

# Calculating Bandwidth for NVR's

## Introduction

This technical note will provide a **guide** as to how many IP Cameras you can connect to an NVR

### Notes

Each NVR will specify the 'Incoming Bandwidth' available for the NVR.

E.g. Hikvision DS-7732NI-I4/16P 32 Channel NVR has an Incoming Bandwidth support of 256Mbps.



As a **guide**, the following will provide an approx Bandwidth of the IP cameras @ 30fps for dual streaming. (Refer Appendix A at the end of this document for more precise bitrates.)

Camera Resolution	H.264	(Hikvision) H.264+	H.265	(Hikvision) H.265+
2MP	4 Mbps	4 Mbps	2 Mbps	2 Mbps
4MP	8 Mbps	8 Mbps	4 Mbps	4 Mbps
6MP	10 Mbps	10 Mbps	5.1 Mbps	5 Mbps
8MP	16.4 Mbps	16 Mbps	8.2 Mbps	8.2 Mbps

## 1.1 Calculating IP Camera Qty's to NVR's

Within the wide range of NVR's from Hikvision there are different models with different Incoming Bandwidths. The NVR's will support a wide range of camera resolutions (e.g. 2mp, 4mp, 6mp, 8mp (4K) etc).

So a common question is "how many cameras can I connect to the NVR". Does 128 Camera NVR really mean you can connect 128 Cameras to it?

The quantity of cameras you can connect to an NVR is limited to the NVR's Incoming bandwidth, resolution of the cameras and the FPS from the cameras.

The formula to calculate the incoming bandwidth and the IP camera connected is:

$$A = B / (C + D). \text{ (or } C + D = \text{Total Bitrate of the camera)}$$

**A** refers to the number of IP camera you want to connect.

**B** refers to the value of the incoming bandwidth.

**C** refers to the bitrate value of the main stream of the connected IP camera.

And **D** refers to the bitrate value of the sub-stream of the connected IP camera.

You cannot exceed the maximum incoming bandwidth of the NVR.

Example:

If we want to connect 4MP IP Cameras to a Hikvision DS-7732NI-I4/16P NVR @ 25fps then how many cameras can I connect?

The incoming bandwidth of DS-7732NI-I4/16P 32 Channel NVR is 256Mbps and the IP camera to connect is with resolution of 4MP (2688 x 1520) / 25 fps.

The bitrate for the main stream and sub-stream of the IP camera is set as 6Mbps and 2Mbps respectively.

In this example, **B**=256Mbps, **C**=6Mbps, **D**=2Mbps.

With Total No of Cameras =  $B/(C+D)$  (256 / (6+2) Total Camera  $\approx$  32.)

However if we wanted to connect 8MP IPC at H.264 for example,

then **B**=256Mbps, **C**=16.4Mbps, **D**=2Mbps and  $A = B/(C+D)$  (256 / (16.4+2)  $\approx$  14 Cameras).

So the number of 8MP IP cameras can be connected to a DS-7732NI-I4/16P 32 Channel NVR at full 25fps recording @ H.264 would be 14.

However if the format was set to H.265 then the total would be  $\approx$  25.

**B**=256Mbps, **C**=8.2 Mbps, **D**=2Mbps and  $A = B/(C+D) = 256 / (8.2 + 2) \approx 25$

If more cameras are required then you will either need to reduce the fps or resolution from the cameras, or change to a different model NVR with more incoming bandwidth.

