



HARDWARE AND PERFORMANCE GUIDE NUCODA AND PHOENIX

2018.2

This includes some hardware recommendations as well as software settings to enhance and improve performance.

Please send any feedback to patrick.morgan@digitalvision.se

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Hardware requirements

Workstation recommendations - Nucoda and Phoenix - July 2018

- Recommended for UHD and High frame rate up to 60p (storage dependent)

HP Z8
Dell T7920
Supermicro

- Recommended for HD including 1080 60p (storage dependent)

HP Z820
Dell T7610

Operating System:

Windows 10 is now the recommended OS for Nucoda and Phoenix
From 2017.1 testing is no longer done on Windows 7

Processors:

Intel Xeon multi-core, dual configuration -

- If the bulk of the work is colour grading it's better to accept less cores with higher speed
- If the bulk of the work is DVO based or Phoenix you should aim for as many cores at as high speed as you can afford where the number of cores have the highest weight of the two.

RAM:

Minimum 32GB, recommended 64GB. RAM speed should be matched for chosen processor and motherboard.

Population of memory if you have dual processors :

E5 V2 or V3 has 4 memory lanes per processor so if you want 32GB RAM it should be 8pcs of 4Gb to maximize performance aka one RAM module per lane.

Memory modules should be evenly distributed so that each memory channel has the same amount of RAM - please follow manufacturer guide

GPU

Quadro M Series M 5000 for HD/2K/UHD M6000 - 12gb - UHD and high frame rate

Quadro M5000 - HD / 2K / UHD

Quadro M4000 - Can be used for Phoenix workstations HD /2K

Quadro P5000 / P6000 - 24gb - UHD and high frame rate

GTX 1080 - Not tested but in use with many customers

Please ensure that the PCI Slot that contains the GPU is set to work as a Gen 3 slot - to check this open the NVidia Control Panel and select System Information from the Help menu. Check the details under the BIOS heading

PCI slots** Min: 2x PCI-E x16, 2x PCI-E x8

GUI Monitors

Min 1920 x 1080 (dual GUI Recommended)
Large resolution monitor recommended for Phoenix
EIZO Monitors are highly recommended

System Drives

SSD for Operating System disk recommended
SSD for Project, Audio, Notes and Thumbnail - Dual mirrored drives

PCI slots are dependant on motheboard configuration

GPU must always run from a PCIe x16 - normally double wide (Gen-3 minimum)
Kona 4 Video I/O requires PCI-E x8
Red Rocket PCIe x8
Storage Card PCIe x8

General Notes:

- For DVO or Phoenix - dual 12 core machines or higher are recommended, all the DVO restoration tools are highly optimised and only process on the CPU, so high core count machines are crucial for highest possible performance.
- Kona 4 in x16 slot and storage cards in x8 slots at least. V-Sync disabled on the NVidia
- Please ensure that GPU's are in Gen 3 slots and the card is in Gen 3 mode.
- Multiple GPU's are currently not utilised by Nucoda - this may change in future.
- Windows 10 supported from 2017.1 - recommended
- Custom workstation are in use at facilities - use good quality components if you want to take this route. We are unable to support these solutions beyond basic recommendations.
- In the BIOS turn off NUMA & Hyper Threading - Ensure that PCI slots are not being forced to Gen 2
- If you are installing anti-virus, please ensure that the media and project drives are NOT scanned as this will affect performance.
- Gaming Nvidia GPUs should work but internally we only test with Quadro
- It is recommended that the system ram should be twice the amount of GPU Frame buffer RAM
- AMD GPU's should work from 2017.1 but were not past of the test cycle

Video Hardware support

AJA Kona 4

Driver 14.01 Included with installer

- Support for the Kona 14.01 driver from AJA
- The SDI format support list has been cleaned up and is much easier to read, a Links column has been added.
- Preference for setting Horizontal and Vertical timing for the Kona - this is in Monitoring I/O, click on the Next button in the bottom right of the menu to access page 2.
- Data Format menu is replaced by 3G SDI Format, the preferred choice is to use Level B, but there is a selection to force the setup to use Level A.
- 4K modes have been removed
- Nucoda will determine the correct video setup based on the amount of links and SDI Colour format. If the selection is not possible Nucoda will fall back to the best available setup.

