to be provided by the hospital IT*

SERVER VIRTUAL MACHINES

Brainlab supports virtualization environments with Citrix XenServer or VMWare ESXi as recommended technologies.

Since the virtual machine will host highly CPU and RAM demanding software, following aspects need to be considered when setting up the VM:

- vCPU:** the recommended hardware CPU specifications above apply for virtual machines as well (e.g. 12 physical cores for RT software)
- Sockets:** For optimal memory management, it is recommended to keep the number of sockets as low as possible
- Oversubscription:** the configured hardware resources shall be reserved for the virtual machine. In case of oversubscription it is not possible to guarantee a high session density (like for instance in bare metal installations).
- Concurrent user sessions:** for each additional user session the server configuration shall be expanded with 2 physical cores and 8 GB RAM (16 GB for Radiotherapy installations).

3D GRAPHICS & ALGORITHMS ACCELERATION

GPU accelerated algorithms: For physical servers see the Graphics section in the hardware specifications above.

For virtualized servers GPU sharing (vGPU) or GPU pass-through based on a dedicated physical NVIDIA graphics card in the VM Host is required.

The VM client itself must be equipped with recent graphics driver (NVIDIA driver versions 361.91 ODE branch *and GRID vGPU Manager (340.57)* or newer).

Advanced 3D graphics views: Elements software offers advanced 3D mostly available with and without physical graphics adapter. High resource demanding data type content may require dedicated 3D graphic acceleration which is supported for server hardware and virtual machines.
The absence of physical graphics adapter on the virtual machine can be partly compensated assigning at least one additional physical core per concurrent session.

In general, Brainlab strongly recommends the adoption of a graphics adapter in order to avoid low quality user experiences.

PERFORMANCE OPTIMIZATION

Depending on the clinical workflow and resources availability, data pre-fetching can enhance peak load performance by pre-loading and pre-processing part of the data before planning sessions.

SERVER SCALING

In order to scale the server according to your real load refer to the maximum number of concurrent sessions estimated for the peak hours. For increasing the sessions density Brainlab Load Balancing allows the distribution of user sessions across multiple servers (Microsoft cluster services are not needed).

Example server architecture tested for up to 5 concurrent sessions:
2 x Intel Xeon Gold 6146 (3.2 – 4.2 GHz)

Note: to achieve an optimal user experience for the target environment and workflow, these parameters shall be used as orientation and they shall be supported by a dedicated consulting session with Brainlab Service.

ENVIRONMENT PREREQUISITES FOR SERVER BASED PLANNING

Client Computer

Minimum		Recommended	
OS	Windows XP / SP 3 or newer MAC OS X 10.11 or newer	OS	Windows 7 or newer
CPU/RAM	1GHz, 512 MB	CPU/RAM	2 GHz, 2GB
Display resolution	1280x1024 landscape (Surgery) 1920x1200 landscape (RT)	Display resolution	1920x1200 landscape 2560 x 1140 (RT)
Display color depth	24 bit	Display color depth	32 bit
Browsers for HTML5 connection	IE version: >8 Safari version: > 9 Chrome version: > 48 Firefox version: > 45	Browsers for RDP connection	IE 8.x or newer, RDP client 7.0 or newer and ActiveX control enabled for Origin server URL

Tablets

- iPad with iOS 8.4 or higher
- Display resolution: 1024x768 or higher
- HTML5 compatible web browser (recommended for full screen capability: e.g. Safari)

Hospital Network

- Existing LAN with minimum 100 Mbit/s bandwidth speed and less than 50ms latency
- Static server IP address
- For wireless client connection: Wireless LAN must be provided by the hospital
- Installation required in an air-conditioned IT industrial standard environment (max 35 °C)
- Data storage solution for long term archiving

- Recommended existing Windows Domain (mandatory only for server clusters in load balancing)

List of critical policies that should not be defined (Setting: "Not Configured") :

Value Name
Computer Configuration\Policies\Administrative Templates\Windows Components\Remote Desktop Services\Remote Desktop Session Host*
Computer Configuration\Policies\Windows Settings\Security Settings\Software Restriction Policies*

The following policies should have the following values:

Value Name	Setting
MACHINE\Software\Policies\Microsoft\Windows\Safer\CodeIdentifiers\AuthenticodeEnabled	0
Computer Configuration\Administrative Templates\Windows Components\Windows Update\Allow non-administrators to receive updates notification	Disabled