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## *VMDC Version 7.0 Performance Guide*

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### General

With the release of the VMDC version 7.0 Vicon has introduced an improved display performance algorithm. As before, using multiple monitors and maximizing the number of display layouts offer the user flexibility, but this requires proper design and configuration so that the system's capabilities are not exceeded. This document describes the factors that need to be considered and the design criteria that should be focused on when determining the quantity and configuration of VMDC and VN-DECODER-2 systems to support a required cameras layout.

This document will use the term VMDC to refer to both VMDCs and VN-DECODER-2 devices.

### Various Factors to Consider

When trying to determine how many cameras can be displayed on a certain monitor and how many VMDCs will be required to achieve such a display, a few parameters need to be considered:

- **Frame Rate**  
The expected frame rate displayed for each camera depends on the video source frame rate as well as the size of the frames, based on compression as explained below.
- **Resolution**  
The higher the picture resolution, the harder the display task becomes.
- **Compression**  
The image compression is also important. JPEG, MPEG-4 and H.264 are all valid compression formats. While the display of each type might require similar resource level, this might also impact the bandwidth required (mostly when using JPEG) and needs to be observed.

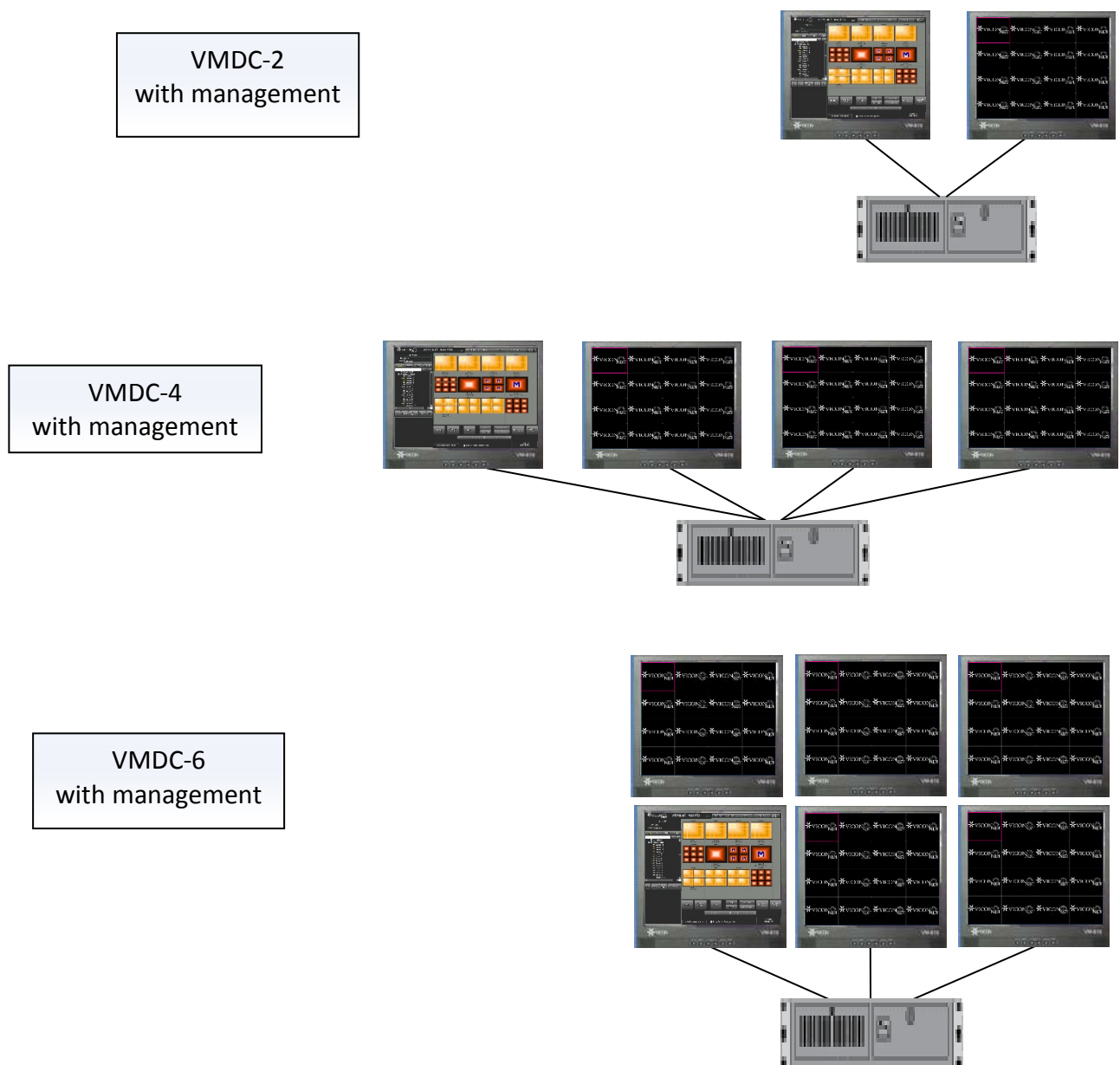
A combination of all these factors will result in the number of cameras that can be displayed across an array of monitors and VMDCs. Adding additional cameras will cause a reduction in FPS and, at a certain point, will bring the VMDC to its maximum resources. The numbers that are shown in this document are test results and not a theoretical calculation.