Support for 2Si:

- 4 x SDI in 10-bit RGB in UHD/4K - Kona SDI Out 1 to 4
- 2 x SDI in 10-Bit YUV422 in 4K/UHD - Kona SDI Out 3 and 4
- **12 Bit RGB not supported - will fall back to RGB 10-bit (For Dolby Vision use Quadrant Mapping)**
- HDMI output will always map to the main output
- New Mapping menu to select between Quadrant and 2Si

Changes:

- 4K/UHD HDMI is always downconverted to HD in Quadrant mode (Firmware restriction)
- HDMI in 2Si mode will always map to the main output format (Firmware restriction)

BMD Decklink - new for 2018.2

Nucoda and Phoenix now have support for the Blackmagic Design range of Decklink video cards. Decklink support is limited to monitoring only and does not allow for the ingest or playout of video using the device.

Nucoda was tested with the Decklink 12g Extreme 4K card with HDMI and also using the optional 4 Link SDI Adapter, the HD Mini Monitor was also tested.

All Decklink cards should be supported but have not been tested, only features that are available on the installed card will be exposed in the setup menu.

Please download Desktop Video 10.10 driver from www.blackmagicdesign.com

Known Issues for Decklink

Can not be used for Dolby Vision with VANC

LTC timecode will only display on the image during playback.

Flashing HDMI output in UHD 50p and 60p

Storage requirements

Required Bandwidth for playback:

(V Res x Hor R x 4 x FPS / 1000000 = Data Rate) Test files are RGB 10 bit DPX

Storage is a complex question and there are many variables. SAN or NAS? Spinning Disk or SSD? Many clients opt for high speed local SSD cache storage for fast playback of UHD and 4K material in addition to fast storage for media storage.

For UHD EXR (Half) files more bandwidth is required.

This requirement for the storage bandwidth is the actual data rate, in reality the rate required from the storage should be at least 50% more than this, possibly more.

For the required rates, looking into local SSD caches is worthwhile, striped SSD sets can provide sustained data rates with little problem, although rates for writing could be lower on these drives.

Drive speed and performance will deteriorate as they fill up and fragment.

In order to play back reliably at any data rate, the requirement for the drive is more than just to be able to sustain the required frame rate. In order to provide stable playback the frame buffers of the video card needs to be filled and maintained at a minimum level, for UHD and 4K, the buffer available is around 24 frames, this means the storage should be capable of at least 25 to 30 frames per second faster than the required playback rate.

After running the test, make sure to check the highest and lowest performance values during reading and writing, note that you may have sudden drops in performance, this is not uncommon, having a deep buffer will help mitigate any dropped frames due to these performance drops.

HD (1920 x 1080) - Min requirement - (* 1.5 for OpenEXR)

HD 1080 25p - 210 MB/s (Megabytes per Second)

HD 1080 60p - 500 MB/s

2K (2096 x 1556) - Min requirement - (* 1.5 for OpenEXR)

2K Full 24p - 313 MB/s

4K (4096 x 3112) - Min requirement - (* 1.5 for OpenEXR)

4K Full 24p - 1223 MB/s

UHD (3680 x 2160) - Min requirement (* 1.5 for OpenEXR)

UHD 24p - 800 MB/s

UHD 25p - 833 MB/s

UHD 50p - 1667 MB/s

UHD 60p - 1990 MB/s

UHD DCIM (4096x2160) - Min requirement - (* 1.5 for OpenEXR)

24p - 850 MB/s

50p - 1769 MB/s

60p - 2123 MB/s

Video playback

High Frame Rate and video playback reliability

Support for high frame rates have been added to the **Kona 4** this includes:

1080p 30
 1080p 59.94
 UHD 3840 x 2160 50p
 UHD 3840 x 2160 60p

 DCI 4096 x 2160 50p
 DCI 4096 x 2160 60p

Playback reliability for all formats and frame rates have also been improved, allowing much higher throughput in GPU readback mode and better overall playback reliability



Please note, when monitoring in UHD DCIM or 12 bit , you will only have half the video frames available in the Kona 4 buffer.

As part of the improvements an option has been added to the preference in Monitoring I/O for copy threads and VSync. The default for upload threads is 8.

