



Control Center 16.1 Performance Reference Guide

This guide provides information about Control Center 16.1 components that may be useful when planning a system.

Control Center front-end application

This section provides guidance for specifying a PC for use with the Control Center front-end application. The actual performance achieved depends on a large number of factors such as processor type, the display adapter and driver version, interlace filter setting, RAM, and type of motion captured.

System specifications

The following tables show the performance of the Control Center front-end application running under standard conditions on three PC specifications.

These tables do not cover the Ultra 5K Fixed Camera.

For more information on the specifications for the Ultra 5K Fixed Camera, "BX 20MP recommended system specifications" on page 1

The CPU specifications provided are for default Control Center front-end application settings. If you use de-interlacing filter in "Best image quality" mode, there is a 20-30% increase in CPU usage for a typical scene. Therefore, you will require a higher specification CPU to achieve the same number of video streams.

When specifying a system for running the Control Center front-end application, please consider the following recommendations.

- Enable hyper-threading if available.
- 41MB hard disk space (for front-end application installation), plus enough disk space to store the map image files.
- 6GB RAM for 64-bit operating systems.
- Gigabit Ethernet 1000Base-T.
- One or more monitors capable of 1280x1024 resolution or above.
- Graphics card with 50GB/s memory bandwidth or above. GDDR5 or later memory technology is recommended.

Notice

The Control Center front-end application does not use the advanced drawing and processing features of graphics cards. Therefore, memory bandwidth is the most significant benchmark when selecting a graphics card.

High-end PC The following provides specifications and performance ranges for high-end PCs.

PC specification:

- Xeon® W @ 3.3GHz CPU (10 core with hyperthreading enabled, giving 20 cores), 32GB RAM
- AMD Radeon Pro WX4100 4GB Graphics Card driving 4 4K monitors at 60Hz
- Windows 10, 64-bit

Sample PC:

- Dell Precision T5820
- Intel Xeon W-2155, 32GB (4x8GB) 2666MHz RAM
- AMD Radeon Pro WX4100 4GB
- Windows 10 IoT, 64-bit

Table 1: High-end PC performance ranges

Camera series	Models tested	Resolution	Bitrate	Frame rate	Total Streams
BX420	BX420	4SIF	1Mbps	25fps	100 (Live) OR 25 (Playback)
BX420	BX420	4SIF	1Mbps	30fps	100 (Live) OR 25 (Playback)
BX420	BX420	1080p	4Mbps	25fps	26 (Live) OR 17 (Playback)
BX420	BX420	1080p	4Mbps	30fps	25 (Live) OR 15 (Playback)
BX430	BX430 4MP VR	4MP	4Mbps	25fps	19 (Live) OR 10 (Playback)
BX430	BX430 4MP VR	4MP	4Mbps	30fps	17 (Live) OR 9 (Playback)
BX620	BX620 4K	4K	8Mbps	25fps	8 (Live) OR 4 (Playback)
BX620	BX620 4K	4K	8Mbps	30fps	6 (Live) OR 4 (Playback)
BX fish eye	BX720 12MP	4000*3000	12Mbps	15fps	10 (Live) OR 6 (Playback)

Mid-range PC The following provides specifications and performance ranges for high-end PCs.

PC specification:

- Core i7 @ 3.2GHz CPU (6 core with hyperthreading enabled, giving 12 cores), 16GB RAM
- AMD Radeon Pro WX2100 2GB Graphics Card driving 4 HD monitors or 3 4K monitors at 60Hz
- Windows 10, 64-bit

Sample PC:

- Dell Precision 3630
- Intel Core i7-8700, 16GB (2x8GB) 2666MHz RAM
- AMD Radeon Pro WX2100 2GB
- Windows 10 IoT, 64-bit

Table 2: Mid-Range PC performance ranges

Camera series	Models tested	Resolution	Bitrate	Frame rate	Total Streams
BX420	BX420	4SIF	1Mbps	25fps	98 (Live) OR 25 (Playback)
BX420	BX420	4SIF	1Mbps	30fps	98 (Live) OR 25 (Playback)
BX420	BX420	1080p	4Mbps	25fps	20 (Live) OR 12 (Playback)
BX420	BX420	1080p	4Mbps	30fps	18 (Live) OR 11 (Playback)
BX430	BX430 4MP VR	4MP	4Mbps	25fps	11 (Live) OR 9 (Playback)
BX430	BX430 4MP VR	4MP	4Mbps	30fps	10 (Live) OR 8 (Playback)
BX620	BX620 4K	4K	8Mbps	25fps	6 (Live) OR 4 (Playback)
BX620	BX620 4K	4K	8Mbps	30fps	5 (Live) OR 3 (Playback)
BX fish eye	BX720 12MP	4000*3000	12Mbps	15fps	7 (Live) OR 5 (Playback)

Low-end PC The following provides specifications and performance ranges for low-end PCs.