**Keep in mind it is good practice to never max out the NVR and keep resources (Incoming bandwidth) spare.**

### Additional Information:

#### Customer Service

**Phone:** 1300 551 991 (M-F 8:30am – 5:00pm)

**Email:** [customerservice@ness.com.au](mailto:customerservice@ness.com.au)

**YouTube:** [www.youtube.com/nesscorporation](http://www.youtube.com/nesscorporation)

**Appendix A**  
**Approx Bitrates for varying resolutions, formats and FPS.**

**H.264 Format**

<b>H.264 Bit Rate at General Resolutions (Approximate Value)</b>								
<b>Recommended Bit Rate at General Resolutions (Approximate Value)</b>								
<b>Resolution</b>	<b>Frame Rate</b>	<b>30 fps</b>	<b>25 fps</b>	<b>20 fps</b>	<b>15 fps</b>	<b>12.5 fps</b>	<b>10 fps</b>	<b>1 fps</b>
<b>12MP(4000×3000)</b>		20480	20480	15360	10240	10240	7680	7680
<b>12MP(4000×3072)</b>		20480	20480	15360	10240	10240	7680	7680
<b>9MP(3072×3072)</b>		16384	16384	12288	8192	8192	6144	6144
<b>9MP(4096×2160)</b>		15360	15360	11520	7680	7680	5760	5760
<b>3840×2160</b>		16384	16384	12288	8192	8192	6144	6144
<b>3072×2304</b>		10240	10240	7680	5120	5120	3840	3840
<b>6MP(3072×2048)</b>		10240	10240	7680	5120	5120	3840	3840
<b>2560×2560</b>		10240	10240	7680	5120	5120	3840	3840
<b>3072×1728</b>		8192	8192	6144	4096	4096	3072	3072
<b>2560×2048</b>		8192	8192	6144	4096	4096	3072	3072
<b>2592×1944</b>		9216	9216	6912	4608	4608	3456	3456
<b>2560×1920</b>		9216	9216	6912	4608	4608	3456	3456
<b>2688×1520</b>		8192	8192	6144	4096	4096	3072	3072
<b>2048×2048</b>		8192	8192	6144	4096	4096	3072	3072
<b>4MP(2560×1440)</b>		8192	8192	6144	4096	4096	3072	3072
<b>3012×1152</b>		6144	6144	4608	3072	3072	2304	2304
<b>QXGA(2048×1536)</b>		6144	6144	4608	3072	3072	2304	2304
<b>1080P(1920×1080)</b>		4096	4096	3072	2048	2048	1536	1536
<b>1600×1200</b>		4096	4096	3072	2048	2048	1536	1536
<b>1280×1280</b>		2048	2048	1536	1024	1024	768	768
<b>1280×960</b>		2048	2048	1536	1024	1024	768	768
<b>720P(1280×720)</b>		2048	2048	1536	1024	1024	768	768
<b>720×720</b>		2048	2048	1536	1024	1024	768	768
<b>4CIF(704×576)</b>		1024	1024	768	512	512	384	384
<b>704×480</b>		1024	1024	768	512	512	384	384
<b>640×360</b>		832	832	576	448	448	288	288
<b>352×288</b>		320	320	192	192	192	128	128

**Note 1:** This sheet is useful for users who has high requirement for bit rate settings. If the real environment is more complex, you can increase the bite rate 20%~30% higher than recommend.