VSync should be set to Off, unless you are using Mon, in which case the setting should be set to VSync on Mon, this is to prevent image tearing when playing back on the DVI or Displayport Monitor. This option will only control the V-Sync if the V-Sync NVIDIA driver is set to "controlled by application" - this is under the performance setting of the driver.

Please note, the high frame rate options are only available for the Kona 4, the video playback performance should improve under the DVS Atomix / Centauris cards, but were not tested. Performance does rely on the larger playback buffer available in the Kona 4.

Mon, Vid, and GFX over SDI modes

For performance reasons the video buffer for the KONA 4 has been increased, due to this you will notice that the video in GUI will run more than a second ahead of the SDI output. This could be distracting. We recommend that you not work with both MON and VID turned on, while not playing back the video will update in the monitor as usual (scrubbing, stepping) - also, if any tracking is done, mon mode will automatically turn on while tracking and then switch off.

High frames rates are not supported on the DV Atomix HDMI / Atomix LT or Centauris

DVS Atomix LT, Atomix HDMI and Centauris cards are no longer tested or developed for.
 Specifications are not a guarantee for performance and stability for hardware not qualified by Digital Vision.

SDI Monitoring Improvements

Changes to video settings and SDI output settings (2018.2)

Updated labels for the SDI output setting to make them easier to understand

- Video SMPTE - working in SMPTE range - ideal for working with scaled Avid Media
- Full Range - working with the full available range 0 -1023
- Cineon Log - Film log working space
- *Video Log - Video log working space (not in general use)*
- ACES - ACES 2065-1 ACEScc ACEScct

Project SDI Output settings



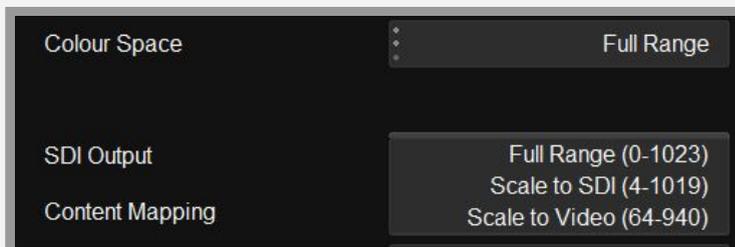
Video (64 to 940)

SMPTE Levels

Video Legal (64 to 940)

SDI Output is clipped to SMPTE legal levels

To export material with SMPTE Legal levels ensure SMPTE legal is set in file export



Full Range (0 -1023)

Default for Full Range

Scale to SDI (4-1019)

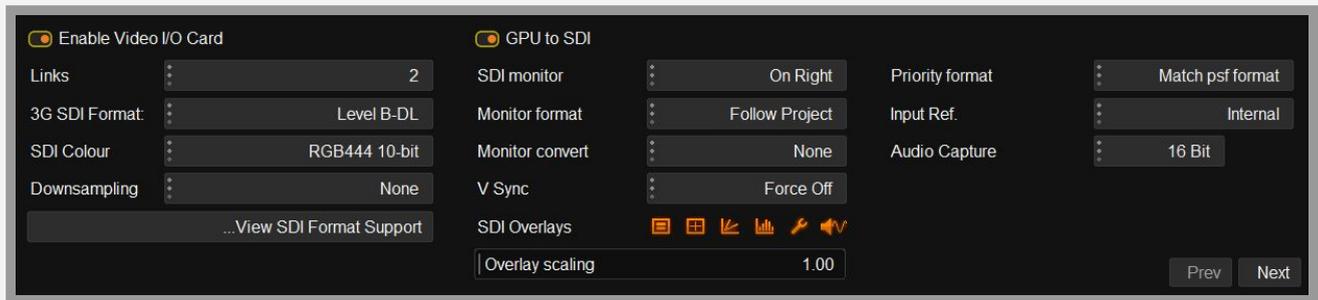
This setting scales SDI values (0 to 1023) into range and is required when working in RGB444 12-Bit - Required for working in Dolby Vision

Scale to Video (64-940) Scale the SDI output to SMPTE range

Useful for working in Full Range and monitoring on a display that cannot display full range images. To export material with SMPTE levels from a Full Range project make sure to set the Full --> SMPTE scaling option in file export dialog

Some file formats like DNx will automatically scale the image, ensure you don't double scale the images.