PC specification:

- Core i5 @ 3.2GHz CPU(6 core), 8GB RAM
- Intel UHD Graphics 630 driving 2 HD monitor at 60Hz
- Windows 10, 64bit

Sample PC:

- Dell OptiPlex 7060
- Intel Core i5-8400, 8GB 2666MHz RAM
- Windows 10 IoT, 64bit

Table 3: Low-end PC performance ranges

Camera series	Models tested	Resolution	Bitrate	Frame rate	Total Streams
BX420	BX420	4SIF	1Mbps	25fps	38 (Live) OR 25 (Playback)
BX420	BX420	4SIF	1Mbps	30fps	34 (Live) OR 25(Playback)
BX420	BX420	1080p	4Mbps	25fps	5 (Live) OR 7 (Playback)
BX420	BX420	1080p	4Mbps	30fps	5(Live) OR 6 (Playback)
BX430	BX430 4MP VR	4MP	4Mbps	25fps	3 (Live) OR 3 (Playback)
BX430	BX430 4MP VR	4MP	4Mbps	30fps	2 (Live) OR 3 (Playback)
BX620	BX620 4K	4K	8Mbps	25fps	1 (Live) OR 1 (Playback)
BX620	BX620 4K	4K	8Mbps	30fps	1 (Live) OR 1 (Playback)
BX fish eye	BX720 12MP	4000*3000	12Mbps	15fps	1 (Live) OR 1 (Playback)

Non-Uniform Memory Access (NUMA)

Disable Non-Uniform Memory Access (NUMA) to get the full performance from a multi-processor PC.

The NUMA option can typically be disabled in the BIOS settings. If this option does not appear in the BIOS settings, then it is disabled by default.

When NUMA is disabled, the memory is configured into a single block that is interleaved between the available processors instead of allocated in blocks for each processor. Leaving this option enabled can decrease performance by 30-40%.

Enhanced Intel SpeedStep Technology

Disable Intel SpeedStep to improve the performance of a Control Center 16.1 workstation.

SpeedStep can typically be disabled in the BIOS settings under **Settings > Performance > Intel Speedstep > Enable/Disable**.

SpeedStep optimises power-consumption and heat production in systems with this technology. When SpeedStep is disabled, these power saving benefits are not available. Leaving this option enabled can decrease performance by 10-15%.

Monitor refresh rates

For optimal performance you should always set the refresh rate of your PC monitor to match an integer multiple of the video rate. Matching monitor refresh rate to video frame rate improves smoothness of the video. This is especially important for applications such as traffic monitoring. If the refresh rate does not match the video frame rate you may observe less than smooth video.

The smooth de-interlacer feature introduced in Control Center 4.3 doubles the effective video frame rate for 4SIF interlaced video. In order to achieve this the following conditions must be met:

- Video encoding resolution must be full frame rate 4SIF (704x480@30fps / 704x576@25fps)
- Video source (camera) must be interlaced
- Video source (camera) must have the correct field ordering. If this condition is not met the video will look very jerky. The correct field ordering is:
 - PAL: Top-field first, bottom-field second
 - NTSC: Bottom-field first, top-field second

When using smooth de-interlacing, the PC monitor refresh rate should match the effective video frame rate. For example, for a 25fps 4SIF stream you should use a refresh rate that is a multiple of 50Hz.

Table 4: Example monitor refresh rate

Video (fps)	Refresh rate (Hz)	Notes
25	50/75/100..	PAL regions
30	60/90/120..	NTSC regions
50	50/100..	PAL regions using CC smooth de-interlacer
60	60/120..	NTSC regions using CC smooth de-interlacer

Stream frame rates

If the framerate is dropped, more streams can be used. However, halving the framerate does not double the number of streams, it may only give a slight increase.

Site database

There are two configuration options for the site database:

- Unsegmented Site Database - all site information is stored in a single database. This option is suited to smaller sites.
- Segmented Site Database - information for each sub-site is stored in separate segments of the site databases (max. 250). This option is suited to large sites with multiple administrators who are responsible for different sub-sites.

NVR-AS

This section provides information about the IndigoVision Windows Network Video Recorder / Alarm Server (NVR-AS).

Recordings

Recorded footage is stored in the video library directory.