## The Different System Layouts

There are a few ways in which VMDC-based systems are being deployed. The main system layouts have been tested to provide as much information as possible:

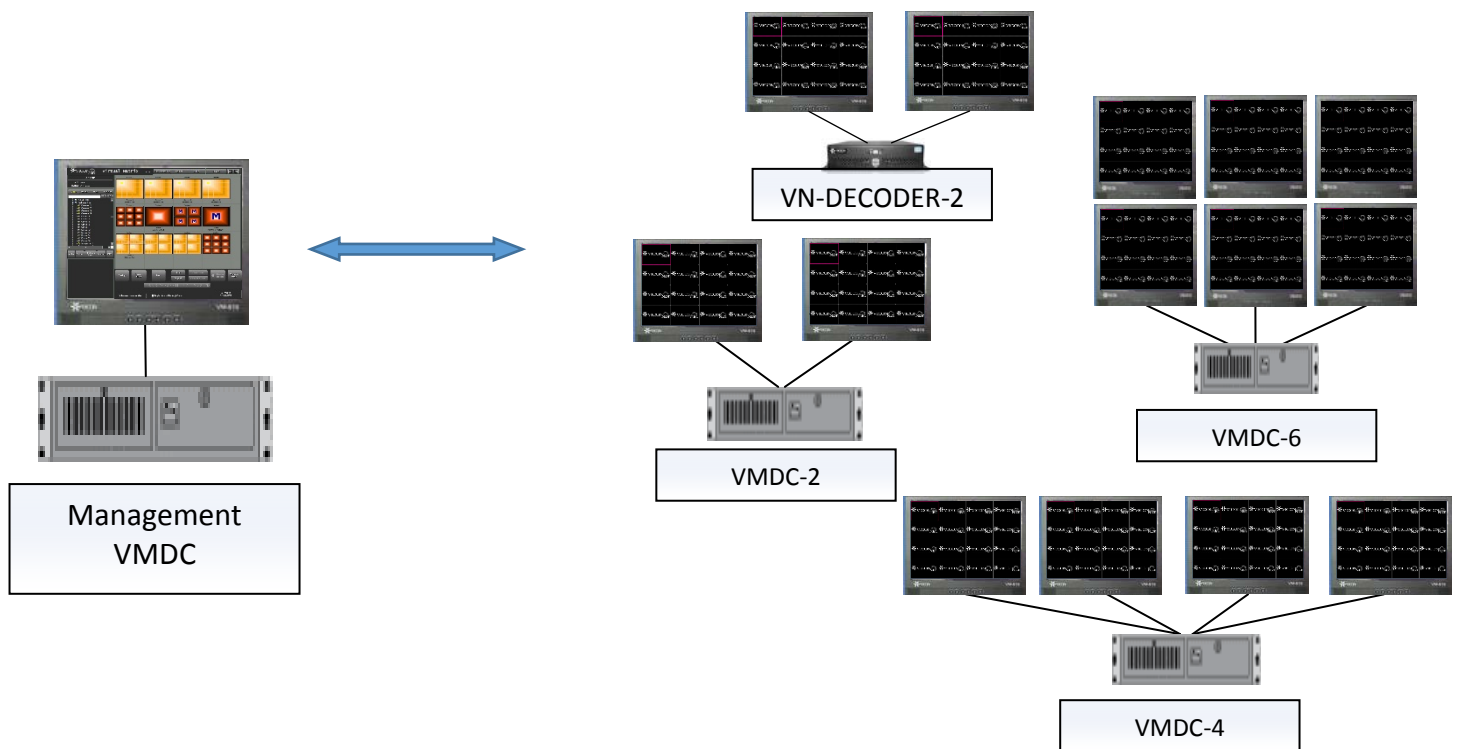
### Basic system using a single VMDC

This system layout assumes a single VMDC PC is used (2, 4 or 6 monitor configuration) and ONE of the monitors is used for the user interface in VMDC mode (preferably displaying the monitor icons, not displaying video).



