The Protocol Wars: How to win and enhance User eXperience (UX)

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Agenda

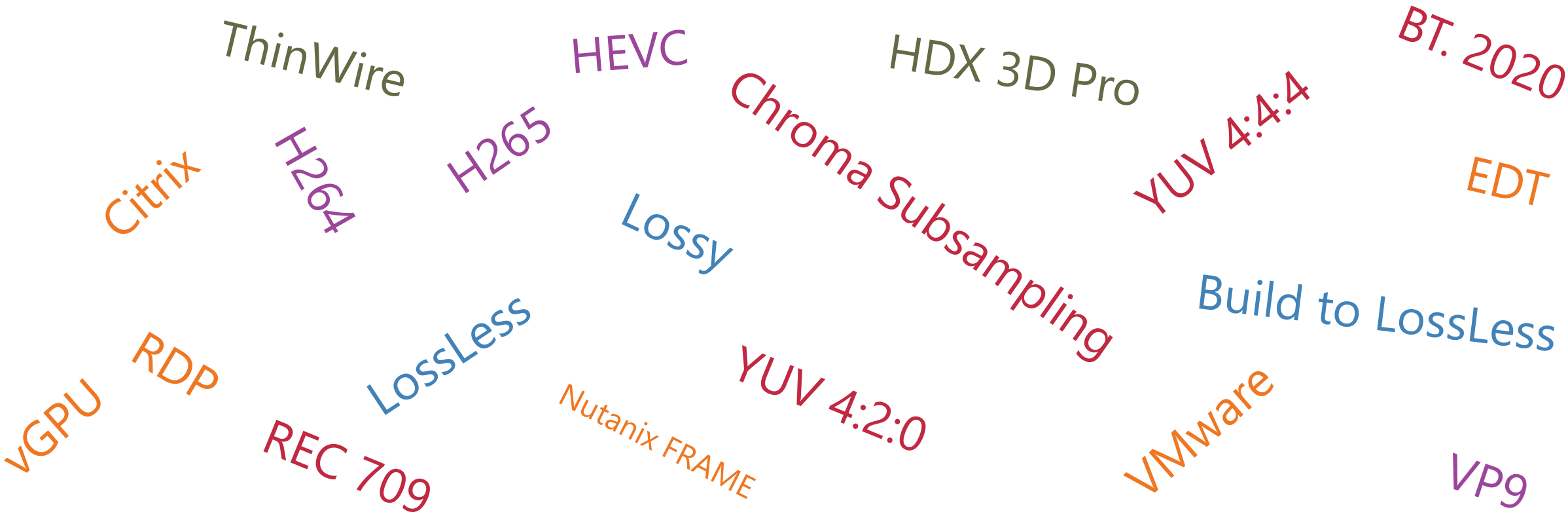
- Introduction
- GPU on Client / Server OS
- The Protocols
- Tools
- WAR!

