Racing VR Optimization Guide
By Robert Ehrling
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Introduction

This guide can both be watched as a YouTube video or read here in the forum where it`s continuously being updated. It's foremost about optimizing the VR experience in iRacing but the information can also be used as a guide for iRacers using monitors as many of the in-game graphic settings are and functions the same. As we drive a racing sim the immersion is very important alongside having the best race result possible. As much as between estimated 25- to 50% of all iRacing members now use a VR headset for their weekly dose of iRacing. With new hardware such as a VR headset there are often tweaks to be found in the software just spending some time investigation.

I like the simplicity of using the famous default setting as that are often a setting that is balanced and stable and If things are working there are really no need to change anything. But as we PC users have different kind of hardware installed there are improvements for the VR headset to get for free both visually and performance vice, how much depends on the hardware and mainly the CPU and GPU that are in use.

We can most certainly get the specified refresh rate of our VR headset in iRacing even in the most demanding scenarios if we just lower our in-game graphic settings, but that would not be the most optimal solution. The reasons are that some settings have affect in the VR environment while others do not and the performance impact of some of these settings are also different so it's more complexed compared to the normal 2d graphic settings. I hope this post will be an all in one place help to users with various VR headsets using iRacing. My objectives are that many throughout this guide will be getting performance boosts and better visuals but the goal is foremost to reach a sustainable and stable frame rate.

To be clear, visually we shouldn't expect to much as the iRacing graphic engine sometimes feels dated and limited. Tracks and cars do look awesome but other stuff not so much so we need to find a sweet spot that serve us well. I have beside done my own testing the iRacing forum as a source of

information much thanks to many incredibly passionate members. I want to especially mention Sean A Fleming, Clive Norton, Clayton Macleod, Eric Bourduas, Scott Velez, Jacob Klein, Aaron Voegele among others for invaluable inputs in the subject.

As iRacing continuously updates the graphic engine and patching up the sim some features will change over time, some will be new and other be deleted. Feel free to help out with these updates in the comment session below to this thread. Also appreciated is letting me know if I got something incorrect in the information and sharing suggestions of adding new stuff to it. I will be doing one big yearly update to the guide.

VR hardware requirements

The two main factors in VR performance are the CPU and GPU. The processor is responsible for keeping track of what is going on in the sim and the video card handles displaying the scene and doing calculations involving lighting, shadows and more. What makes VR especially demanding is that the display for each eye must be rendered separately since they originate from different positions. Each eye's display is in high resolution and needs to refresh quickly for a smooth in-game experience and preventing motion sickness.

The VR scene will render all the pixels in a graphical complex 3D space and that requires far more GPU power than if we were just using a monitor with a flat surface. That is the reason why VR users can’t run the same detailed in-game graphic settings in iRacing as on running with a monitor despite similar resolution. The VR technology is indeed very complex and much harder to quantify given the almost limitless variables. VR users in iRacing can for an example look around inside a race car and as it happens the rendered scene are constantly changing over and over.

Hardware wise the CPU clock speed is important as that impacts how many instructions per clock called IPC each core can handle. IRacing staff say that the rendering is still basically single threaded in DX11 so it doesn't take much to get our CPU bottlenecked, so we want the best single core performance available in VR and we know iRacing loves that to. The latest generations of Intel and AMD CPUs will do a great job and generally a CPU with a single core max clock speed around 4.5GHz are fine in iRacing. Above 5.0GHz on one or more cores will deliver a very good VR experience in terms of the CPU performance.

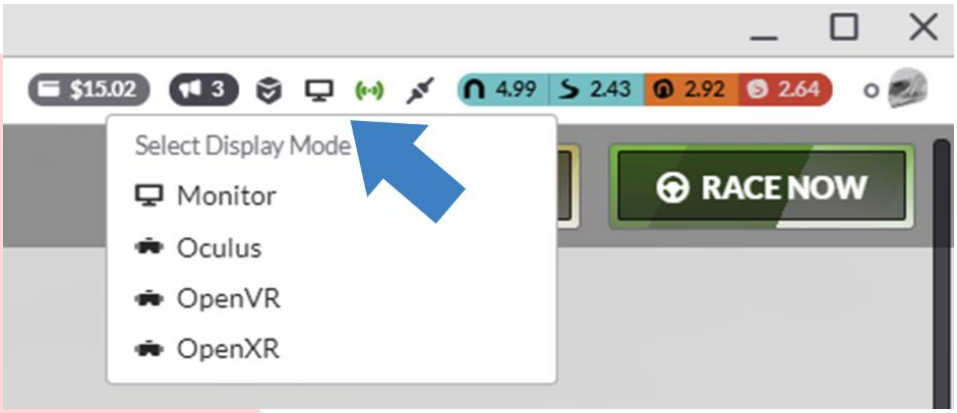
A note here is that Intel and AMD CPUs got different architectures so just looking at the clock speeds are not the fairest way to determine the performance as the IPC are handled differently. But generally the higher clock speeds the better IPC can be sort of a guidance and recommendation, every +50Hz, +100Hz help a lot and that is also more important than more cores. If we go the AMD route I recommend the Ryzen 5000 and the new Ryzen 7000 series CPUs as the important single core performance got greatly improved with those architectures. If we go with INTEL we got more to choose from and any unlocked gaming CPU from the latest generations with a single core max clock speed around 5.0GHz and above will be very good. To this date Intel still got a little bit of advantage over AMD in terms of single core performance but going either way will not disappoint. The choice of GPU in a VR system running iRacing is quite simple, on the Nvidia side I recommended to have at least something from the GTX1000 and the RTX2000 series to not drain the system. For the best

performance I suggest going for the RTX3000 or the new shiny RTX4000 series GPUs which looks awesome for us VR users. An AMD Radeon RX5000 will work but it's the same scenario here, go for the latest generations for the best performance, the RX6000 and the RX7000 series will work way better. Nvidia high end series are to this date the GPUs that I recommended as they offer the best features and best performance in iRacing. This will be furthermore explained in the guide.

I recommend having 16GB or 32BG of DDR4 RAM installed in our PC running VR in iRacing. Having two memory sticks in our system is better than one because we want to run them dual channel for better performance, also the size means almost nothing if the RAM is not fast enough. Low latency timings alongside the highest clock speeds around 3200MHz and above can be beneficial. That is even more important when using lower resolution monitors where more loads are added to the CPU and RAM. But in the VR environment where we run our headset at higher resolutions more loads are added towards the GPU and the VRAM instead. But for sure, a pair of good size and good quality RAM memory sticks will generally serve us well.

The performance difference between using DDR4 or DDR5 memory in iRacing and VR is negligible so far. The higher memory bandwidth that comes with the higher clock speeds in DDR5 modules gives us a slighter faster overall PC experience than DDR4, but the increased clock speeds is not everything. Low latency must go with it before we can see any real benefits when gaming and I suggest we wait shifting to the DDR5 memory standard until it gets more mature and cheaper.

Switch between monitors and VR



Since a 2022 build update a new user preference has been added to the iRacing UI and we can now easily switch between different sim display modes that will be used when we start a race. We can choose between Monitor, Oculus, OpenVR and OpenXR. The display of choice has its own ini file so we can set the appropriate graphic settings for each of the different displays. That means we now potentially have 5 renderer.ini files. A thing to mention here is that if we launch iRacing from the old website the original rendererDX11.ini is in use and if we use the new iRacing UI it will use the specific files for the different displays just mentioned. This new feature is helpful for evaluating both the visuals and the performance or if we just want to run with monitors for a while. We just must make sure to edit the right ini file when we tweak our in- game graphic settings. Using third party app as

iRacerAssistant and iRacingConfig was before the iRacing update the only way to manage multiple iRacing ini files simultaneously. Those programs are still being updated and offers even more functionality and control of the different ini file than iRacing do. We can as an example create different profiles based of different car cam settings and in-car black box positions between the VR headset and monitors and much more.

OpenXR VR standard

For the best possible performance and visuals I highly recommend the new OpenXR improved open source VR standard when we choose our sim display mode. OpenXR recently got initial support in iRacing and is very promising and this cross platform software works with headset from Oculus, StemVR, Window Mixed Reality, Vive, Varjo among others. Many VR users report that OpenXR give them a smoother experience and is user friendly and easy to setup.