- Maximum number of recording files per NVR-AS: 1,000,000

If this number is exceeded, the NVR-AS deletes the oldest unprotected footage to create more storage space.

Alarms

Detectors and zones are stored on the Alarm Server, as well as the records of alarms and detector activations.

- Total number of detectors per Alarm Server: 10,000
- Total number of 3rd party camera motion detectors per Alarm Server: 5000
- Total alarms (zones) that can be active in one instance of Control Center: 10,000
- Total number of email actions per Alarm Server: 20,000
- Total number of actions (including email actions) per Alarm Server: 50,000
- Detector activations per second: 5
- Total historical alarms stored on the Alarm Server: 500,000

Integrated data

External data source and data records are also stored on the Alarm Server.

- Total number of external data sources per Alarm Server: 10,000
- Data records per second: 1
- Total data records stored on the Alarm Server:
 - NVR-AS 3000: 250,000 records with an average size of 50 bytes
 - NVR-AS 4000: 3 million records with an average size of 50 bytes

If the average record size increases, the total number of records will decrease.

- Maximum data record length: 160 characters

Redundancy limits

An NVR-AS can only act as a failover for a maximum of 15 other NVRs.

Digital signatures

The NVR-AS can embed digital signatures in every recording file allowing the authenticity and integrity of that footage to be verified at any point in the future.



However, digital signing of footage has an impact on performance. Enabling this feature will increase CPU usage.

For systems specified to use Intel Xeon E3 or newer processors, digital signatures can be enabled without affecting system performance.

For existing systems with older processors, the current CPU usage must be evaluated before using digital signatures. Enabling digital signatures approximately doubles CPU usage. For reliable system operation, the total system CPU usage should be less than 70%. This means that digital signatures should not be enabled if the NVR-AS averages more than 35% CPU in normal operating conditions.

Camera Gateway™

System specifications

This section provides guidance for specifying a system for use with Camera Gateway.

The IndigoVision Camera Gateway can be installed on one of the following Windows operating systems:

- MS Windows 7 (64-bit)
- MS Windows 10 (64-bit)
- MS Windows Server 2008 R2
- MS Windows Server 2012
- MS Windows Server 2012 R2
- MS Windows Server 2016

For systems with more than 16 streams it is recommended to use Windows Server 2016.

IndigoVision recommends that you install Camera Gateway on a server-style system, with a server network adaptor, and the following minimum requirements:

- Server class PC
- Current generation Intel Xeon processor
- 4GB RAM
- At least 5GB of disk space

IndigoVision recommends that for Camera Gateway installations on VMWare the minimum specification is:

- 4 vCPUs
- 4GB RAM
- VMXNET3 network adapter

For improved performance, configure the VMXNET3 network adapter with the following settings:

- **Receive Side Scaling:** Enabled
- **Tx Ring Size:** 4096
- **Rx Ring #1 Size:** 4096
- **Rx Ring #2 Size:** 4096

Performance The Camera Gateway can achieve the following with appropriate hardware, such as a NVR-AS 4000:

- Maximum incoming bandwidth (cameras to Camera Gateway): 150Mbps
- Maximum outgoing bandwidth (Camera Gateway to other Control Center application): 450Mbps
- Maximum number of cameras: 100 cameras

- Maximum number of motion detectors configured to monitor cameras on the Camera Gateway: 100

Camera Proxy

IndigoVision recommends you install the Camera Proxy on a system with the following specifications:

- Server class PC
- Current generation Intel Xeon processor
- 4GB of RAM
- Microsoft Windows Server 2008 R2

Video Stream Manager

This section provides guidance for specifying a system for use with the IndigoVision Video Stream Manager (VSM) software.

IndigoVision recommends you install the VSM on a system with the following specifications:

- Intel Xeon E5-2620 v3
- 16GB RAM (4 x 4GB)
- Intel X520 10Gb Ethernet adapter
- Windows Server 2012 R2

Performance The VSM can achieve the following when using the recommended system specification:

Table 5: Performance details

	RTSP cameras
Maximum number of cameras	1000
Maximum simultaneous live views and recordings from a single managed camera	10 unicast, unlimited multicast
Maximum incoming bandwidth	1.6 Gbps
Maximum outgoing bandwidth	7.2 Gbps

FrontLine

FrontLine recordings are temporarily stored in the FrontLine Manager footage directory before being moved to the NVR-AS video library.