### System with a dedicated management VMDC

This is a more advanced system layout that has a dedicated VMDC PC (typically VMDC-2) for the user interface in VMDC mode (displaying the monitor icons, not displaying video) and one or more additional VMDC/VN-DECODER-2 PCs that are in decode only mode and are fully controlled by the management device.



In each test, a different source type was used in order to measure the maximum FPS that can be displayed before the system reached its resource limit. The maximal camera count for a management VMDC was also measured in order to set clear criteria for these.

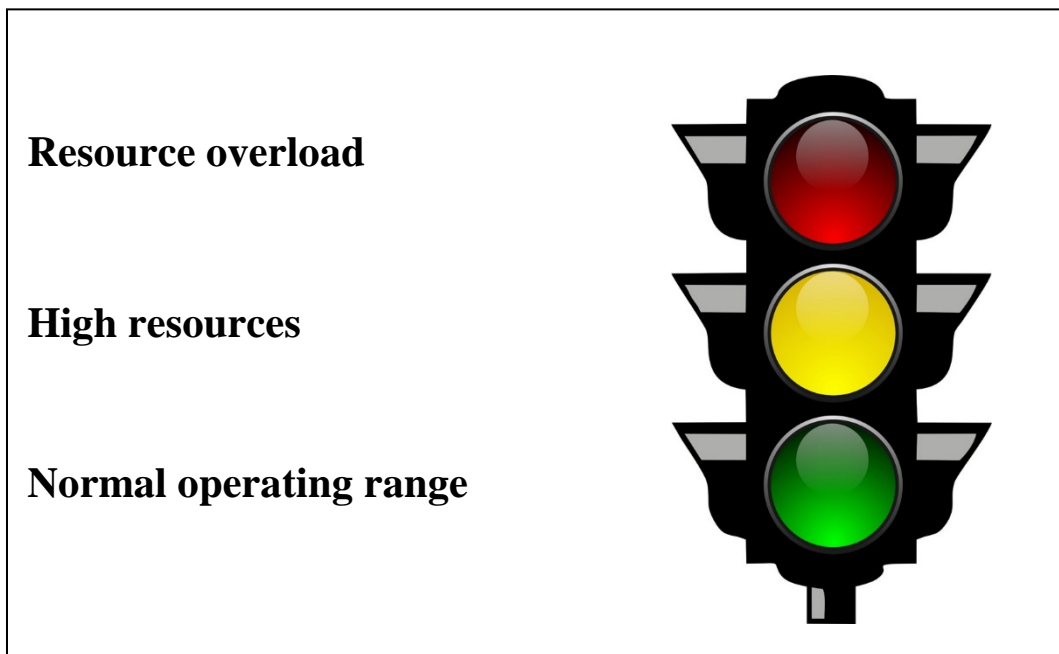
**Note!** In any case, any single VMDC is limited to a maximum of 64 cameras on a monitor and 150 cameras total.

## System Resources and Performance Monitoring

The VMDC and VN-DECODER-2 are built using the optimal hardware and software for their task. The different PC components such as the CPU, memory, display card and motherboard speed are working together to display as many frames per second as possible. When these combined resources reach a certain level, they cannot process any more data and might even reach a critical point at which the whole VMDC will stop working.

To prevent the systems from crashing as a result of a resource overload, VMDC products have built-in limitations, as well as a dynamic performance monitoring mechanism, that protects it and notifies the user that the system is being pushed over its capabilities.

This mechanism can be looked at as a virtual traffic light (**There is no actual traffic light indication on the application; the picture below is for clarification only!**)



### Normal Operating Level – “Green Light”

As long as the VMDC has the combined resources to keep displaying video, it is working in the virtual green light zone. The recommended camera numbers provided in this document are meant to keep it in that zone, and additional cameras may be added until the next level is reached.