Most recently the useful OpenXR Toolkit got green light to work in iRacing to and from there we can try their features of upscaling, sharpening, field of view adjustments and much more really cool settings. The iRacing in-game R meter, that are soon explained in the guide, can give strange readings when using OpenXR but as long as our frame rate is fine, all is well. IRacing staff says that they are working on a fix but as the Open XR architecture is substantially different it can take some time before this is solved.

Monitoring our performance

Beside using Windows task manager a great way to monitoring our VR performance in more detail is to enable the in-game R and G meters in the framerate meter to be shown as numeric instead of graphical. We can do that in the options menu since a build update in 2018 and this will indicate which element is more overloaded, the CPU (R), the GPU (G) or both. There are a lot of meters available if we want but the R and G are the ones that matter for our performance. We can move and drag the black box with our meters where we want it on our screen by clicking “Alt + K” and that is also true for the others iRacing in- game overlays. The R and G meters give us information how many milliseconds it takes for tasks to be done by the CPU and GPU for the next frame to be rendered.

Theoretically we want the numbers to stay below a value of 10.7ms based on our VR headset refresh rate running at 90fps. If we use a headset with a lower refresh rate such as 80Hz the numbers will be increased to 11.7. Preferably we want the values to be under 5ms so we can maintain a good frame rate under racing in a full field race. If the numbers are higher than as an example of 10.7ms we will immediately drop frames. Also if the value of R is much higher than the value of G indicates that our CPU is bottlenecked and the other way around means our GPU is bottlenecked. If the R and the G meters are too high we must adjust our in-game graphic settings that are either impacting our CPU or GPU.

Recommended iRacing graphic settings in VR 2022

I have done my testing with an AMD RYZEN 9 5900X CPU, Nvidia RTX 3080 GPU, 32GB DDR4 3600MHz memory and an Oculus Rift VR headset. For extended details of each setting and much more I highly suggest continuing reading the whole guide. As mentioned before, the goal here is to reach a stable frame rate and find a sweet spot visually based on our PC spec that is balanced and can be trusted.

To make it easier I have marked settings in greenish that I recommended to enable and tweak as first steps if we got performance headroom and want some additional eye candy and immersion. The settings that marked in red are the most important ones to disable as they severely punish our CPU and GPU and potato our frame rate and give us very little visual improvements in return. These are my recommended iRacing graphic settings in VR 2022.

IRacing graphic settings

Alright, let's dive into the different graphic settings and go through what each setting does for us VR users. We must kill the features that kill VR performance and not giving us anything in return. In some settings we can also go into the iRacing documents folder and the different display rendererDX11.ini files and the app.ini file to further optimize the settings if we want.

IRacing provides us with a graphic slider at the top with max frame rate on one end and the max quality on the other divided in 6 different classes with values. We can slide it left for more details and right for less but this setting is not very precise so we turn it max to the left and do our settings manually under the advanced tab for better result. Some of the changes can be visible right away if we go out on the track while others need a restart to make effect. For making this easier we can drive one lap and then jump out of the car and use the replay tab and change one setting at the time. We can then see if the changes made any visual or performance impact on our system, not all settings that are under the graphic tab are in the replay tab but doing this can be helpful. Even if there are hours to be made exploring all the different settings, I suggest having a starting point to try keep things as simple as possible. We don't want to over complicate stuff as the more settings we change the more control we lose of how each setting work and working with others and the placebo effect in VR are so powerful.

Besides giving my graphic settings recommendation I also give information on how much some of the features penalize the CPU and the GPU that can be helpful to really get into the finest optimizations. The bigger the track the bigger performance hit is not an entire true story as shorter track can be well as demanding, it's the detail settings, number of cars, objects and shadows that requires time to render. The more we have, the more work has to be done.

Resolution

Lower the resolution as much we can is a good thing even if it should have no real effect in the VR environment as it's a low quality mirror or window of the rendered VR scene. The reason we got this mirror is to my understanding just to get the mouse cursor to work in VR. Several iRacing staffs says it should be pretty transparent in terms of overall performance, but a suggestion is to make the mirror window as small as possible in size nevertheless, just to minimize any performance drains. I got mine set to 1024x768 but we can go lower than that. I guess there are some uncertainties here and during my own testing I did not experience any frame rate drops or gains testing this setting in different resolutions. I recommend having Resolution set to a value as low as possible.

Res Scaling

This is an upscaling feature that uses AMD FSR (FidelityFX Super Resolution v.1.0) and is an open source software compatible running both on AMD GPUs and Nvidia GPUs from GTX1000 series and above. DLSS which is Nvidia upscaling feature is to this date not implemented in iRacing and the same for the latest AMD FSR v.2.0. Resolution scaling allows the sim to be rendered at a lower resolution to save performance and then be upscaled to fit the correct output resolution. This

feature will not reduce the load on the CPU and will only function if the Anti-Aliasing (AA Samples) setting is set to higher than 0x or that the Anti-Aliasing are set to either SMAA or FXAA. There are four different modes to choose from- Ultra, Quality, Balanced and performance. The Ultra mode will give us the highest quality with the lowest performance increase and the other modes will give us lower quality, but with an increase of performance.

This setting needs a restart to be enabled and iRacing staff states that it produces an image with lower quality than without the feature but will require less processing power from the GPU. We can try this feature and get some free performance but the result can vary depending on what VR headset and resolution we are using. My recommendation is to leave it disabled despite its promising technique. We can get added performance from other graphic settings that are not degrading our overall VR visuals like this feature do.

UI Zoom

Makes the iRacing menus and in car overlays bigger or smaller so if we want that we can change this setting, no performance impact and personal preferences.

Full Screen

If checked this setting will run the mirror of the rendered VR scene in full screen and if not checked it will go into windowed mode. There are no performance differences between them in VR and this feature does not affects what we see inside the VR googles, so personal preferences here.

Border

Adds a border around the window that show the rendered VR scene and this can be helpful if we want to move that window around to the optimal spot for us, personal preferences here.

Enable SPS (VR)

This is a pure VR feature that needs a GTX1000, RTX2000, RTX3000 or a RTX4000 series Nvidia GPU and a device driver after v.390 to work. This setting is enabled by default if our PC specs meet these requirements and SPS in VR works like what the SMP does for the use with multiple monitors. SPS (Single Pass Stereo) optimize the VR rendering and allows the sim to render a scene for one eye and then the GPU via shaders and SPS create the image for the other eye without needing to submit the entire scene a second time. This reduces the CPU load of the rendering thread and increases the frame rate up to 30% stated by iRacing staff. The gains are especially shown at the largest and most complex scenes when the frame rate would be lowest. VR users report that the performance benefits with SPS enabled are in the most common scenarios up to around 10%.

The difference between the two series Nvidia GPUs in regards of how SPS functions is that the GTX1000 series doesn't support non-parallel projections. If we have SPS enabled on Nvidia GTX1000 series GPUs we will have the performance benefits but with a slightly visual distortion because there

will be align offsets between the two rendered scenes. On the newer Nvidia RTX series GPUs there is no problems visually with SPS enabled as it supports both non-parallel and parallel projections axis, everything is lined up properly. Another obstacle here is that SPS can have different results based on what VR headset we use. This is because VR manufacturers as HP, Valve and HTC uses asymmetric projections with a different align of the focal points for each eye and therefore handles SPS differently.

Oculus VR users seems not to be affected and this issue is very similar to how the Nvidia GTX1000 series GPUs work with SPS. I suggest we test SPS and make a decision if the performance gains are worth it or not and take the information mentioned to consideration. I recommend having SPS enabled as it's probably the best feature available in iRacing to optimize the VR performance. For AMD users the feature LiquidVR is equivalent to SPS but is to this date unfortunately not implemented in iRacing.

Align

There are very limited information available about what this setting actually does but my guess is that it's similar to the border function above as it helps out when we use multiple monitors to determine on which screen will show the rendered VR scene from start, personal preferences here.

Reflex

This is an another Nvidia specific feature that is supported in iRacing and is working on GTX900 series GPU and above, it´s disabled by default if our GPU and drivers does not support it. We can enable it here and there is no need to go to the Nvidia control panel and this feature helps us reduce latency mainly when we are GPU bound. It will automatically be enabled "low latency mode" in our driver when needed. If we choose the preset "boost mode" it also keeps the GPU clock speed higher when the sim is CPU bound and submitting frames to our VR headset faster, which is nice to. We are not talking about getting more fps here, instead this feature is firstly aiming to reduce the latency between our wheel- and pedal inputs and our VR headset. It does that by removing the render queue and allowing the CPU and GPU to work close together and I recommend having this setting enabled with the "boost mode" on.