SDI Output configuration



The configuration of the output format is based on:

- SDI Colour encoding (YUV or RGB)
- Number of available SDI Links
- 3G SDI Format - Level B DL is preferred but can be set to Level A if required

The most important setting for the user is the SDI Colour encoding, during configuration this will only be changed if it is not supported by the requested video standard. The number of links will only be taken into account if there are multiple valid configurations possible with a different number of links.

Example:

If one or four links are specified:

1080 25p RGB 444 will be set up as 1 x SDI link using 3G.

If two links are specified:

1080 25p RGB 444 it will be set up as 2 x SDI links at 1.5G

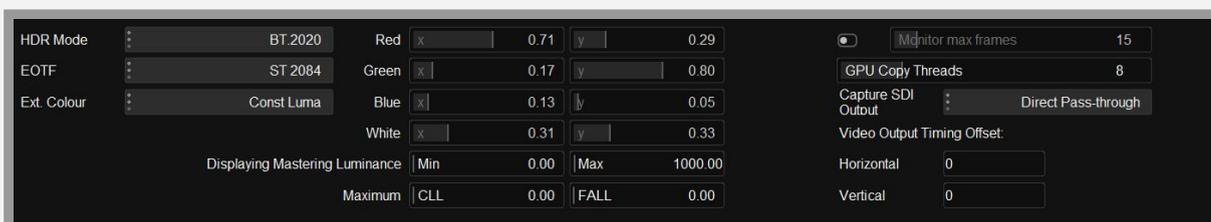
The SDI configuration is displayed above the timeline, and is colour coded, white indicates that the configuration is exactly as requested, yellow means that a change was made due to an invalid setup option. Red will indicate invalid options.

The monitoring format

The monitor format option can be used to always monitor in a particular format, and the monitor convert option will specify how the content is scaled to fit the output.



This way the user can set monitoring to always be 1080p and the conversion is set to fit. Regardless of the output format



size, it will always be scaled to 1080p. Using the next and previous button on the bottom right of the Monitoring I/O tab will switch to a second menu containing additional settings for the installed card. Settings will only be shown if supported by the installed card.

Improvements to SDI monitoring

Accessible via preferences/Monitoring I/O

The concept of a default video format in the Project Manager has been removed. On exiting a project, the video I/O card format and frame rate is not changed, so the splash screen is displayed in the same frame rate and format as the last project edited. On entering a project, the video I/O card frame rate and format changes only if the project requires a frame rate and format different to that currently set.

On exiting the application, the video I/O card's current video frame rate, format and stereo enable state are saved to preferences named :

```
IOCard.lastOutputFormat  
IOCard.lastOutputFormatStereo
```

The settings in these preferences are restored to the video I/O card when the application next starts, on the assumption that the user is likely to want to work on the same settings as before.

The very first time the application is started after a version with this change is installed, the video I/O format defaults to PAL, as with previous versions of Nucoda.

It is still possible to set a fixed resolution for video monitoring in the video I/O and monitoring preferences.

The "Default format" drop-down list and "Always monitor default format" check-box are now combined into a single "Monitor format" drop-down list, which contains the same options as the previous "Default format" list plus a new option of "Follow Project".

When a video resolution option is chosen, the video I/O card will always be set to formats of that resolution, though frame rate and stereo will follow the project's requirements, as before.

When "Follow Project" is selected, the video I/O card's resolution will also follow the project's requirements, which is equivalent to "Always monitor default format" being turned off. The state of this option is stored in preference IOCard.outputFormat.

The old preferences :

```
IOCard.defaultOutputFormat  
IOCard.forceDefaultOutputFormat
```

are replaced with the equivalent setting of IOCard.outputFormat when a version of the application with this change is first run.

Performance settings and features in Nucoda and Phoenix

Preferences and General.prefs

- Enable the "*fillOnAllocate*" preference in general.prefs - it increases initialisation time but improves UHD playback when the application is first run - set to true
- Also enable Interactive Mode in the preferences.

