INNES

Gekkota_RT
Graphics cards benchmark
For multi-screen
Test report

Version 001F
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1 Introduction

1.1 Purpose of this document

The goal of this document is to expose the different tests done with Gekkota_RT to support multi-screen (typically for screen-wall).

1.2 Test configuration

Platform used for multi-screen:	**PC:** - Processor: Intel Core i7-4770S 3.10 GHz, - DDR: 16 GB - System: MS-Windows 10 64 bits - Model : VSN970 (Datapath)
Displays - Tested with 4 identical displays	**SAMSUNG:** - U24E590D - 4K@60Hz max through DP input
Graphics card models Note: - Only one graphics card used at a time (tested separately)	**NVIDIA Quadro K1200:** - CUDA Cores: 512 - GPU Memory 4 GB GDDR5 - Memory Interface 128-bit Memory Bandwidth 80 GB/s - System Interface PCI Express 2.0 x16 - Display Connectors: 4 mini-DisplayPort (mDP) - DisplayPort 1.2 - DXVA2 decoder capability : AVC, HEVC
	NVIDIA NVS 810: - CUDA Cores: 1024 (512 per GPU) - GPU Memory 4GB DDR3 (2GB per GPU) - Memory Interface 128-bit (64-bit per GPU) - Memory Bandwidth 28.8GB/s - System Interface PCI Express 3.0 x16 - Display Connectors: 8 mini-DisplayPort - Mini-DP to DP Adapters: 8 included - DXVA2 decoder capability : AVC, HEVC ⚠ Molex DC power connectors are not delivered in the NVIDIA NVS810 package. Think to order some connectors to NVIDIA
	NVIDIA Quadro M4000: - CUDA Cores: 1664 - GPU Memory 8 GB GDDR5 - Memory Interface: 256-bit Memory Bandwidth 192 GB/s - System Interface: PCI Express 3.0 x16 - Display Connectors: 4 DisplayPort 1.2 + Stereo - DisplayPort: 1.2 - DXVA2 decoder capability : AVC, HEVC ⚠ Molex DC power connectors are not delivered in the NVIDIA M4000 package. Think to order some connectors to NVIDIA

Screen Composer	V3.11.12
Gekkota_RT	V3.12.31 beta9

1.3 Synchronization card required if more than one NVIDIA graphics card is used

⚠ In case using of several graphics cards, an additional synchronization card is required to synchronize the cards each other's (and avoid video tearing). Please contact NVIDIA sales to know if required for your configuration and to know the synchronization card reference.

1.4 NVIDIA drivers & configuration tools installation

1. First install all your NVIDIA graphics cards
2. Then install the NVIDIA driver up to date (ex: NVIDIA K1200 build 362.72).

⚠ In case some of the cards are installed after drivers installation, some of them could not be detected properly. So install again the driver if required as soon as a new card is installed in the PC.

Note1: The NVDIA drivers and configuration tools have not been installed with the DVD content delivered with graphics card but with a more recent version (NVIDIA K1200 build version for Win10) downloaded from NVIDIA official Web site.

Note2: This installation may fails when one of Windows group strategy parameter has not been modified just before. This parameter has to be modified in the dialog « administration tools ». On the left, make appear the menu of scrolling strategy local computer > administration templates > system > peripherals installation restrictions. On the right, turn the parameter prevent peripheral installation with ... to inactivated.