Gamma, Brightness, Contrast

This setting is kind of self-explanatory, here we can adjust our gamma, brightness and contrast ratio based on our personal preferences. VR users report that changing the gamma setting can improve night visibility and if we got HDR enabled we can find these adjustments helpful for the fine tuning. Contrast can help the image to pop better and giving more definition to cars and track details. If further adjustments are necessary we can use the Nvidia control panel which have more settings. There we can as an example adjust iRacings colour palette witch many thinks are too yellow and exaggerated.

Sky/Clouds

Medium to high performance impact mainly on the CPU, lowering this setting to low will improve frame rate as that makes the sky and clouds to refresh at a lower rate and resolution. There are some shadows involved here to and those are real killers in VR. Medium setting looks very similar to high and the performance hit is likewise significant. Despite the sky can seem a bit jumpy I recommend low detail setting, we don't want to waste performance on a feature we hardly notice when racing.

Cars

Medium to high performance impact evenly on both the CPU and GPU, lowering this setting to medium or low will improve frame rate especially at race starts or when many cars are visible. We got to be careful here as this feature also adds draw distance especially at the highest setting and that is very demanding in VR. But if we don't set this to high cars will pop in and out in the distance at super speedways. I recommend high detail setting as a first choice and if the frame rate impact is to hard go for medium.

Pit Objects

Low to medium performance impact evenly on both CPU and GPU, lowering this setting will improve frame rate especially when the pit area is visible. At Off the only thing we see in our pit area is the lollipop guy, at low we got an empty pit box with a pit board hanging over our site. At medium we got all the crew and mechanics visible and at the highest setting we got some added movement to the crew behind the pit wall. I recommend medium detail setting as this setting cause extra drawing to occur and we want to limit that in VR.

Event

Medium to high performance impact evenly on both CPU and GPU, if we want objects as cars, trucks, campers, tents and crowd on the inner field we can choose max setting and at low we got the trucks alone and switching this setting to off the inner field is complete empty. I recommend low detail setting here as the performance impact in terms of frame rate are less noticeable at off and low compared to max detail setting and we want some things to be shown in the inner field for the sake of realism.

Grandstands

Medium to high performance impact mainly on the CPU, lowering this setting will improve frame rate and at off we don't see any grandstands at all. At low we can see them but with a flat surface, at high we will get some added 3d modulation to the seats. This is not something that will be visible when racing so we just set the detail setting to low and save some frame rate especially at race starts. I recommend low detail setting.

Crowds

Medium to high performance impact evenly on both CPU and GPU, this setting is a bit complex and it has been rebuilt from the ground up under 2019 to significantly improve both appearance and performance. Lowering this setting to off we don't have any crowds and fans spectating the races, at low the crowds are displayed but with front faces only like a paperboard, at medium the folks are in full attendance and at high some additional 3D characters are added around the track. A note here is that during testing sessions the crowds are always off and during practice and qualifying sessions the crowd are reduced to around 50%.

In the display rendererDX11.ini file in use there is a line "forceCrowdVisible=0" that was introduced in a build update back in 2017 and was previously located in the app.ini file. When changing the value to "forceCrowdVisible=1" it enabled the grandstands to be filled with spectators regardless of event type.

```
DriveUIFullScreen=0                    ; Let triple headed driving UI expand to fill full display
DriveUIMaxAspectRatio=1.800            ; Adjust driving UI maximum aspect ratio up or down
DriveUITransparency=1.000              ; Adjust driving UI transparency up or down
forceCrowdVisible=0                    ; Force the crowd in the grandstand to show up on practice/qualify sessions
ForceVisibleWhenMove=0                 ; Force all movable controls to become visible when moving UI elements
hideCarNum=0                           ; Hide car numbers/decals in test sessions, so you can paint your own versions
KeepUIHiddenOnFocus=0                  ; If set to 1 then the UI can only be enabled with the space bar
```

This graphic setting and the three different detail levels does not adjust how many crowd members we see in the grandstands, just the rendered quality of them so the performance hit can be different due to what track we race at and how big the grandstands and the crowd size are. Lowering this setting will improve frame rate as expected so I recommend low detail setting here to free some frame rate for other stuff. If we want the crowds to flash their cameras when we race on some tracks we must enable crowds and also particles on whatever detail setting alongside having event enabled.

Objects

Medium to high performance impact evenly on both CPU and GPU, this feature controls the number of larger objects around the track both on the inner field and the outer surroundings as buildings, lightning poles, additional grandstands and commercial signs. I recommend high detail setting as the difference between the low and high setting are too big and it's like we are getting robbed on everything at low and I want some things to be shown around the track for the sake of realism much alike the event setting. This setting does not affect the bigger stadium lights just the lightning poles around the track so driving at night are fine despite what setting we choose here. Also remember that different tracks have different amounts of objects around the track so that will affect this features performance impact.

Particles, Full Res and Soft

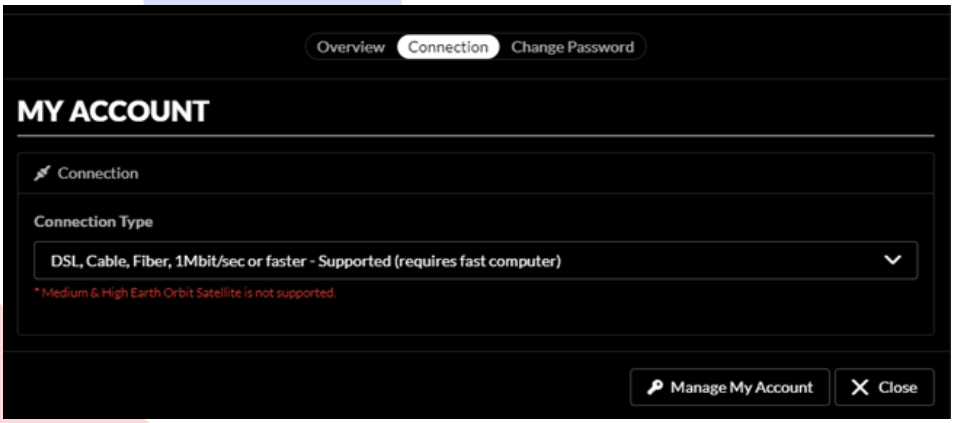
Low, medium to high performance impact evenly on both CPU and GPU, this is a part of the PopcornFX engine that iRacing uses for nice graphic effects like smoke, marbles, sand, dirt, grass and exhaust pipe sparks. This is a must feature for us VR users as it adds great immersion and not only visually. At medium and high settings we also get fireworks and some neat sound effects added to

the different particles and as the performance impact of the three different detail levels here are almost the same. But in the dirt and rallycross environments where there's a lot of dirt and dust the impact of medium and high settings can be too demanding and reduce our frame rate, I generally recommend high detail setting.

Also checking the box Full Res is important as it generally makes us gain frame rate except for some scenarios when the track being filled with large clouds of smoke. Likely important is unchecking the box Soft as it makes us lose frame rate without making any obvious visual differences and according to iRacing staff it also incurs a per frame overhead and we don't want that in VR.

Max Cars, Draw Cars and Draw Pits

Low, medium to high performance impact evenly on both CPU and GPU, Max Cars is linked to the choice of connection type found in our iRacing account. A connection type of 128k/sec is more or less the necessary bandwidth for around max 28 cars and 1 mbit/sec for max 63 cars which is the maximum number of cars other than us.



The faster connection we have the more detailed information for other cars position, orientation and movement are transmitted to us so we set this accordingly to our connection speed. My recommendation is having Max Cars set to 40 or as large as our connection can handle, personal preferences. Draw Cars and Draw Pits are separated from the pre-existing Max Cars setting but kind of working together anyway. These new rendering features specify how many cars that are being rendered by the ones that are transmitted to us accordingly to the Max Cars setting. We can control how many of these cars will be shown in our main cockpit view camera and in the mirrors, the value in the parentheses determine the limit of the inside mirrors. Draw Pits does exactly the same thing but is only controlling the amount of rendered cars being visible in the pit area.