Introduction

It’s all about

Introduction

- There are so many options to tune the User Experience



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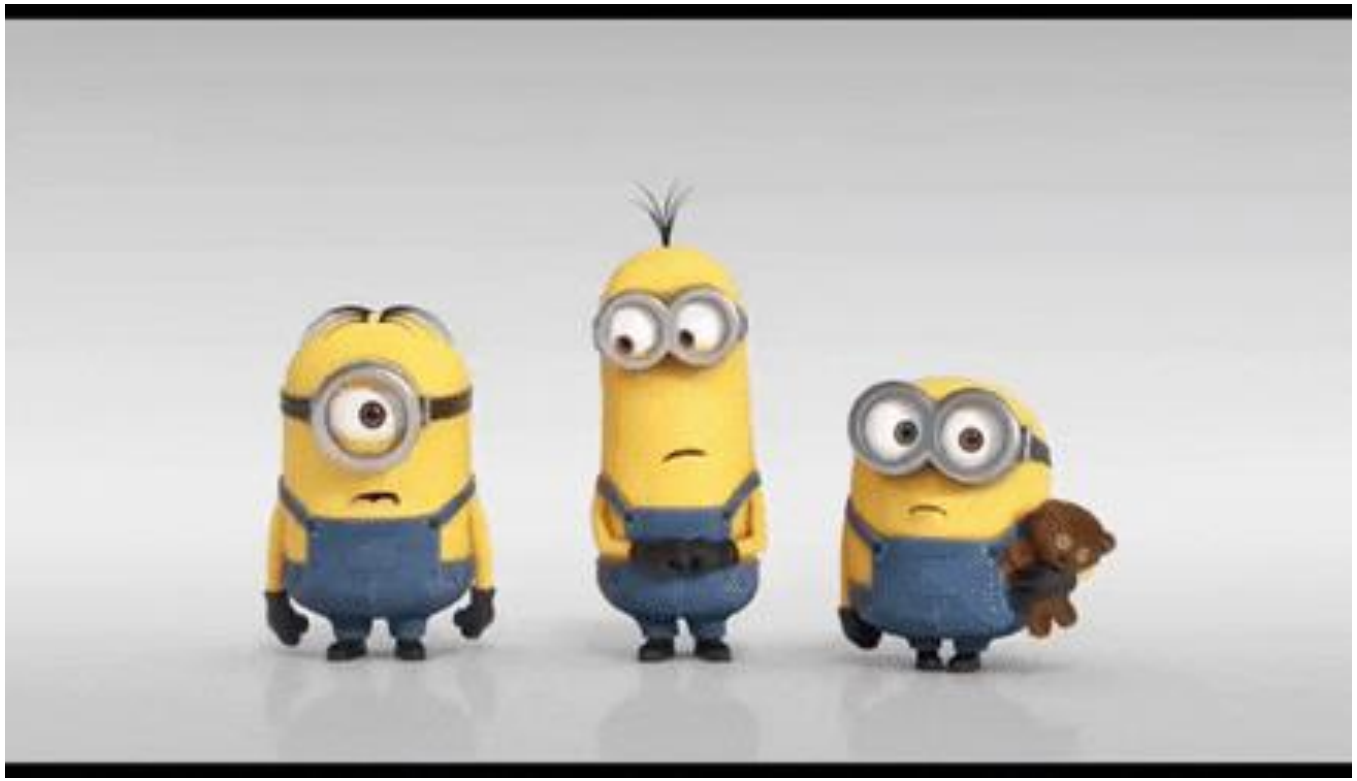
CHAOS



GPU Client / Server OS

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It’s all about the Frame Buffer

- Memory buffer that contains the complete frame to display
- Can be stored on the GPU (Video RAM) or RAM
- Can be directly accessed by the CPU

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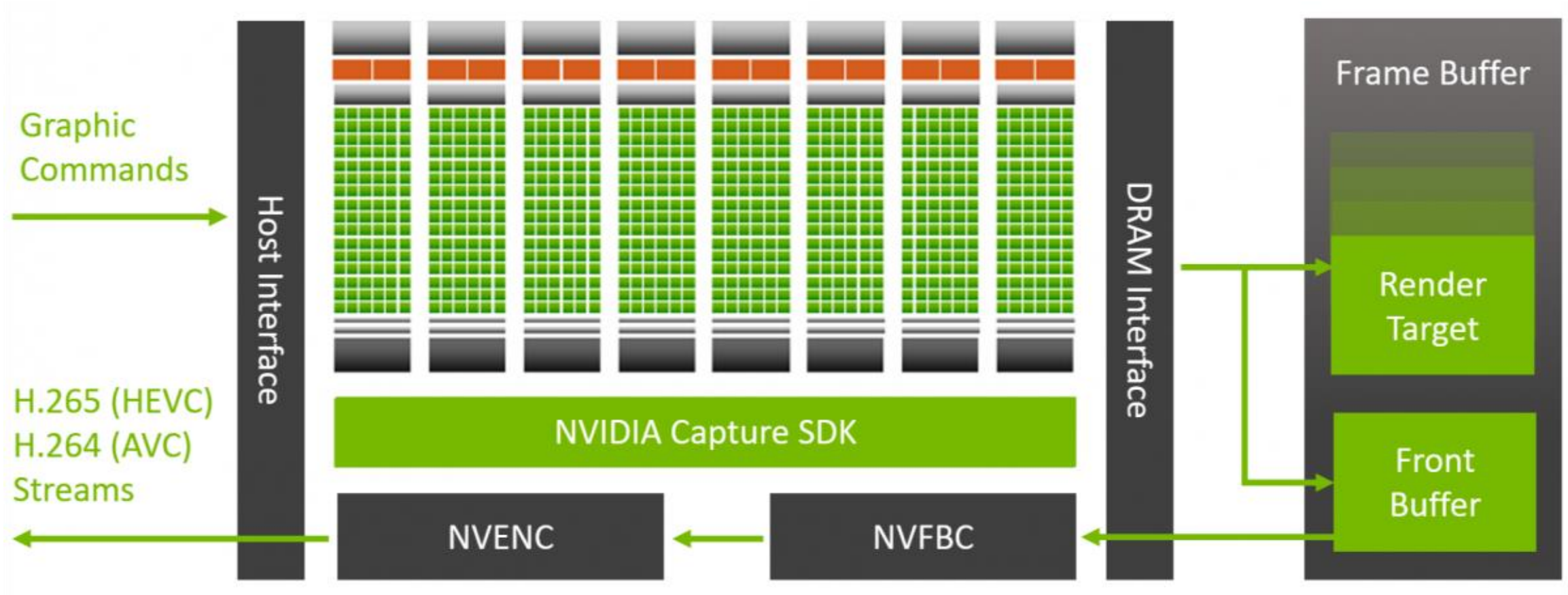
Frame Buffer – Client OS