**Note 2:** The above value is suitable for all series IPC and PTZ with new platform.

### H.264+ Format

H.264+ Bit Rate at General Resolutions (Approximate Value)								
Recommended Bit Rate at General Resolutions (Approximate Value)								
Resolution	Frame Rate	30 fps	25 fps	20 fps	15 fps	12.5 fps	10 fps	1 fps
12MP(4000×3000)	max bitrate(Kbps)	20480	20480	15360	10240	10240	7680	7680
	target bitrate(Kbps)	10240	10240	7680	5120	5120	3840	3840
12MP(4000×3072)	max bitrate(Kbps)	20480	20480	15360	10240	10240	7680	7680
	target bitrate(Kbps)	10240	10240	7680	5120	5120	3840	3840
9MP(3072×3072)	max bitrate(Kbps)	16384	16384	12288	8192	8192	6144	6144
	target bitrate(Kbps)	8192	8192	6144	4096	4096	3072	3072
9MP(4096×2160)	max bitrate(Kbps)	15360	15360	11520	7680	7680	5760	5760
	target bitrate(Kbps)	7680	7680	5760	3840	3840	2880	2880
8MP 3840×2160	max bitrate(Kbps)	16384	16384	12288	8192	8192	6144	6144
	target bitrate(Kbps)	8192	8192	6144	4096	4096	3072	3072
6MP(3072×2048)	max bitrate(Kbps)	10240	10240	7680	5120	5120	3840	3840
	target bitrate(Kbps)	5120	5120	3840	2560	2560	2000	2000
2560×2560	max bitrate(Kbps)	10240	10240	7680	5120	5120	3840	3840
	target bitrate(Kbps)	5120	5120	3840	2560	2560	2000	2000
3072×1728	max bitrate(Kbps)	8192	8192	6144	4096	4096	3072	3072
	target bitrate(Kbps)	4096	4096	3072	2048	2048	1856	1856
2560×2048	max bitrate(Kbps)	8192	8192	6144	4096	4096	3072	3072
	target bitrate(Kbps)	4096	4096	3072	2048	2048	1856	1856
2592×1944	max bitrate(Kbps)	9216	9216	6912	4608	4608	3456	3456
	target bitrate(Kbps)	4608	4608	3456	2304	2304	1928	1928
2560×1920	max bitrate(Kbps)	9216	9216	6912	4608	4608	3456	3456
	target bitrate(Kbps)	4608	4608	3456	2304	2304	1928	1928
2688×1520	max bitrate(Kbps)	8192	8192	6144	4096	4096	3072	3072
	target bitrate(Kbps)	4096	4096	3072	2048	2048	1856	1856
4MP(2560×1440)	max bitrate(Kbps)	8192	8192	6144	4096	4096	3072	3072
	target bitrate(Kbps)	4096	4096	3072	2048	2048	1856	1856
QXGA(2048×1536)	max bitrate(Kbps)	6144	6144	4608	3072	3072	2304	2304
	target bitrate(Kbps)	3072	3072	2304	1856	1856	1544	1544
1080P(1920×1080)	max bitrate(Kbps)	4096	4096	3072	2048	2048	1536	1536
	target bitrate(Kbps)	2048	2048	1856	1440	1440	1136	1136
1280×960	max bitrate(Kbps)	2048	2048	1536	1024	1024	768	768
	target bitrate(Kbps)	1440	1440	1136	832	832	648	648
720P(1280×720)	max bitrate(Kbps)	2048	2048	1536	1024	1024	768	768
	target bitrate(Kbps)	1440	1440	1136	832	832	648	648

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**Note 2:** The above value is suitable for all series IPC and PTZ with new platform.

## H.265 Format

H.265 Bit Rates at General Resolutions (Approximate Value)							
Recommended Bit Rate at General Resolutions (Approximate Value)(Kbps)							
Resolution \ Frame Rate	30 fps	25 fps	20 fps	15 fps	12.5 fps	10 fps	1 fps
12MP(4000×3000)	10240	10240	7680	5120	5120	3840	3840
12MP(4000×3072)	10240	10240	7680	5120	5120	3840	3840
9MP(3072×3072)	8192	8192	6144	4096	4096	3072	3072
9MP(4096×2160)	7680	7680	5760	3840	3840	2880	2880
8MP 3840×2160	8192	8192	6144	4096	4096	3072	3072
6MP(3072×2048)	5120	5120	3840	2560	2560	1920	1920
2560×2560	5120	5120	3840	2560	2560	1920	1920
3072×1728	4096	4096	3072	2048	2048	1536	1536
2560×2048	4096	4096	3072	2048	2048	1536	1536
2592×1944	4608	4608	3456	2304	2304	1728	1728
2560×1920	4608	4608	3456	2304	2304	1728	1728
2688×1520	4096	4096	3072	2048	2048	1536	1536
4MP(2560×1440)	4096	4096	3072	2048	2048	1536	1536
QXGA(2048×1536)	3072	3072	2304	1536	1536	1152	1152
1080P(1920×1080)	2048	2048	1536	1024	1024	768	768
1280×960	1024	1024	768	512	512	384	384
720P(1280×720)	1024	1024	768	512	512	384	384
4CIF(704×576)	704	704	512	384	384	256	256
640×360	576	576	384	320	320	192	192
352×288	320	320	192	192	192	128	128