### High Resources Level – “Yellow Light”

The VMDC’s built-in monitoring system senses that the combined resources utilization is getting to a level that might cause display issues. The system will automatically switch the display to show only the reference frames (also known as I or Intra frames) or a one frame per second, in order to reduce the load. This will result in a slow and jerky display, due to the low FPS, but will not harm recording. Once resources are made available, the display will return to the normal operating level.

### Resource Overload Level – “Red Light”

The VMDC’s built-in monitoring system senses that the combined resources utilization is reaching a critical level that might lead it to freeze or crash. The system will stop displaying video completely to protect it from freezes and crashes. This will obviously result in no video display until resources are made available and the system will return to the normal operating level.

### *Important Notes:*

- The monitoring mechanism is dynamic and depends on several factors, some dynamic themselves (for example, some cameras will have more motion during the day than at night). Designing the system according to the rules listed in this document will help avoiding this mechanism from kicking in and will keep the system functioning in the normal operating level.
- As explained, there is no actual traffic light indicator (this is a virtual concept) on the user interface; it is an internal monitoring mechanism.
- System messages through Central Failure Notification will advise the operator when the high resources (“yellow”) or resource overload (“red”) zones are entered.

### Guidelines for Maximum Performance

As explained above, the VMDC’s performance varies significantly between different sources and the different parameters each offers. There are a few ways that can help to maximize the performance when using specific features offered by some cameras:

#### Take advantage of camera dual-streaming

In cameras that offers multiple video stream configurations (most new open standard cameras offer dual streaming), the camera setting will typically have a stream for the highest resolution (for example 2MP) and a second one with a lower resolution (like D1). This means that display of multiple cameras (4, 9, 16, etc.) can use the second, lower resolution stream and save on display resources instead of pulling the first HD stream,

which will require much more. Additionally, in a screen layout that is showing multiple cameras, the picture size in pixels is fairly small, so there is no value in using an HD image.

When setting up the camera, ensure a second stream (640x480 or even 320 x 240) is defined, so when VMDC displays this camera in a split screen, it will automatically attempt to use the lower resolution stream and save resources. If a camera is called into up in single mode, VMDC will use the first, high resolution stream to maximize the quality. This way the system will be able to support many more cameras.

The display behavior described above does not affect the recording resolution (as the camera can still send the first high resolution stream for recording).

### Consider actual resolution in your [calculations](#)

In cameras that do offer the lower resolution option as described above, you should consider this in the screen layout accordingly. When using cameras that offer dual-streaming, or those that provide lower resolution on request (such as Axis,) understand the behavior and consider which layout is going to be used so the calculation can be made accordingly.

For example, a 2MP camera in single view will provide the whole 2MP picture, but if put in a quad or higher split screen, it will provide the lower resolution picture, such as D1. This means that when calculating how many cameras the system can display, you might be able to use the D1 camera count rather than the 2MP if you know it is always going to be displayed in a split screen.

### Control your FPS

As mentioned earlier, frame rate is a critical factor in the display process; the lower the FPS is for the cameras, the more of them the VMDC will be able to display. This is true in any camera that allows controlling FPS, and provides an option to lower the FPS and, by that, increase the number of cameras that can be displayed.

### *Remember!*

Older generation ViconNet IP devices, such as SVFT, KTX-4, VN-301T and V910, automatically throttle down FPS when VMDC is sensing a high processing load while the newer H.264 encoders and Surveyor HD work like any open standard device.

### Adding Hardware

Remember that the limitation is mainly based on the performance of the VMDC that handles display; you can always add a VMDC if you notice limitations in displaying what is needed and move some of the display to it. This of course will add monitors but will ensure that the system as a whole can process and display the required number and quality of cameras.

## Performance Specification

All the performance guidelines below are based on the current hardware specifications for VMDC and Decoder-2 hardware and on 64bit Windows 7 operation system. If older hardware or operating system is being used, refer to the former version design guide.

### The Management VMDC (Controller)

In every system there is at least one management VMDC that is running the VMDC user interface (with the monitor icons) and manages the video traffic from the cameras to the monitors that are doing the display itself. This management VMDC is limited by two factors:

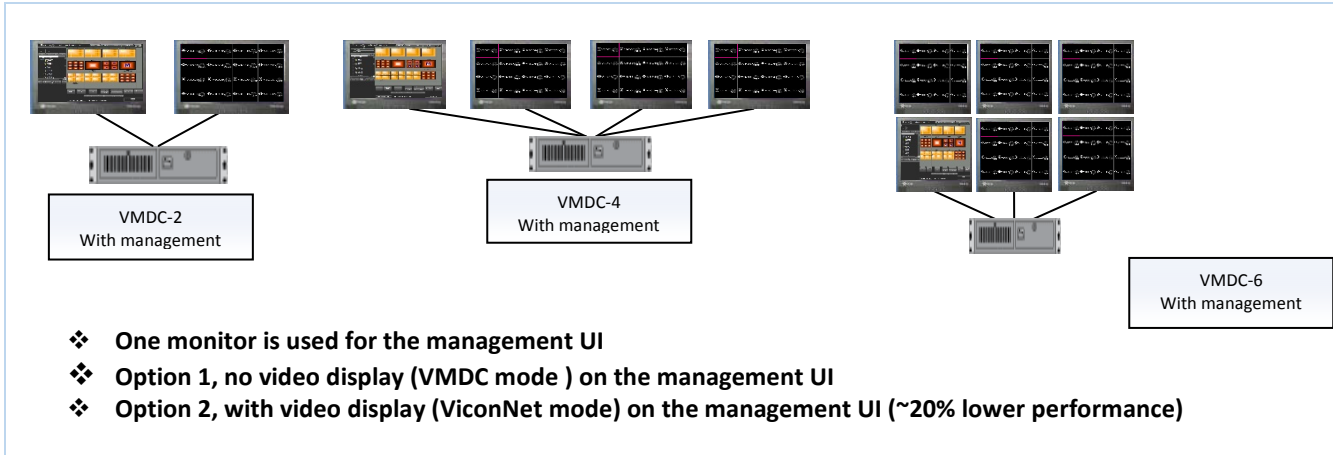
- Number of channels that can be processed: This is the total number of cameras that any management VMDC can connect to and handle. This is not the total number of cameras on the system, only those that at any time are handled by the specific management VMDC.
- Bandwidth to and from the management VMDC: The management VMDC has a 1Gbps network card and is expected to connect to a compatible port.

In order to ensure the system's performance these guidelines need to be observed:

- **Do not exceed 500 cameras** to be connected by any given management VMDC. To explain what connected means:
  - A camera on the site list that is displayed on any monitor managed by the VMDC by the user, PLC, keypad or macro.
  - Cameras on the list that are never used by the VMDC do not need to be part of this count as they do not require resources.
- If the performance guide is followed, it is very unlikely the recommended 700Mbps (70% of the maximum 1Gbps) bandwidth will be exceeded.
- If more than 500 cameras need to be switched and managed on the VMDC systems, or if the bandwidth is expected to exceed the one recommended, add another management VMDC and split the tasks between them.

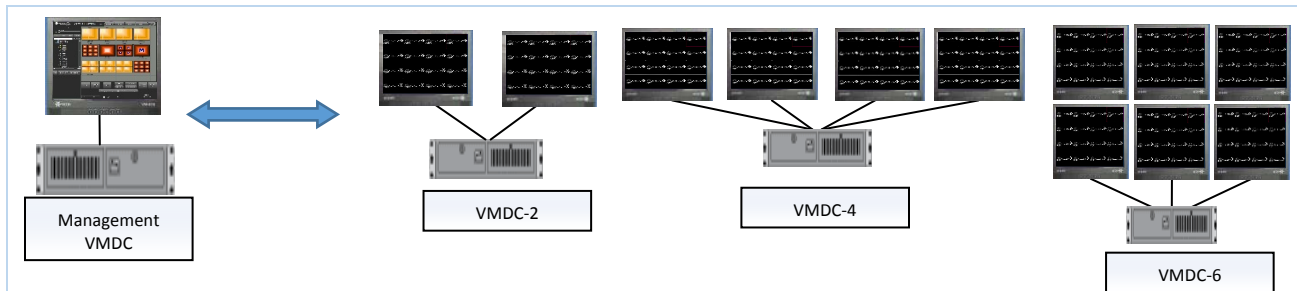
Maximum number of ACTIVELY managed cameras by a single management VMDC	Maximum bandwidth allowed through a single management VMDC
500 cameras	700Mbps