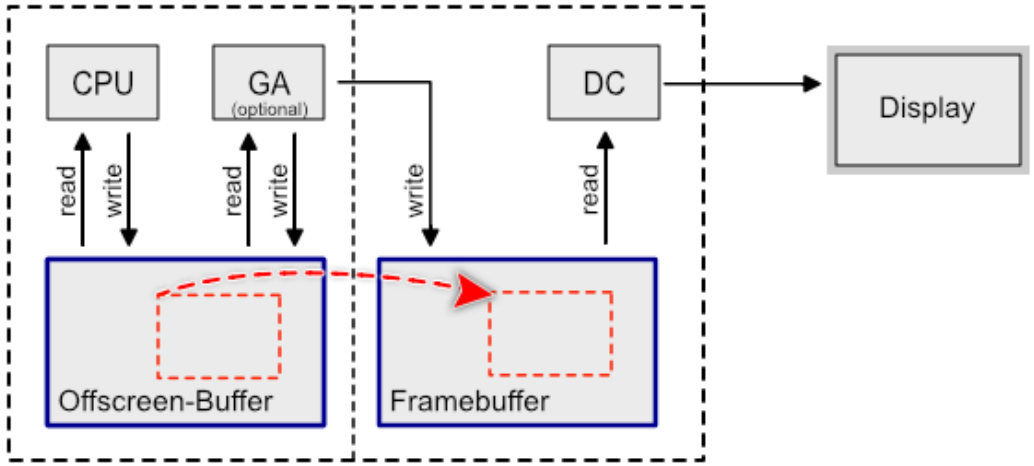
- Frame Buffer is in Video Memory (Very fast!)
- Frame can be directly rendered by NVENC
- Can be directly accessed by CPU
  - > Citrix uses NVFBC (NVIDIA Frame Buffer Capture) to directly get frames from Frame Buffer and send them to clients
  - > Reduces latency

Frame Buffer – Client OS



Frame Buffer – Server OS

- The „Offscreen Buffer“ handles the resolution for sessions and is responsible for the communication between session and GPU driver
- Frame created in vRAM is copied to RAM
- No direct NVENC support



The Protocols

The Protocols

- All information is based on Citrix Virtual Apps and Desktops
- Use version 7.18 or above
- Partly valid for VMware Horizon

The Protocols

- ThinWire
  - 2DRLE/MDRLE for text/crisp areas, JPEG for images
  - „Build to Lossless“ and „Always Lossless“ policies for pixel perfect quality
  - Many compression policies (Image quality, color depth, etc.)
  - Can utilize client side bitmap cache
  - No hardware encoding (NVENC)
  - Very bandwidth efficient for static content

Use Case: Pure Office

The Protocols

- HDX 3D Pro with H264 – Quality Low to High
  - YUV 4:2:0
  - Good compression and visual quality
  - Hardware encoding (NVENC)
  - Chroma subsampling yields blurred text
  - Bandwidth efficient for video/moving images

Use Case: 3D CAD

The Protocols

- HDX 3D Pro with H264 – Quality Lossless
  - YUV 4:4:4
  - Very good visual quality
  - Hardware encoding (NVENC)
  - No chroma subsampling
  - Great for sharp graphics as well as text
  - Increase in bandwidth

Use Case: 2D CAD or High Color Accuracy Req.