Interactive mode

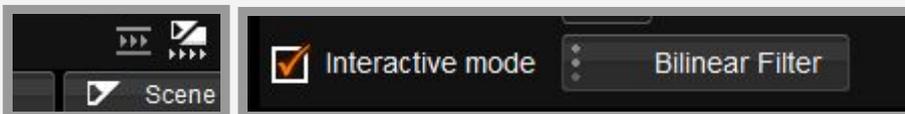
Real time proxy on the fly

Interactive mode provides a way for users to get better previews and real time playback when using heavy effects, like Sapphire or any other effects. It should improve interaction and the amount of layers you can preview in real time.



Once turned on it will create a proxy image on the fly. For UHD projects this means an HD image will be displayed during playback, but on stopping, the image will revert to full resolution image. Cloned material and caches will be used if available.

Interactive mode can be turned on in the Preferences menu and filtering can also be selected.



The default scaling amount is 0.500000 - for lower quality change to .20000
stillFrame is set to false, changing this to true, will show the proxy image when playback is stopped

```
interactiveMode
{
  scale 0.500000
  active false
  filter "Bilinear Filter"
  stillFrame false
}
```

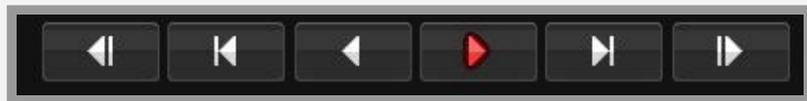
Interactive mode will be automatically ignored when,exporting media, playing to tape and using DVO Fix tools.

Turn off vsync

There is a setting in the Nucoda/Phoenix application to turn VSync on/off, for this to function the Nvidia setting should remain on "use 3D application setting"

Video playback drop frame indicator - removal of P D I indicators

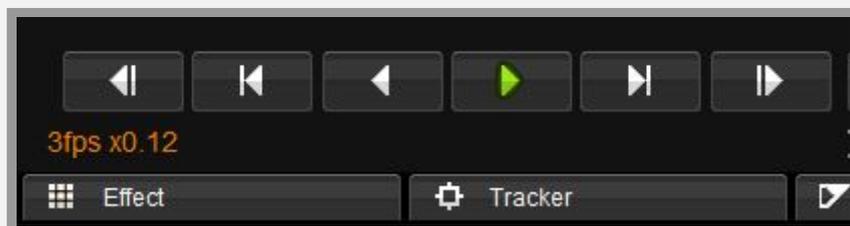
The P D and I indicators have been removed from the playback display and the frame rate indicator has been removed from the SDI monitor when in SDI Overlay Mode (GPU Readback)



Playback sync is now indicated by a green or red playback button, when in VID mode, green indicates that the SDI playback is real time and red indicates dropped frames - dropped frames will be shown below the play button.

When not playing out to SDI and the frame rate is less than real time, the playback rate will be indicated below the play button. The button will remain green.

This indicator is only available for Kona 4 and Decklink hardware.



Setting up and running the system speed test

Storage and System test for performance using AJA System Test

Please note: These test are only an indication of performance, SAN performance may not be accurate using these types of tools

The AJA test application is an excellent way to test the performance of your system drives and of the Kona card. The instructions in the document is a test description for testing UHD performance. If you have performance issues, please set up the test according to the type of media you will be using, run the tests and send the results to the address provided.

The AJA test application is included in the qualified drivers for Nucoda and Phoenix (14.0 - 2018.2)

System disk test

Resolution: 3840x2160 UltraHD
Test File Size: 16gb
Codec Type 10 Bit RGB
Target Disk: Your media drive
Settings: Change Disk Test to "file per frame"

AJA Device Test

Resolution: 3840x2160 UltraHD
Pixel format: 10 bit RGB
AJA Device (Auto detected)
Settings: Change Disk Test to "file per frame"

Disk and Device Test

Resolution: 3840x2160 UltraHD
Test File Size: 16gb
Codec Type 10 Bit RGB
Target Disk: Your media drive
Settings: Change Disk Test to "file per frame"
Pixel format: 10 bit RGB
AJA Device (Auto detected)
Settings: Change Disk Test to "file per frame"

Results from AJA Test

After running each test, generate and save a report, you can turn off the option to generate .nfo file.

Please add the following details:

Workstation
Amount of storage - type of storage connection - RAID Level
Current slot configuration

Please email the resulting PDF's to support@digitalvision.se, and provide your company name.

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