3. Then install Gekkota_RT (3.12.31 or above)

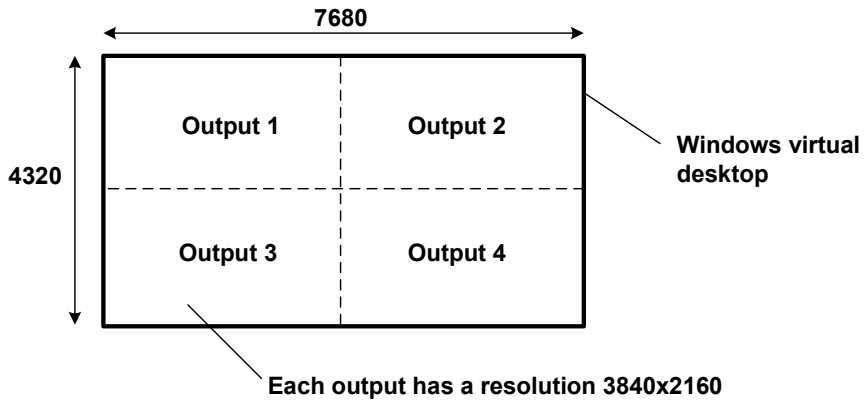
1.5 NVIDIA Configuration panel

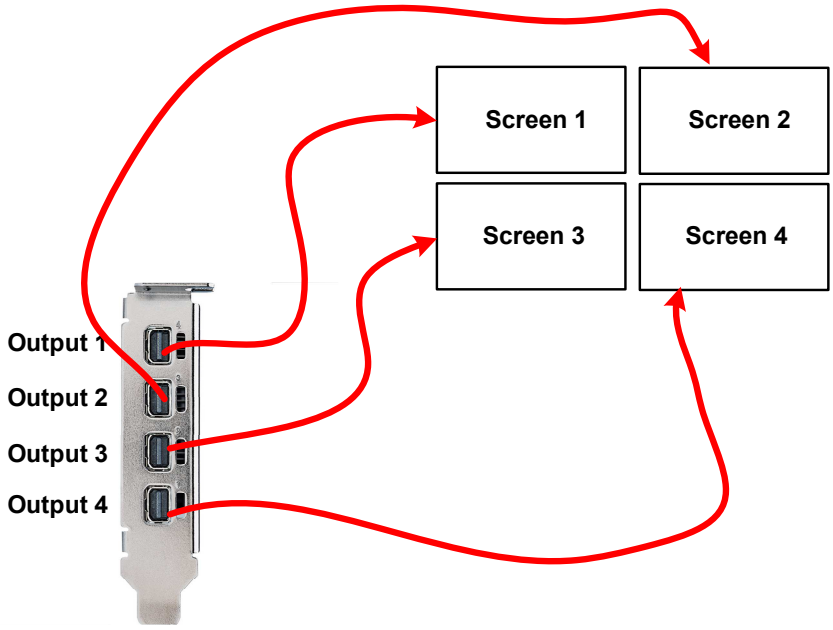
First Plug all your screen and switch on all the screens.

The screen wall is represented in NVIDA control panel as a Windows virtual desktop which is a projection of the zone on several screens. Each screen has a resolution which can be configured in NVIDA control panel
Ex:

- 1920x1080 (Full HD)
- 3840x2160 (4K)
- Many other proposed by NVIDIA
- Custom resolution

Example for screen wall of 7680x4320 with 4 screens 4K (only one graphics card used)





Then you can use NVIDIA configuration panel available in the Windows desktop menu.

- To modify the screen resolution, select on the left, Display > Change resolution*
- To modify screen layout, select Display > Configure several display, then move the screen icon to match your configuration.

⚠ It is advised to unplug the cable from default graphics cards of PC (if any) to avoid any unexpected behavior on the screen wall.
⚠ Program strictly all the screen with the same resolution else all the screen could return automatically to lower resolution (for example Full HD instead 4K)
⚠ Restart Windows session each time a new screen configuration is modified else the configuration could not be taken into account properly.

2 Benchmark / test report with NVIDIA cards

Card	Virtual desktop (Size)	1 video 4K on 4 displays	Status when several videos 4K are played simultaneously	Status when several videos full HD are played simultaneously	2 videos 4K + 2 MS-Powerpoint media
QUADRO K1200	4 screens 4K **(Size: 15360x8640)**	1 x 50 Mbps : ok 1 x 40 Mbps : ok 1 x 16 Mbps : ok	4 x 40 Mbps : ko 4 x 16 Mbps : ok 3 x 50 Mbps : ok 3 x 40 Mbps : ok 3 x 16 Mbps : ok 2 x 50 Mbps : ok 2 x 16 Mbps : ok 1 x 50 Mbps : ok	4 : ok 2 : ok	ok
QUADRO M4000	4 screens 4K **(Size: 15360x8640)**	1 x 50 Mbps : ok 1 x 40 Mbps : ok 1 x 16 Mbps : ok	4 x 40 Mbps : ko 4 x 16 Mbps : ko 3 x 50 Mbps : ko 3 x 40 Mbps : ko 3 x 16 Mbps : ok 2 x 50 Mbps : ok 2 x 16 Mbps : ok 1 x 50 Mbps : ok	4 : ok 2 : ok	ok
NVS 810	4 screens 4K **(Size: 15360x8640)** or 4 screens of 2560x1400 **(Size: 10240x5600)**	1 x 50 Mbps : ko 1 x 40 Mbps : ko 1 x 16 Mbps : ok	4 x 40 Mbps : ko 4 x 16 Mbps : ko 3 x 50 Mbps : ko 3 x 40 Mbps : ko 3 x 16 Mbps : ko 2 x 50 Mbps : ko 2 x 16 Mbps : ko 1 x 50 Mbps : ok	4 : ko 2 : ok	ko (for videos) ok (for powerpoints)

OK: video decoded and correctly rendered
KO: video not correctly rendered (frames skipped)