The Protocols

- HDX 3D Pro with H265 – Quality Low to High
  - YUV 4:2:0
  - Better compression than H264
  - Requires hardware encoding (NVENC)
  - Chroma subsampling yields blurred text
  - Bandwidth efficient for video/moving images
  - Only works on Windows Endpoints! (With HW Decoding on)

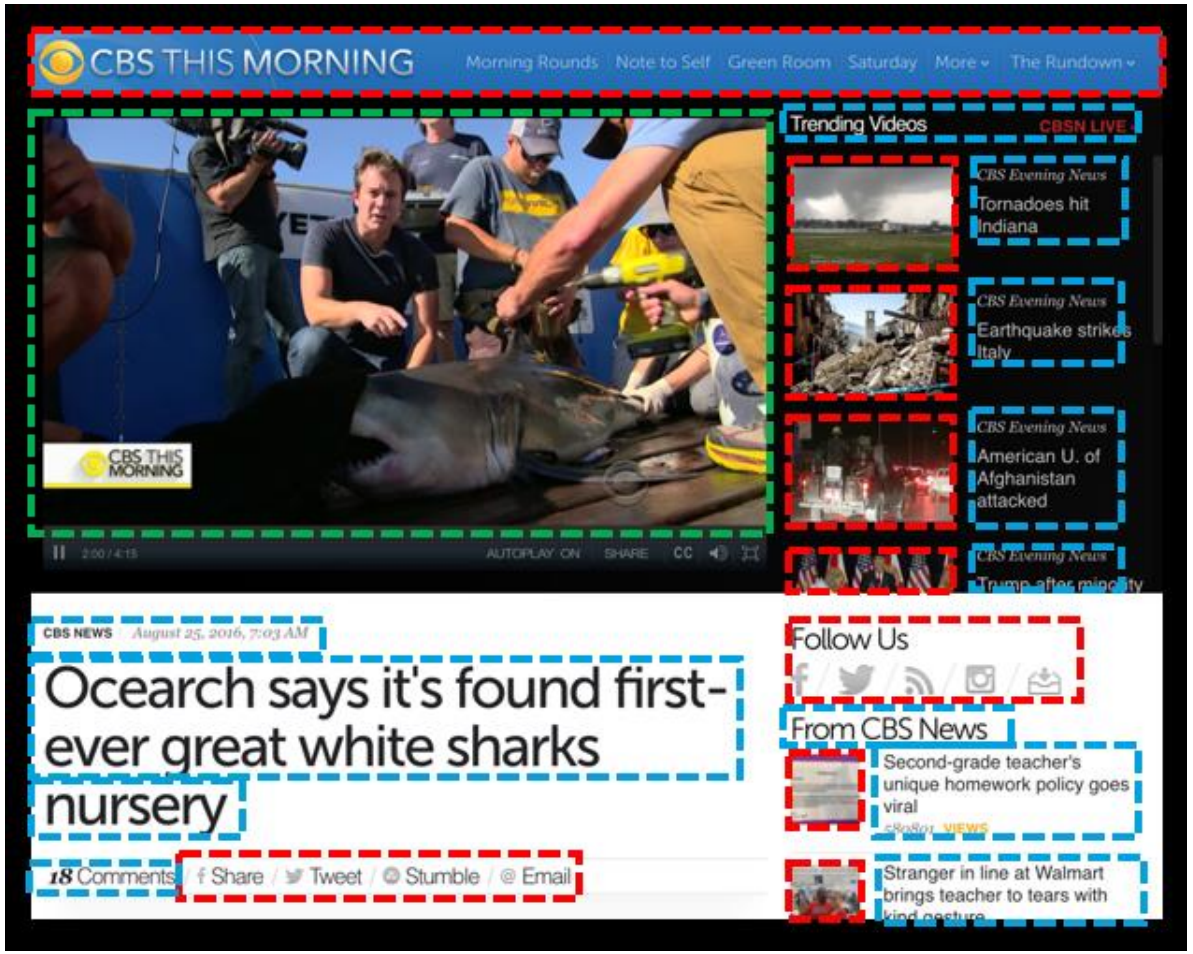
Use Case: 3D CAD in low Bandwidth scenario