Lowering these settings can be an easy fix for better performance but I recommend having these settings set to the default values as it feels balanced in terms of performance and what we get visually. If we want to fine tune our performance here we can go the display rendererDX11.ini file in use and do additional changes.

```
LODPctMax=400                          ; above 100% increases FPS and decreases LOD (25 to 500)
LODPctMin=100                          ; below 100% decreases FPS and increases LOD (25 to 500)
LODMinFPSTarget=60                     ; Reduce LODs (see LODPct* settings) when FPS is below target.
MaxPitObjsToDrawInMirrors=6            ; 0 to 192: Max number of pit objs to render per mirror camera
MaxPitObjsToDraw=40                    ; 0 to 192: Max number of pit objs to render per camera
MaxCarsToDrawInMirrors=20              ; 4 to 64: Max number of cars to render per mirror camera
MaxCarsToDraw=40                       ; 10 to 64: Max number of cars to render per camera
MaxAniso=16                            ; 1=off, or 2, 4, 8, 16 - improved edge-on textures
FarTerrain=1                           ; 0=no far terrain, 1=far terrain in separate pass
DriverHands=1                          ; Show driver hands? 0=no, 1=yes
```

Dynamic LOD, FPS, World and Cars

Low to medium performance impact evenly on both CPU and GPU. The old dynamic Level of Detail system (LOD) in iRacing only affected the cars and pit objects and has been replaced with an improved system. These new settings adjust the complexity of the objects as the camera changes distance from the objects in order to optimize the visuals and the performance. When enabled we can specify a minimum acceptable target frame rate (FPS) and iRacing will then automatically adjust the LOD selection to maximize visual quality while helping our PC to maintain the frame rate target.

Objects in the sim are made up of polygons and the more polygons that are in use, gives more detail to the objects. To help performance as objects gets further away from our cockpit view position the LOD system swap them out with objects with lower polygon counts and continue to do this until the object basically are a block. This feature doesn't adjust anything other than the distance at which objects drop or gain polygon detail. It doesn't change shader, shadows, or anything else according to iRacing staff. As an example if the actual frame rate falls below the target the system will automatically reduce the LODs of cars, characters, track-side objects, pit area objects, track surfaces, walls, and fences to improve our frame rate. On the other side, if the frame rate increases beyond the target frame rate, the system automatically increases the level of detail to improve the visual quality of everything.

If we set these settings to off we are in a way reverted back to the old LOD system and Racing staff state that we will then have worsen performance. I recommend VR users to leave Dynamic LOD, World and Cars settings to the default values, the FPS should be set to our VR headsets specified refresh rate, or slightly below. If we want we can dive into the display rendererDX11.ini file in use and change these settings even further but with not much of a value. There are very little visual and performance benefits to find here, if we don't exaggerate things off course.

```
CarDetail=2                            ; 0=low, 1=med, 2=high
SkyRefreshRate=1                       ; 0=low update rate, 1=med update rate, 2=high update rate
Trilinear=1                            ; 0=off, 1=improved texture quality
LODPctDynoMirrorsMax=500               ; above 100% increases FPS and decreases LOD (25 to 500)
LODPctDynoMirrorsMin=100               ; below 100% decreases FPS and increases LOD (25 to 500)
LODPctDynoMax=400                      ; above 100% increases FPS and decreases LOD (25 to 500)
LODPctDynoMin=100                      ; below 100% decreases FPS and increases LOD (25 to 500)
LODPctMirrorsMax=500                   ; above 100% increases FPS and decreases LOD (25 to 500)
LODPctMirrorsMin=100                   ; below 100% decreases FPS and increases LOD (25 to 500)
LODPctMax=400                          ; above 100% increases FPS and decreases LOD (25 to 500)
LODPctMin=100                          ; below 100% decreases FPS and increases LOD (25 to 500)
LODMinFPSTarget=60                     ; Reduce LODs (see LODPct* settings) when FPS is below target.
MaxPitObjsToDrawInMirrors=6            ; 0 to 192: Max number of pit objs to render per mirror camera
MaxPitObjsToDraw=40                    ; 0 to 192: Max number of pit objs to render per camera
MaxCarsToDrawInMirrors=20              ; 4 to 64: Max number of cars to render per mirror camera
```

Frame Rate

This setting does nothing for us in VR as our headsets refresh rate decide the frame rate. If we got a headset that run at 90Hz we automatically got a roof of 90fps in iRacing. Vertical Sync also does nothing for us in VR as Vsync are already locked on in the drivers and we cannot turn it off. This is a must in VR as otherwise tearing would be very bad and that leads to motion sickness.

Max GPU Video Memory to use

I recommend set this limit to our GPU video memory capacity and reducing that with around 2000MB or more to get a proper value. We can see the amount of memory being used by iRacing to the right side of the slider and 8192MB is the max value we can dedicate to iRacing. As an example I got roughly 10GB of video memory so I set this value to 8192MB that should be well enough to feed iRacing and that also give the GPU a lot of MB left for important tasks within windows. IRacing staff says that setting this video memory slider to just a little over what iRacing uses can help with frame rate issues, personal preferences.

Max System Memory to use

The maximum setting here is 16384MB and I suggest we leave it at that if we use 32GB of system RAM as I do and moving the slider to around 8000MB if we use 16GB. This will make iRacing happy with its share and we got plenty of RAM left. If less system memory is installed just lower this setting accordingly and again, we can see the amount of memory being used by iRacing to the right side of the slider, personal preferences. We can adjust both these settings in the display rendererDX11.ini file in use to increase the value even more than the sliders provide by changing VidMemMB=" and "MaxWorkingSetMB_64Bit=" to the amount needed.

```
MaxPreRenderedFrames=1                          ; 1=normal  0=disabled/multi-gpu
VerticalSync=0                                  ; 0=allow tearing, 1=lock FPS to refresh rate
TwoBackBuffers=0                                ; 0=1 back buffer, 1=try to create 2 back buffers
MaxWorkingSetMB_64Bit=16384                     ; (64-bit) 1024 to 8192 MB - Lower to reduce page faults!
VidMemMB=8192                                   ; Maximum GPU video memory to consume (MB)
UIScalePct=100                                  ; User Interface Size

[Debug]
```

Anisotropic Filtering

Low performance impact evenly on both CPU and GPU, this feature adds sharpness to textures and leaves very little to no impact on performance so there is no reason to not have this cranked up all the way. My recommendation is having Anisotropic Filtering set to 16x as adding sharpness in iRacing is a good thing in VR and more of that soon.

AA Samples

Medium, high to very high performance impact evenly on both CPU and GPU. AA stands for antialiasing and iRacing uses MSAA (Multisample Antialiasing) and the technique reduces the

appearance of jaggy triangle edges in the rendered scenes. Antialiasing consumes a lot of video memory and can drastically reduce frame rate since many more pixels are rendered per frame. In VR this is very expensive because the headset must do two high resolution renders and the AA setting makes those even larger so I recommend AA Samples 2x and 4x and try see how it goes as the performance impacts doubles for each step. At 8x the reduction in frame rate is around 20% right off and is much more demanding on the GPU, even if that mode provides slightly better visual quality than 4x it is not worth the loss in frame rate. 2x and 4x are the most used setting here among VR users and I don't recommend turning AA off completely as that results in way to low visual quality.

A note here from the iRacing staff is that some VR headsets got their own antialiasing build into the device driver and software but it is necessary to use the sim graphic options. This is because the antialiasing is performed on an off-screen multi sampled render target which is then down sampled and warped to fit the smaller VR displays. Setting antialiasing via your VR headsets device driver and software is not good enough and won't work properly.

AA Mode

Does nothing and are broken, probably a leftover from DX9. Why is this "empty box" still here?

Render Dynamic Track Data and Render Dynamic Tire data

Medium to high performance impact evenly on both CPU and GPU, these two features are a must for us VR users as it like particles adds great immersion to the sim and connects physical aspects of the car and the track together. From the Dynamic Track Data we can see stuff like skid marks and rubber from tyres being stuck to the track surface and making it darken, track temperature fluctuates from the heat of the tyres and rubber marbles kick of the tires making piles at the side of the racing line. From the Dynamic Tire data we can see debris as grass, dust and rubber appearing on our tires when going off track. I recommend having Render Dynamic track data and Render Dynamic Tire data enabled for the sake of realism. A note is that the later one is hurting us more in frame rate so keep an eye on it.