3 Conclusion

3.1 NVIDIA Winner

The NVIDIA Quadro K1200 graphics card has the best performances (2)
(2) *Quadro K1200 seems to have also the best compromise price/quality ratio (4th of may 2016).*
The maximal number of decoded 4K videos in parallel is 4 (with a video bitrate 16 Mbps)
The maximal number of decoded Full HD videos is 4 (maximal bit rate not communicated)

3.2 Minimal system configuration required to support screen wall

Processor type: Intel Core i7
DDR: 16 GB
System: MS-Windows 10

3.3 Unexpected jerky video when using several cards K1200

⚠ *In case several card are used, unexpected jerky effect could be noticed when playing the video medias.*
In order to support "4x4" screen wall, do use Screen wall supporting daisy chain (see appendix)

3.4 Unexpected tearing with Windows7

Above 2 displays, Windows 7 is inactivating aero theme implying unexpected tearing effect on videos. No workaround has been found with NVIDIA support.
So, do use Windows 10 for screen wall to avoid to face any unexpected video tearing.

3.5 Decoder DXVA2 (hardware acceleration)

DXVA2 decoder (hardware acceleration) of tested NVIDIA graphics cards do not support video resolutions whose height or width is upper than height_4K (2160) or width_4K (3840) (ex for a banner video of the resolution 7680x1080*).
**To solve the issue decrease your media video resolution to 4K or choose a another graphics cards supporting higher video resolution*

4 Appendix

4.1 Video used for the tests

File	Decoder	Profile	Size	Frame rate	Bit rate
LG - 4K - Arctique.mp4	AVC	High@L5.1	3840x2160	29.97	50.0 Mbps
[ULTRA HD] TRANSFORMERS 4 Trailer [HD 4K].mp4	AVC	High@L5.1	3840x2160	23.97	16.6 Mbps
NASA_Synthesis_Data_Visualization.mp4	AVC	High@L5.2	3840x2160	29.97	40.0 Mbps
TRANSFORMERS_top_left.mp4	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_top_right.mp4	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_bottom_left.mp4	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_bottom_right.mp4	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_hor_middle_3840x540.mp4 horizontal banner	AVC	High@L4.0	3840x540	23.97	10 Mbps
TRANSFORMERS_hor_middle_7680x1080.mp4 horizontal banner	AVC	High@L4.0	7680x1080	23.97	10 Mbps
TRANSFORMERS_hor_1.mp4 cut from « TRANSFORMERS_hor_middle_7680x1080.mp4 bande horizontale »	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_hor_2.mp4	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_hor_3.mp4	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_hor_4.mp4	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_vert_middle_1920x4320.mp4	AVC	High@L4.0	1920x4320	23.97	10 Mbps
TRANSFORMERS_vert_1.mp4	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_vert_2.mp4	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_vert_3.mp4	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_vert_4.mp4	AVC	High@L4.0	1920x1080	23.97	10 Mbps
TRANSFORMERS_vert_middle_960x2160.mp4	AVC	High@L4.0	1920x4320	23.97	10 Mbps
moyen_d_essais_2015_v8_1920_DEF.mp4	AVC	Main@L4.1	1920x1080	25	33.3 Mbps
1920-1080-24-p-high-4.0-7000-mp3-320-elephants_dream.mp4	AVC	High@L4.0	1920x1080	24	7 000 Kbps
GEG clip VF.mp4	AVC	High@L5.1	1920x1080	25	5 972 Kbps
FormatFactoryLAB2_AA.mp4	AVC	High@L4.0	1920x1080	25	9 392 Kbps
LAB2_AA.mp4	AVC	Main@L5.1	3240x1920	25	25.1 Mbps

4.2 PowerPoint used for the tests

File	MB
2006_NEW Domus 1 - version Cabirol 1sur2.ppt	20.3
2006_PRESENTATION SWEELIT 2006c.ppt	28
2009_BD2009-8colonnes.pps	17
2011_OffreJeudi_20112008_ppt2003.pps	1.2
Présentation-Innes-v3.ppsx	8.4
2014_Présentation Cathédrale Narthex.pptx	2.3
2009_Tarifs Novotel & Ibis.pptx	0.4

4.3 Daisy chain

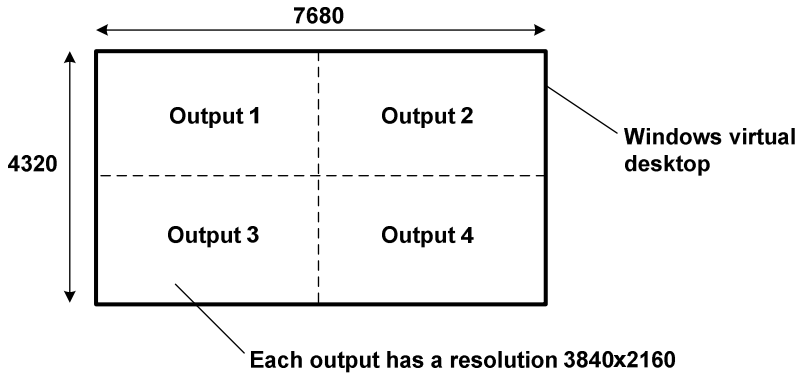
With some screen-wall configurations, it is possible to use only one card by using daisy chain feature of screens (supported on professional screens generally used for screen wall).