The Protocols

- Selective H264 / For Active Changing Regions
  - Auto-selects between ThinWire / H264 or H265
  - Can use hardware encoding H.264/H.265 (NVENC) for video regions
  - Very good image quality for static content (Bitmap) and low bandwidth requirement for moving images/video (H.264/H.265)
  - Can’t use NVFBC as it is only parts of the screen

Use Case: Office usage with multimedia

The Protocols



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The Protocols

- H264 (H265) Build to Lossless
  - Sends lossy images to the user during periods of high network activity
  - Sends lossless images after the network activity reduces
  - Sharpening effect when changing from moving to static content but pixel perfect quality
  - Can use NVENC
  - Chroma subsampling less problematic as it is used only for moving images/video

Use Case: 2D CAD with low Bandwidth

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ThinWire	Setting	Value
VDA	Use Video Codec for Compression	Do Not Use
Selective H264		
VDA	Use Video Codec for Compression	For Active Changing Regions
	Use hardware encoding for video	Enabled
H264		
VDA	Use Video Codec for Compression	For the Entire Screen
	Use hardware encoding for video	Enabled
	Optimize for 3D graphics workload	Enabled
Client	Hardware acceleration for graphics (OPTIONAL)	Enabled
H264 YUV 4:4:4	Same as H264 with the following changes	
VDA	Allow Visually Lossless Compression	True
	Visual Quality	Lossless
H265	Same as H264 with the following changes	
Client	Hardware acceleration for graphics (REQUIRED)	Enabled
	H265 Decoding for Graphics	Enabled

Tools

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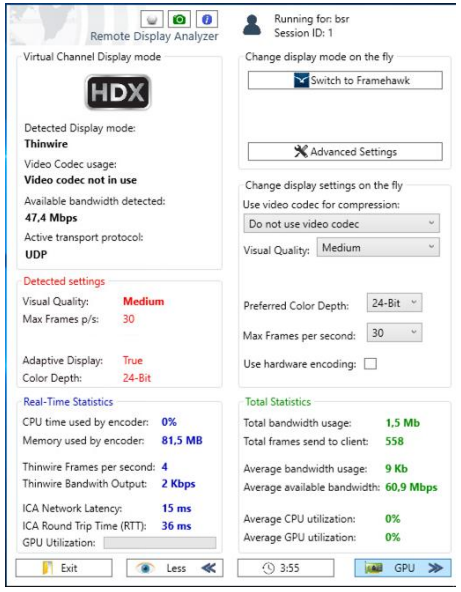
RD Analyzer

- Instant policy switching (Citrix / VMware / RDP)
- Monitor CPU / GPU usage
- 50 euro / year



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REX Analytics Framework

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Let’s start the battle

Test Environment

- Client:
  - Intel NUC i7 / 32 GB Ram (NUC7i7BNH)
  - Windows 10 1809
  - Citrix Workspace App 1903
- VDA:
  - 2 vCPU / 6 GB Ram
  - NVIDIA P4-2Q – GRID 8.0
  - Citrix Virtual Apps and Desktops 1903
  - Windows 10 1803

Test Environment

- Other devices:
  - Elgato HD60S (Frame Grabber)
  - Apposite linktropy mini2 (WAN Emulator)

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The tests

- 3D CAD on LAN – ThinWire vs H264
- 3D CAD on 4 Mbit – H264 vs Build to Lossless
- Office worker on 2 Mbit – Comparison
- Office worker on 2 Mbit – H264 vs Build to Lossless

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Conclusion

- There is an option for every situation
- Choose wisely
- Use testing tools and perform user tests to validate your environment