Shadow maps/Cloud Shadows

Medium, high to very high performance impact evenly on both the CPU and GPU, shadows and lightning effects are cool but they can be very demanding. Shadow maps/Cloud Shadows work both at day- and night tracks. Having these shadows enabled can reduces the frame rate by around 15%. Since the iRacing 2022 Season 3 build update we got fewer options to choose from here. Previously we could just use Shadow maps on track/cars and save some performance but now we are forced to have Cloud Shadows everywhere if enabled and the difference it makes is huge.

IRacing staff says that there is now only a global setting for Shadow maps and the option before only disabled shadows for the terrain. They recommend having Shadow maps enabled to avoid weird situation where the track is bright and the area outside is dark, or vice-versa. It´s unfortunate iRacing changed this setting because VR users could previously enjoy shadows at an acceptable performance

cost but not anymore so my recommendation is having Shadow maps/Cloud Shadows off. To try gain some performance out of the Shadow map feature we can dive into the display rendererDX11.ini file in use and adjust the line “DynamicShadowRes=1” to “DynamicShadowRes=0”. This will make iRacing use a lower resolution of the shadows 512x512 pixels instead of the default 1024x1024 pixels. The shadows look jagged and ugly but it could be worth an attempt. They can also be increased in resolution by changing the same line to “DynamicShadowRes=2” for 2048x2048 pixels or even “DynamicShadowRes=3” for 4096x4096 pixels at a performance cost out of this world for sure.

```
EnableSwayTrees=1                       ; 0=normal trees, 1=trees sway with wind
TrackDisplacementEnable=1               ; 0=render without displacement, 1=render using track displacement shaders
DNSMMaxLightsPerPass=3                  ; 0- 6 = Shadowing lights per-fullscreen pass
DynamicShadowRes=1                      ; (For 3 maps! So, x3) 0 = 512x512 1 = 1024x1024 2 = 2048x2048 3 = 4096x4096
DynamicTireRendering=1                  ; 0=render without dynamic tires, 1=render with dynamic tires
DynamicTrackTextureUpdateRate=2         ; 0=min, 1=low, 2=med, 3=high frequency of dynamic track texture updates
DynamicTrackDataRendering=1             ; 0=render without dynamic track data, 1=render with Dynamic Track Data
```

Objects Self Shadowing

Very high performance impact evenly on both the CPU and GPU and when enabled it hits us with an around 5% reduction in frame rate. This setting will add shadows from trackside objects to the scene and alone this setting is not so demanding but as it only can be enabled alongside Shadow maps/Cloud Shadows this is a now a real frame rate killer. I recommend having Objects Self Shadowing disabled.

Dynamic objects

Very high performance impact evenly on both the CPU and GPU, this option makes cars, pit boxes and other dynamic objects and a few selected trackside objects to have shadows. This is one of the bad boys in terms of killing frame rate and we don’t need it so make sure this box is unticked and likewise in replay. We are talking about a more of a twofold performance impact of the Shadow maps/Cloud Shadows, so this is scary. I strongly recommend having Dynamic objects disabled.

Night Shadow Maps, Walls and Headlights

High to very high performance impact evenly on both CPU and GPU, this allows the sim to use Shadow maps similar to the Shadow Maps/Cloud Shadows for multiple lights at night tracks. Walls is a part of this feature and will make the track walls to cast additional shadows and the same for Headlights that allows the cars headlights to cast shadows. Night Shadow Maps, Walls and Headlights is a bit troublesome as the performance is little all over the place. It probably works fine on most tracks but can cause serious dips in frame rate, screen freezes and lightning/shadows inconsistency on others. My recommendation is having Night Shadow Maps, Walls and Headlights disabled.

Number of Lights and Filter

Medium, high to very high performance impact mainly on the CPU, this feature controls the number of lights that can cast shadows and I recommend Number of Lights set to 1. As my recommendations is to not have any Shadows Maps enabled we actually don’t need any higher number than this. Going

the other direction would to my understanding increase the performance impact with no visual differences, It's the same with filter so I recommend no filter as these does nothing useful in VR.

Dynamic Cubemaps and Fixed Cubemaps

Very high performance impact mainly on the CPU, these two are bit strange, the first one is aimed to reflects other cars and cones to your car and the second one to reflects things like the walls and the fences. IRacing staff says that the fixed cubemaps are meant for the future and should be set to 0, it has gotten some updates but is still a kind of work in progress to get implemented on all tracks. Dynamic cubemaps works but the performance is terrible and adversely affect frame rates so my recommendation is having Dynamic Cubemaps and Fixed Cubemaps disabled by choosing 0 on both.

Shader Quality

This setting is like a shortcut for enabling/disabling the shadow settings mentioned above, at low we got mugged of every feature that involves shadows, at medium we got some features added and at high they are all there. A note here is that this setting oddly affects the shadow quality of our gloves and suit and also on our pit crew but not presumably the quality of Shadow Maps. So we got to have this at high as especially the gloves inside our car looks like garbage otherwise and also to be able to tweak every shadow setting available.

Since the 2020 season 3 build update we can also choose an ultra-detail shader level here if we use the graphic class level at 1 or maxed out. This new category has 3 additional textures into it and is working with cars with the new damage model. This affects our frame rate to various extent as the most expensive shaders are used on these cars to show the full damage appearance and also on dirt surfaces. So for the sake of realism my recommendation is to have Shader Quality at ultra-detail setting.

Hide Steering Wheel

Low performance impact evenly on both the CPU and GPU, here we can choose what we want to see when moving our head around inside the car. We can dial in that setting that feel most realistic in VR so personal preferences.

Two Pass Trees, High Quality Trees and SpeedTree Self Shadowing

Low to medium performance impact mainly on the CPU, if enabled the first two settings make the trees geometry renders twice and adds additional quality. SpeedTree Self Shadowing is a part of a new 3D vegetation modelling system that is aiming to render trees more efficiently and with a built in level of detail (LOD) optimization. SpeedTree Self Shadowing is currently only working on the track Mount Washington. I recommend having these three settings disabled as we don't spend that much time looking at tree foliage around the track when we race and even if the visual difference is noticeable, it's not worth it. Enabling these setting can be very costly at locations like Nürburgring Nordschleife and Hungaroring due to its large vegetation and trees around the track.

Cockpit Mirrors Max

High to very high performance impact evenly on both the CPU and GPU, when enabled this is a major resource hog and iRacing have continuously tried making this feature more efficient but it's still quit a pain in performance and also to handle. The disabled mirrors are blacked out and when enabled they are based on a priority scheme, left mirror first, then rear view mirror, then right mirror and lastly other mirrors like computer screens in some cars. If the virtual mirror, more info of that soon, and cockpit mirrors are enabled at the same time, the rear view mirror is lowered in priority to be after the side mirrors.

Depending of what car we drive and the number of mirrors that the car has and the scheme of the mirrors priority this is a feature that can be tricky to optimize, especially when using monitors. In VR it's a bit easier because we can see all the mirrors when looking around inside the car and the priority is less important. When 1 mirror enabled the frame rate is reduced by around 15%, 2 by 20% and 3 around 25%.

My recommendation is having Cockpit Mirrors Max set to 2 meaning our closest left side mirror and rear view mirror are enabled and if we are using the virtual mirror our right side mirror will automatically be enabled instead of the rear view mirror. If our PC can handle it and for the sake of realism we can go for a higher number for sure but to be fair mirrors are less needed in VR as we easily can look over our shoulders for other cars and also have our in-game sound rotating with our head movement helps out to.

Higher Detail In Mirrors

Very high performance impact evenly on both the CPU and GPU, this is another bad boy in terms of killing frame rate, this feature determines the rendered quality shown in our mirrors and it nearly adds 10% loss in frame rate for each mirror so I strongly recommend having Higher Detail In Mirrors disabled as it's not worth it.

Headlights

Low to medium performance impact evenly on both the CPU and GPU, this affects the cars that have headlights and if these are enabled the lights are visible during racing at late afternoons, nights and sunrises. This feature has been revamped since the introduction of day/night transitions, the headlight beam is now more procedural and move with the pitch/roll of the car and the brightness level have generally been increased. Headlight beams locks very cool in VR so my recommendation is having Headlights enabled at low detail setting.