Note: this daisy chain feature can be called "video wall" or "loopout". Each screen has a Display Port IN and a Display Port OUT

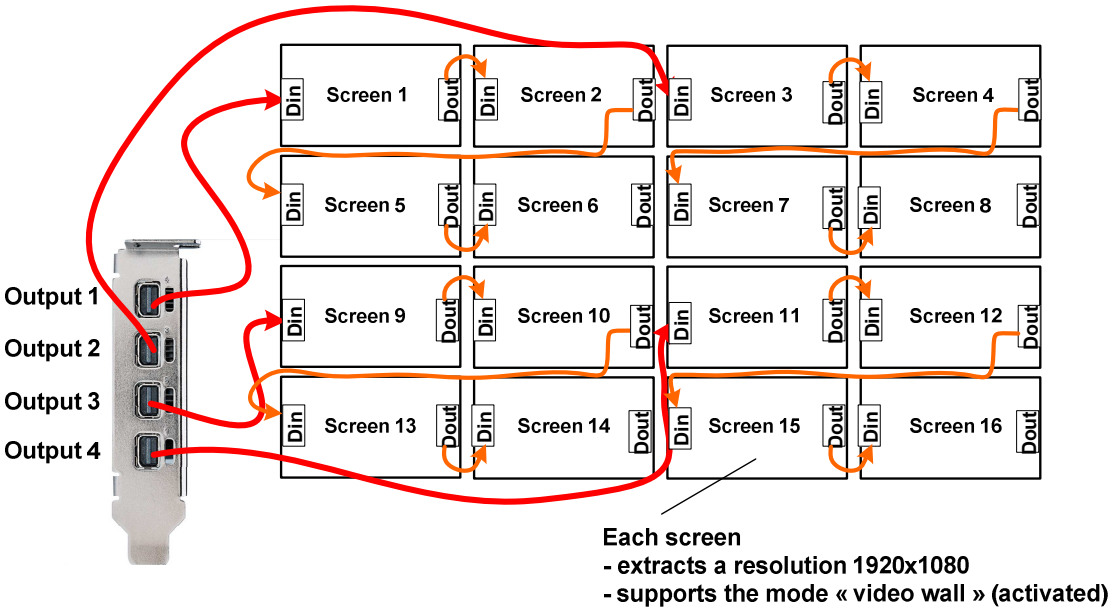
The screens have to support 4K on display port.

4.3.1 Daisy chain "16" screens (4x4 screens full HD)

Virtual desktop configuration :

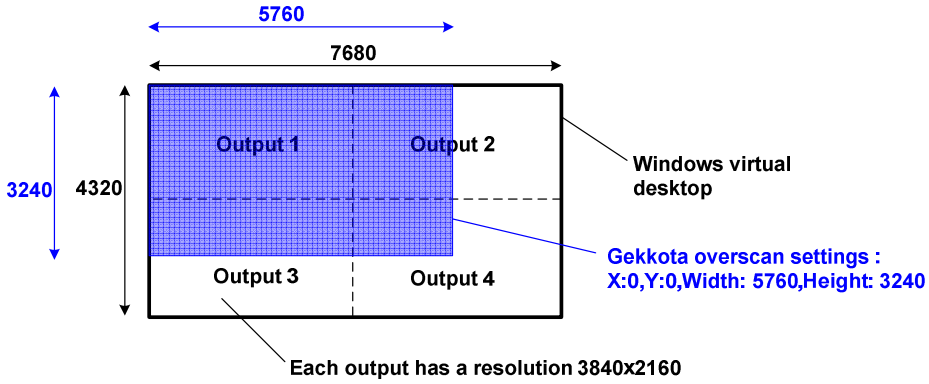


Physical configuration :



4.3.2 Daisy chain "9" screens (3x3 screens full HD)

Virtual desktop configuration :



Overscan

Overscan can be adjusted by injecting a configuration file (V1.10.19 or above) in your player, programming especially the required overscan settings.

Extract of configuration file

```
// --- Change the display area (overscan)
setOverscan(0, 0, 5760, 3240); // ---- This one for enabling and change the parameters
```

For more information about injection procedure, please refer to Gekkota configuration-by-script application note or contact support@innes.pro

Physical configuration :