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### H.265+ Format

<b>H.265+ Bit Rates at General Resolutions (Approximate Value)</b>								
<b>Recommended Bit Rate at General Resolutions (Approximate Value)</b>								
Resolution	Frame Rate	30 fps	25 fps	20 fps	15 fps	12.5 fps	10 fps	1 fps
<b>12MP(4000×3000)</b>	max bitrate(Kbps)	10240	10240	7680	5120	5120	3840	3840
	target bitrate(Kbps)	5120	5120	3840	2560	2560	2000	2000
<b>12MP(4000×3072)</b>	max bitrate(Kbps)	10240	10240	7680	5120	5120	3840	3840
	target bitrate(Kbps)	5120	5120	3840	2560	2560	2000	2000
<b>9MP(3072×3072)</b>	max bitrate(Kbps)	8192	8192	6144	4096	4096	3072	3072
	target bitrate(Kbps)	4096	4096	3072	2048	2048	1856	1856
<b>9MP(4096×2160)</b>	max bitrate(Kbps)	7680	7680	5760	3840	3840	2880	2880
	target bitrate(Kbps)	3840	3840	2880	2000	2000	1778	1778
<b>3840×2160</b>	max bitrate(Kbps)	8192	8192	6144	4096	4096	3072	3072
	target bitrate(Kbps)	4096	4096	3072	2048	2048	1856	1856
<b>6MP(3072×2048)</b>	max bitrate(Kbps)	5120	5120	3840	2560	2560	1920	1920
	target bitrate(Kbps)	2560	2560	2000	1648	1648	1364	1364
<b>2560×2560</b>	max bitrate(Kbps)	5120	5120	3840	2560	2560	1920	1920
	target bitrate(Kbps)	2560	2560	2000	1648	1648	1364	1364
<b>3072×1728</b>	max bitrate(Kbps)	4096	4096	3072	2048	2048	1536	1536
	target bitrate(Kbps)	2048	2048	1856	1440	1440	1136	1136
<b>2560×2048</b>	max bitrate(Kbps)	4096	4096	3072	2048	2048	1536	1536
	target bitrate(Kbps)	2048	2048	1856	1440	1440	1136	1136
<b>2592×1944</b>	max bitrate(Kbps)	4608	4608	3456	2304	2304	1728	1728
	target bitrate(Kbps)	2304	2304	1928	1544	1544	1250	1250
<b>2560×1920</b>	max bitrate(Kbps)	4608	4608	3456	2304	2304	1728	1728
	target bitrate(Kbps)	2304	2304	1928	1544	1544	1250	1250
<b>2688×1520</b>	max bitrate(Kbps)	4096	4096	3072	2048	2048	1536	1536
	target bitrate(Kbps)	2048	2048	1856	1440	1440	1136	1136
<b>4MP(2560×1440)</b>	max bitrate(Kbps)	4096	4096	3072	2048	2048	1536	1536
	target bitrate(Kbps)	2048	2048	1856	1440	1440	1136	1136
<b>QXGA(2048×1536)</b>	max bitrate(Kbps)	3072	3072	2304	1536	1536	1152	1152
	target bitrate(Kbps)	1856	1856	1544	1136	1136	908	908
<b>1080P(1920×1080)</b>	max bitrate(Kbps)	2048	2048	1536	1024	1024	768	768
	target bitrate(Kbps)	1440	1440	1136	832	832	648	648
<b>1280×960</b>	max bitrate(Kbps)	1024	1024	768	512	512	384	384
	target bitrate(Kbps)	832	832	648	464	464	354	354
<b>720P(1280×720)</b>	max bitrate(Kbps)	1024	1024	768	512	512	384	384
	target bitrate(Kbps)	832	832	648	464	464	354	354

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**Note 2:** The above value is suitable for all series IPC and PTZ with new platform.