I really can't see any visual differences between the three detail settings and I have done extensively testing with many different cars, it could be some small antialiasing involved and also some more shadows but I am not sure. Either way we don't want to waste performance on features that don't make any obvious visual difference. A little note here, if we disable headlights we still have the ability to flash our headlights so that feature is separate. If we want we can make an adjustment in the

display rendererDX11.ini file in use to enabling monochrome headlights. This will make all cars headlights to render as white lights providing a bit less banding and saving performance.

```
ShaderQuality=3                         ; 0=low, 1=med, 2=high, 3=max
HeadlightLevel=2                        ; 0=low quality, 1=medium, 2=high quality. *** -1=disabled ***
ParallelSorting=1                       ; 0=disabled 1=multithreaded scene sort
MonochromeHeadlights=0                  ; 0=color headlights 1=all white (less blotches/banding)
HeadlightsInMirrors=1                   ; 0=off 1= headlights illuminate track surface in mirrors
LoadTexturesWhenDriving=1               ; 0=only load when out of car
NumMultiGPUs=1                          ; Number of GPUs in Crossfire/SLI (1=off to 4). Set low as works.
```

Headlights on track in mirrors

Low to medium performance impact evenly on both the CPU and GPU, when enabled this feature we will at late afternoons, nights and sunrises see rendered headlight beams from other cars onto the track surface in our mirrors. It does not control the headlight itself as many believe and it could be useful to see other cars headlights beam lightning up the track surface especially at corners. As this happens in our mirrors I recommend having Headlights on track in mirrors disabled as it can be costly performance wise.

Virtual Mirror FOV

Medium to high performance impact evenly on both the CPU and GPU, this feature gives us a rear facing mirror placed at the top of the screen and by pressing “Alt + K” we can move the virtual mirror to the position we want and that can be helpful in VR. The virtual mirror is a little bit more friendly in terms of performance impact compared to the rear view mirror but it’s important to dial in a FOV in the setting to the right that preferably is as low possible.

Many VR users report that a FOV number around 45 or less is helping a lot with the frame rate. The lower the value the closer other cars are in the mirror and the opposite when raising the value. If we dive into the display rendererDX11.ini file in use we can also adjust the size of the virtual mirror by changing the values in the line “VirtualMirrorSize=1”. I can’t make a recommendation here whether we should enable or disabled the virtual mirror as it’s all about personal preferences.

```
[Drive Screen]
UIOffsetBottomPct=0                     ; Shift bottom of UI up by specified percent
VirtualMirrorSize=1                     ; Size of virtual mirror, 0-large, 1-med, 2-small, 3-X-small, 4-XX-small

[User Options]
DriveUIFullScreen=0                     ; Let triple headed driving UI expand to fill full display
DriveUIMaxAspectRatio=1.800             ; Adjust driving UI maximum aspect ratio up or down
```

Motion Blur

Medium to high performance impact mainly on the GPU, this is a post processing effect that can be used when racing but is more used in replays for making fancy screenshots. The problem in VR having motion blur enable when racing besides it can be resource intensive is that we are getting motion blur effect for moving our head around and that is not very realistic, but some users like it. This effect is since the 2020 season 1 build update reduced slightly in the VR environment but despite that I recommend having Motion Blur off.

Anti-Aliasing

Low, medium and high performance impact mainly on the GPU. Here we got two settings to choose from, FXAA (Fast Approximate Antialiasing) and SMAA (Subpixel Morphological Antialiasing). These post processing effects aims to smooth out edges of objects on the screen. FXAA compared to SMAA is significantly more GPU efficient but the big downside is that FXAA makes everything look blurry. Even with sharpening enabled we can't differentiate the blurred effect completely.

SMAA will do better job and clean up the rendered scene but to a cost of an even larger performance hit. IRacing standard AA is more efficient right out of the box for us VR users so my recommendation is having Anti- Aliasing disabled. There are two settings in the display rendererDX11.ini file in use that can make FXAA seems less blurry to an additional hit in frame rate. We can try reducing the numbers in the lines "FXAAQualityEdgeThreshold=166" and "FXAAQualitySubPix=75".

```
SharpeningClamp=9                       ; sharpening clamp (0=min, 10=default, 100=max)
SharpeningAmount=125                    ; sharpening strength (10=min, 125=default, 300=max)
SMAA=0                                  ; 0=off, 1=Subpixel Morphological Antialiasing enabled
FXAAQualityEdgeThreshold=166            ; 333=too little(fast),250=lowqual,166=default,125=highqual,63=overkill(slow)
FXAAQualitySubPix=75                    ; aliasing amt (100=soft,75=default,50=sharp,25=low,0=0ff)
FXAA=0                                  ; 0=off, 1=FXAA enabled
Sharpening=0                            ; 0=off, 1=sharpening enabled
SSAO=0                                  ; 0=off, 1=screen space ambient occlusion enabled
```

Sharpening

Low to medium performance impact mainly on the GPU, sharpening helps the antialiasing and enhances the edges and reduces blurriness and this drastically improves clarity. If we want we can make an adjustment in the display rendererDX11.ini file in use and the line "SharpeningAmount=125" to a lower or higher number that decrease or increase the sharpening effect. We can also fine tune it even more by changing the line "SharpeningClamp=9" to preferably a higher number that to my understanding adjust the maximum percentage that each pixel can change. This is a great feature in VR and I strongly recommend having Sharpening enabled.

```
NumDynamicCubemaps=0                    ; number of dynamic cubemaps to render per frame(100 = 1/frame)
ReplayRenderModes=0                     ; 0=off, 1=Replay Render Modes enabled
Distortion=0                            ; 0=off, 1=Distortion enabled
SharpeningClamp=9                       ; sharpening clamp (0=min, 10=default, 100=max)
SharpeningAmount=125                    ; sharpening strength (10=min, 125=default, 300=max)
SMAA=0                                  ; 0=off, 1=Subpixel Morphological Antialiasing enabled
FXAAQualityEdgeThreshold=166            ; 333=too little(fast),250=lowqual,166=default,125=highqual,63=overkill(slow)
FXAAQualitySubPix=75                    ; aliasing amt (100=soft,75=default,50=sharp,25=low,0=0ff)
```

HDR

Medium to high performance impact evenly on both CPU and GPU. Today's VR headset are mostly equipped with Standard Dynamic Range displays (SRD) and not with High Dynamic Range displays (HDR) but this feature works in VR anyway, with some limitations. We don't have enough dynamic range to see a significant difference but we can notice some visual improvement. Examples are bloom of bright objects such as rear brake lights at nights and higher contrast and colour saturation overall, how much depends on the rendered scene. We can see more of HDR elements at day/night transitions and when staring at the sun or when cars spin out and generate a lot of tire smoke.

My recommendation is having HDR disabled anyway because of the rather big loss in frame rate and the diminishing returns in visuals. It helps to have a lot of GPU memory to have HDR working properly.

Video mem swap high-res cars

When enabled the 3 closest cars when racing will render with higher quality textures and other with lower resolutions. This saves GPU memory usage as it uses onboard RAM instead but I can't see any real benefits of having this option enabled as we VR users have enough GPU memory installed around 4GB and more. It also can't be good to have car textures be swapped in and out between system RAM and video memory creating some latency and in worst cases resulting in flickering cars. I recommend having Video mem swap high-res cars disabled.

2048x2048 car textures

Low performance impact evenly on both the CPU and GPU, this feature bumps up the resolution of car paints from 1024x1024 pixels to 2048x2048 and this greatly enhances how the car paints look. For an even better result we can visit the display rendererDX11.ini file in use and the lines "CompressTexturesSuits=1", "CompressTexturesHelmets=1" and "CompressTexturesCars=1" and change the values to "0" instead of "1" so the textures are uncompressed. IRacing staffs says that this feature and the changes in the ini.file does not affect frame rate it, just makes iRacing consumes more video memory, up to around 1GB in a 60 car race. I recommend having 2048x2048 car textures enabled and also do the changes in the ini file.

```
HeadlightsInMirrors=1                    ; 0=off 1= headlights illuminate track surface in mirrors
LoadTexturesWhenDriving=1                ; 0=only load when out of car
NumMultiGPUs=1                           ; Number of GPUs in Crossfire/SLI (1=off to 4). Set low as works.
CompressTexturesSuits=1                  ; 0=uncompressed   1=block compress (recommended)
CompressTexturesHelmets=1                ; 0=uncompressed   1=block compress (recommended)
CompressTexturesCars=1                   ; 0=uncompressed (warning! no!!)   1=block compress (highly recommended)
CompressedVertices=1                     ; 0=off  1=Use compressed vertices
ReduceCockpitFlicker=1                   ; 0=off  1=enabled
CarPaint2048x2048=1                      ; 0=1024x1024 car textures res,  1=2048x2048 car texture res (max)
```

Hide car numbers

This feature will enable us to paint over the car numbers and decal areas with our own graphic during a testing session and have nothing to do with the performance so personal preferences.