Table 6: FrontLine import time

Video Type	Time to import 1 hour of footage from 1 camera	Time to import 1 hour of footage from 7 cameras (1 full dock)
Normal Resolution	3 minutes	7 minutes
High Resolution	6 minutes	12 minutes

The FrontLine Manager footage directory default location is on the system drive and is limited to 10GB. This amount of temporary storage space is adequate when using a

single FrontLine Camera. However, when using multiple FrontLine Cameras with the FrontLine Manager PC, the size of the FrontLine Manager footage directory must be increased according to the following.

Table 7: FrontLine storage requirements

Number of Cameras	Storage Required
1	10 GB
7 (1 full dock)	106 GB
14 (2 full docks)	218 GB
21 (3 full docks)	330 GB

For instructions on how to increase the size of the FrontLine Manager footage directory, refer to the IndigoVision FrontLine Administrators Guide.

Control Center Web

This section provides guidance for specifying a PC for use with Control Center Web and the Media Server. The actual performance achieved depends on a number of factors such as processor type, RAM, and type of motion captured.

All specifications for Control Center Web are for BX Range HD cameras such as the BX420, BX520 and BX620. Other cameras are expected to produce similar performance results.

System specifications

The following tables show the performance of Control Center Web and Media Server running on different PC specifications.

The Enterprise NVR-AS 4000 1U, Enterprise NVR-AS 4000 2U and Hybrid NVR Workstation are all IndigoVision products which can be used with Control Center Web.

For these devices, the performance of Control Center Web depends on the amount of video being processed by Control Center and the NVR-AS. For the purposes of this guide, the background load on the device is indicated in each table.

Table 8: Enterprise NVR-AS 4000 1U

PC Specification	Intel Xeon E3-1220 v5, 8GB RAM DDR4 Windows Server 2012 R2		
NVR-AS	Recording 50 streams, 4SIF, 30fps @ 1.2Mbps, total recording throughput @ 60Mbps		
Installation Type	Control Center Web and Media Server (Hyper-V)		
Resolution	Input Bitrate	Frame rate	Total Streams (Live)
1080p	4Mbps	30fps	4
1080p	2Mbps	15fps	8
4SIF	1Mbps	30fps	11

Table 9: Enterprise NVR-AS 4000 2U

PC Specification	Intel Xeon E5-2620 v3, 16GB RAM DDR4 Windows Server 2012 R2		
NVR-AS	Recording 100 streams, 4SIF, 30fps @ 2.5Mbps, Total recording throughput @ 250Mbps		
Installation Type	Control Center Web and Media Server (Hyper-V)		
Resolution	Input Bitrate	Frame rate	Total Streams (Live)
1080p	4Mbps	30fps	9
1080p	2Mbps	15fps	14
4SIF	1Mbps	30fps	20

Table 10: Integra View Mid (G2) Workstation

PC Specification	Intel® Core™ i7-8700, 16GB RAM DDR4, 1 x 256GB SSD (PCIe NVMe Class 40), AMD Radeon Pro WX2100 2GB Graphics Card Windows 10 IoT 64bit		
Control Center	6 live streams, 1080p, 30fps @ 4Mbps		
Installation Type	Control Center Web and Media Server (Hyper-V)		
Resolution	Input Bitrate	Frame rate	Total Streams (Live)
1080p	4Mbps	30fps	4
1080p	2Mbps	15fps	14
4SIF	1Mbps	30fps	6

Third party hardware You can also install Control Center Web on third party hardware not sold by IndigoVision.

The following tables demonstrate the performance on a typical server configuration using two different approaches:

- Control Center Web and the Media Server are both installed on the same server using Hyper-V for the Media Server.
- Media Server is installed directly onto the server, with no need for virtualisation.

In this scenario, Control Center Web is hosted on a separate PC, where it will have a negligible performance impact.

Table 11: High end 1U server running Media Server in Hyper-V

PC Specification	Intel Xeon E5-2620 v4, 16GB RAM DDR4 Windows Server 2012 R2		
Sample PC	Dell PowerEdge R430		
Installation Type	Control Center Web and Media Server (Hyper-V)		
Resolution	Input Bitrate	Frame rate	Total Streams (Live)
1080p	4Mbps	30fps	14
1080p	2Mbps	15fps	24
4SIF	1Mbps	30fps	40

Table 12: High end 1U server running Media Server directly

PC Specification	Intel Xeon E5-2620 v4, 16GB RAM DDR4		
Sample PC	Dell PowerEdge R430		
Installation Type	Media Server installed directly on PC, separate Control Center Web installation		
Resolution	Input Bitrate	Frame rate	Total Streams (Live)
1080p	4Mbps	30fps	18
1080p	2Mbps	15fps	30
4SIF	1Mbps	30fps	46