### Basic system using a single VMDC



Resolution	Maximum Cameras Across All Video Monitors					
	30 FPS		15 FPS		7 FPS	
	No video on management	With video on management	No video on management	With video on management	No video on management	With video on management
<b>1 CIF</b>	60	46	114	90	150	150
<b>4 CIF</b>	41	32	68	54	150	90
<b>800x600 (0.5MP)</b>	25	18	39	30	80	52
<b>1280x720 (1MP)</b>	18	14	30	24	58	46
<b>1280x1024 (1.3MP)</b>	17	13	28	22	56	44
<b>1920x1080 (2MP)</b>	12	9	22	17	42	33
<b>1600x1200 (2MP)</b>	12	9	22	17	42	33
<b>2048x1536 (3MP)</b>	8	6	14	11	28	22
<b>2600x1950 (5MP)</b>	4	3	7	5	14	11

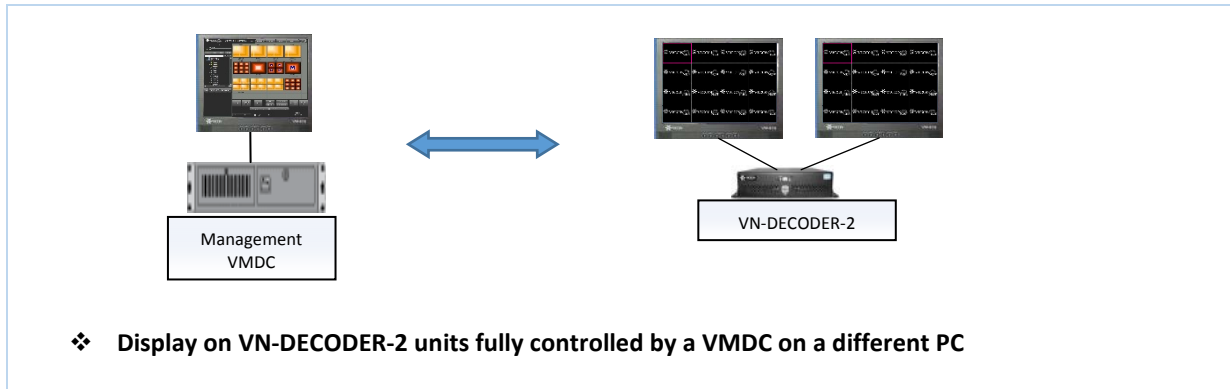
## Systems with a dedicated management VMDC controlling display (RX only) VMDCs



❖ Display units fully controlled by a VMDC on a different PC (receive monitor only)

Resolution	Maximum Cameras Across All Video Monitors		
	30 FPS	15 FPS	7 FPS
<b>1 CIF</b>	60	114	150
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<b>1920x1080 (2MP)</b>	12	22	42
<b>1600x1200 (2MP)</b>	12	22	42
<b>2048x1536 (3MP)</b>	8	14	28
<b>2600x1950 (5MP)</b>	4	7	14

## Systems with a dedicated management VMDC controlling VN-DECODER-2



Resolution	Maximum Cameras Across All Video Monitors		
	30 FPS	15 FPS	7 FPS
<b>1 CIF</b>			
	66	100	150
<b>4 CIF</b>			
	25	35	80
<b>800x600 (0.5MP)</b>			
	11	16	40
<b>1280x720 (1MP)</b>			
	7	15	32
<b>1280x1024 (1.3MP)</b>			
	7	15	32
<b>1920x1080 (2MP)</b>			
	6	11	24
<b>1600x1200 (2MP)</b>			
	6	11	24
<b>2048x1536 (3MP)</b>			
	4	7	15
<b>2600x1950 (5MP)</b>			
	2	4	7

## Summary

With the release of the VMDC version 7.0, with its improved display performance algorithm, this document describes the factors that need to be considered, as well as the design criteria that should be focused, for determining the quantity and configuration of VMDC and VN-DECODER-2 systems to support a required cameras layout. When trying to determine how many cameras can be displayed on a certain monitor and how many VMDCs will be required to achieve such a display, a few parameters need to be considered:

- **Frame Rate**  
The expected frame rate displayed for each camera depends on the video source frame rate as well as the size of the frames, based on compression as explained below.
- **Resolution**  
The higher the picture resolution, the harder the display task becomes.
- **Compression**  
The image compression is extremely important. JPEG, MPEG-4 and H.264 are all valid compression formats, but the display of each type requires different resource levels.

A combination of all these factors will result in the number of cameras that can be displayed across an array of monitors and VMDCs. Adding additional cameras will cause a reduction in FPS and, at a certain point, will bring the VMDC to its maximum resources. The numbers that are shown in this document are test results and not a theoretical calculation.

Following the guidelines in this document will help to ensure the system will always run in its optimal state and not switch into a high or critical resource state, which will slow down the video.