Distortion

Low to medium performance impact mainly on the CPU, this adds the ability for particles to distort the image they are rendering on top of, that means that some visuals elements around the track look a bit more realistic and not so cartoonish. I recommend have Distortion disabled as we don't want to waste our VR performance on a feature we hardly notice when racing even if it's a good one.

Heat Haze

Medium performance impact mainly on the GPU, this effect aims to create the appearance of heat shimmer, a visible distortion in the air and this effect is tied into the ambient and track temperatures. My recommendation is having Heat Haze disabled because sure it adds realism but in VR compared to monitors the effect is hardly noticeable due to the resolution and the pixel density of today's VR headsets.

SSAO

Very high performance impact mainly on the GPU, Screen Space Ambient Occlusion (SSAO) is another frame rate destroyer and is an alternative to the more standardised Ambient Occlusion. This setting is aiming to generate depth in our rendered scene by adding ambient light and soft shadows but it´s not worth the very subtle differences it makes. It does make the inside of our car a bit more realistic but my recommendation is having SSAO disabled, perhaps it will become more relevant and optimized in the future.

Additional ini.settings

There are more iRacing tweaks to do under the hood in the iRacing folder that are not related to any in-game graphic option and the first to try is in the display rendererDX11.ini file in use and the line "VisibilityFrameDelay=5", when changing this to "0" we could eliminate some stutters and gaining some FPS especially when cornering at large road courses according to iRacing staff.

```
CarPaint2048x2048=1                     ; 0=1024x1024 car textures res,  1=2048x2048 car texture res (max)
CacheSwap3HighResCars=1                 ; 0=shrink to fit  1=cache swap higher res for nearest cars
WorldNearPlaneDistance=10               ; In 1/10 meters, min=1(0.1m) max=30(3m), helps z-fighting but may clip track.
VisibilityFrameDelay=5                  ; Number of frames to wait before re-testing object visibility. 0 = no delay
AAQuality=0                             ; 0=low - 0=max (GPU & AASamples specific)
AASamples=4                             ; 1=off, 2, or 4 - num samples
MipLODBias=0                            ; % bias texture lookup 100 is a mip level, positive is blurry, negative sharp
```

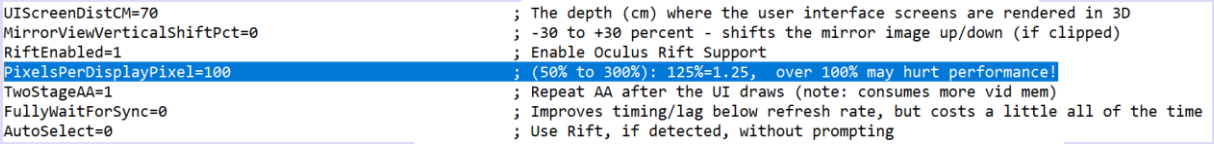
The second "showJoinLeave=1" is located in the iRacing app.ini file and controls if we want to see a message when members enter/leave sessions. This can cause stutters especially when their car is added to the sim with its paint and even if iRacing staff have been addressing this issue it's not completely solved so give this a try. Changing the value to "0" will stop the messages.

```
irsdkLog360Hz=0                         ; Log some telemetry at 360 Hz rather than at 60 Hz
irsdkLogSetup=1                         ; Log the current setup to telemetry
showIncidentMessagesWhileDriving=1      ; Show Incident messages while driving
showJoinLeave=1                         ; Show player join/leave messages
showSysMessagesWhileDriving=1           ; Show system messages while driving
showUserMessagesWhileDriving=1          ; Show user chat messages while driving

[Overlay]
```

The third to try is in the display rendererDX11.ini file in use and the line "PixelsPerDisplayPixel=100" for Oculus users and this one is widely debated. When increasing the pixel density value it will make scenes being rendered at a higher resolution and being super sampled before being down sampled to be displayed in the VR headset. When decreasing the pixel density to a value below the default

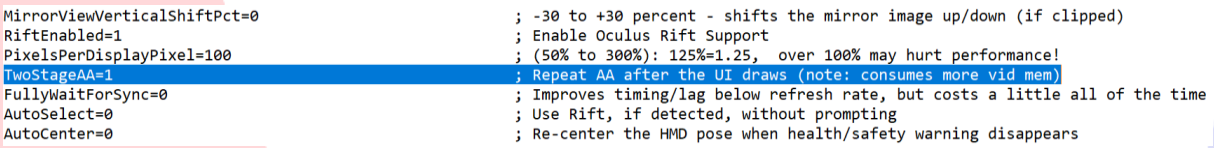
settings it's costing us in resolution in the centre of our view and iRacing staff says that that can be an acceptable compromise for gaining frame rate at some circumstances. Mostly this setting is being used to improve the visual quality and not the opposite and the reason is that this noticeably help with the overall image quality and antialiasing, especially with text on the screen and on the in car dashboard. Downsides are that changing the pixel density is less beneficial than the in-game antialiasing setting and VR users report that any value above the default can cause artefacts and not making any differences, it's just a matter of placebo.



Other VR users report significantly improvements in the image quality by changing the pixel density and a value around 130 seems to be a sweat spot and working great, so this is a mixed bag and it's highly in conjunction to what hardware we use. Changing the pixel density is very resource heavy mainly on the GPU and as an example by changing the "PixelsPerDisplayPixel=100" to a value of 130 adds around 17% loss in frame rate loss right off. Increasing the pixel density is definitely worth a try and digging more into just be careful that your computer can handle it.

The fourth is an option called "TwoStageAA" and this setting is enabled by default and staff says that this option run antialiasing on the UI elements and runs a second pass of antialiasing on the scene after all of the post processing effects are run. The reason for this option was added was because of optimizing changes of how the SDR and HDR scenes was functioning in VR.

This caused the UI elements to not have any antialiasing and also degrading the antialiasing of the rendered scenes. When enabling this option it will add that antialiasing back and if we are low on VR resources or want to save some performance we can disable this option by changing the prefix value to "0" instead of "1", but that will result in less antialiasing and a lot of jaggy triangle edges in the rendered scenes.

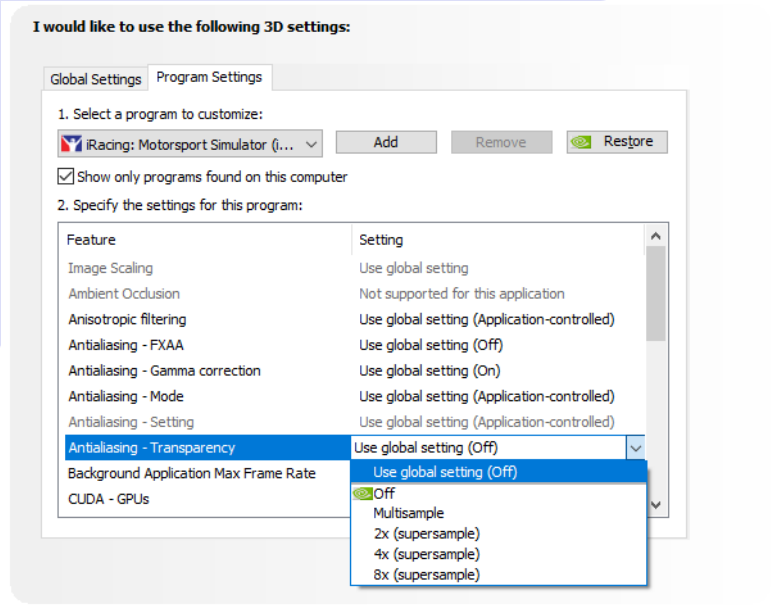


Nvidia settings and general tweaks

Moving on into the Nvidia control panel settings and the profile for iRacing, not the global ones, AMD users can for sure find correspondent settings in their menus but I am unfortunately not able to look more into that. Some settings we change here override those corresponding we set in the in-game graphic settings and I just go through the ones I suggest we change and leave the others default.

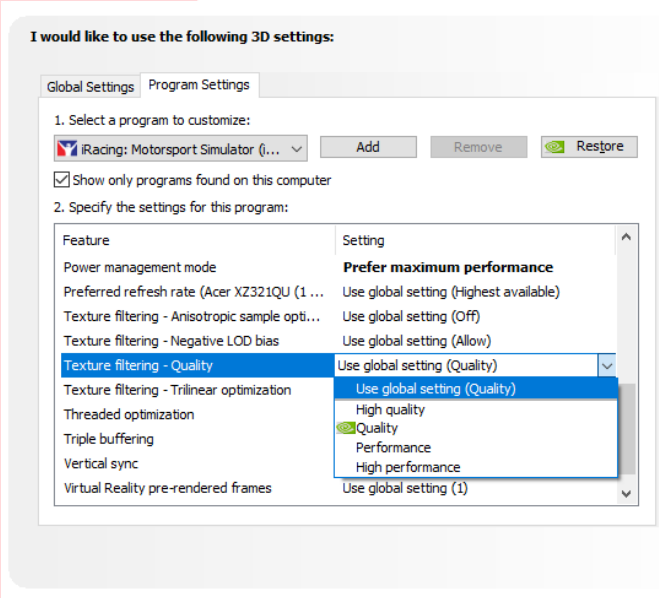
AA Transparency

Try change this from off to either Multisample or Supersample 2x and more for reducing shimmering from antialiasing. This stop edges on semi-transparent parts of the scene like fences, track lines trees etc. and it works great but is very costly on the GPU. Multisample can be a good choice to start with.



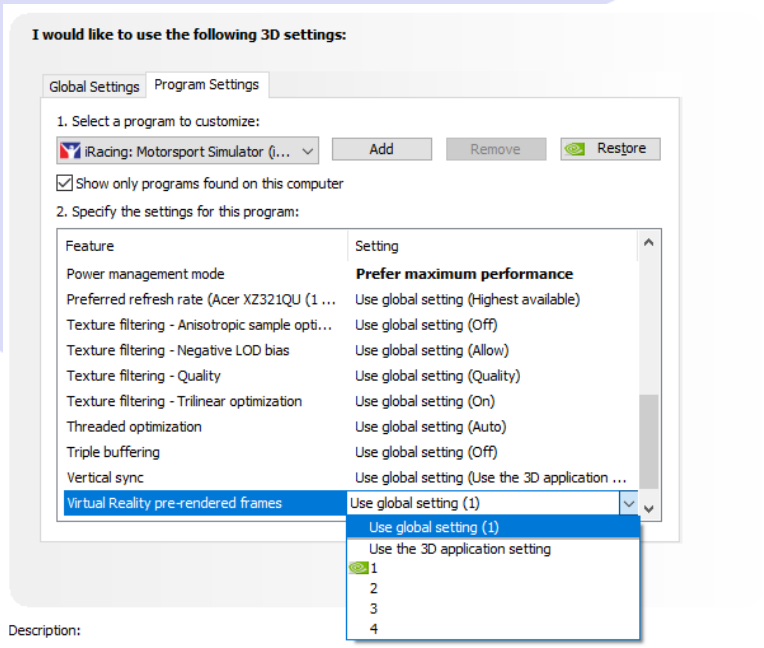
Texture Filtering

Change from Quality to Performance or High performance as we won't notice the difference in VR and it will give us some free resources.



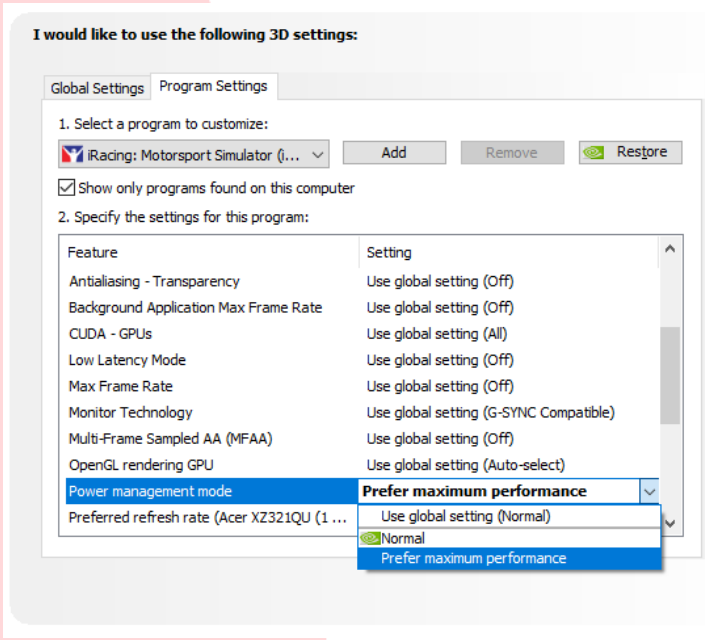
Virtual Reality pre-rendered frames

Set this to either “2” or “3” instead of “1”, this has the impact of much faster rendering and really smoothing of the image and scene in VR. There is some added latency which is a bad thing but not something we will notice too much when racing and this is definitely a setting to try out.



Power management mode

Change from Optimal power to Prefer maximum performance, this locks the GPU into a higher voltage and higher clock state and will not lower itself into idle or a low power mode during racing. We want the best performance available to eliminate random frame rate dips.



Variable Rate Supersampling

Variable Rate Supersampling (VRSS) is an Nvidia feature that dynamically apply up to 8x Supersampling to the centre of the rendered VR screen. Compared to alternative techniques that super sample the entire screen this will theoretically improve the performance but iRacing is to this date not officially supported. The third party app Nvidia Inspector can be used to enable this feature in some basic regards and VR users report that it can have visual and performance benefits but others report the opposite so this setting is a mixed bag in current state.

Uninstall the GeForce Experience

We actually don't need this and VR users report that having this enabled can cause frame stutters due to its processes taking up CPU and RAM resources to a level that is not acceptable. Remove it from the Windows add/remove programs in the control panel or when we manually install a new Nvidia driver by just select custom install, clean install and unchecked GeForce Experience.

Use DDU when updating GPU drivers

Display Driver Uninstaller is a driver removal tool that help us completely remove AMD and Nvidia GPU drivers from our system without leaving leftovers behind such as registry keys, folders and files. Over time these leftovers can cause compatibility issues such as drivers failing to install and reducing performance or system crashes/freezes. By using DDU we can remove these leftovers and solve many common issues related with GPU drivers. It also got an option to uninstall the GeForce experience which is a good thing.

Disable Windows 10 Game Mode

Game Mode is a feature in Windows 10 that focuses system resources on games when enabled but is not currently very VR friendly. Make sure this feature is disabled as it lowers our overall performance and it seems to starve important processes and causes massive stuttering.

Disable SysMain Service

Since Windows 10 update 1809 the renowned Superfetch and previous prefetch service was retitled to SysMain. This service keeps track of which applications we use most and loads this information in RAM so that programs load faster than they would if the hard disk had to be accessed every time. We want this to be disable because it creates issues like high CPU and hard disk usage and can cause frame stutters when racing. Press "Win + R" shortcut keys on the keyboard to open the Run dialog and type "services.msc" and find the SysMain service in the service console list. Double click on the service to open its properties and under start-up type, select Disabled and click on the Stop button if the service is running, Apply and click Ok. After doing bigger Windows updates the SysMain service can automatically be enabled so keep an eye on this one.

Disable ASW/AR/MP and Motion Smoothing

Asynchronous Spacewarp (ASW) for Oculus users, Asynchronous Reprojection (AR) for SteamVR users and Motion Reprojection (MP) for Window Mixed Reality users are settings aiming to get iRacing run smoothly without causing motion sickness. If we occasionally are dropping frame rate to below the value that our VR headset are specified running at, these settings kick in and fills in frames that can't be rendered in time.

SteamVR Motion Smoothing improves upon the previous Asynchronous Reprojection (AR) but the downside is that these settings are very aggressive and can drop the frame rate at the slightest hint of limited performance headroom. These dips can create frame stutters, judders and visual artifact which is not a nice thing to have. ASW/AR/MP and Motion Smoothing can work fine in many PC games but in iRacing It's well known that it has compatibility issues with the interpolation. I highly recommend disabling these settings as we are racing a high pace sim and the overall consistency in frame rate is important. Even if we don't or do reach our specified refresh rate of our VR headset we want the door locked for ASW/AR/MP and Motion Smoothing.

Happy VR racing everyone!