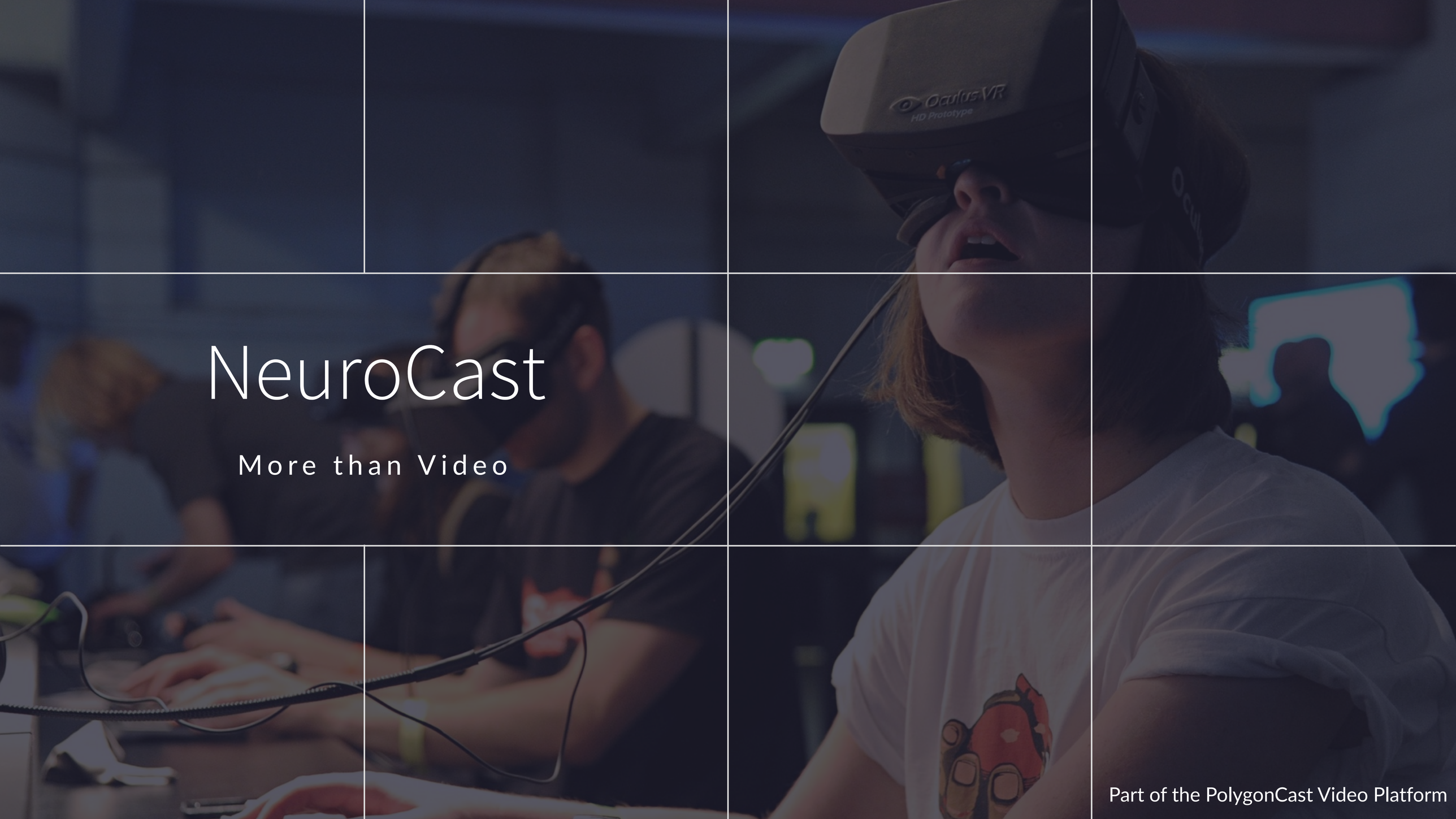


NeuroCast

More than Video

Part of the PolygonCast Video Platform

State of the 360 video industry

FOV Selective Playback

Depending on content type and viewing angle, NeuroCast can **save 58-82% of bitrate and bandwidth** compared to other 360 video streaming solutions.

How the playback is handled

360 video playback is still done in a very rudimentary manner. In order for the viewers to get the experience of “being in the center of the action”, the content is mapped onto a geometrical shape (usually a cube or sphere), at the center of which the camera is then placed. Said content is first squished into a standard 4K or 8K framework and then spread over the entire sphere or cube. Regardless of where the user is currently looking, every single pixel of the content is downloaded and played back.

Horrendous QoE

The majority of machines belonging to end-users are incapable of playing back 8K video. Same goes for the internet connection, which severely strains under the load. Even if the user is capable of downloading and playing back the content, the time to first frame is very high. Most viewers “rage-quit” before an 8K 360 video starts playing back. As a compromise most companies employ a tactic of starting the playback at resolutions like 240p and then scaling up. With 360 video, this gives the viewer incomprehensible viewing quality.

Excessive quality requirements

Since the content needs to be mapped onto a geometrical shape and the user’s full FOV can only register a fragment of it, the quality requirements skyrocket. The current minimum for a satisfactory QoE is 8K. Anything less and the user gets highly pixelated and blurry content.

Wasted horsepower

There is no method of restricting the content being played back in high quality to just the viewer’s FOV. This means that even 80% of bandwidth and hardware power go to downloading, rendering and playing back in HD something that is never even seen. It’s impossible even with standards like DASH.

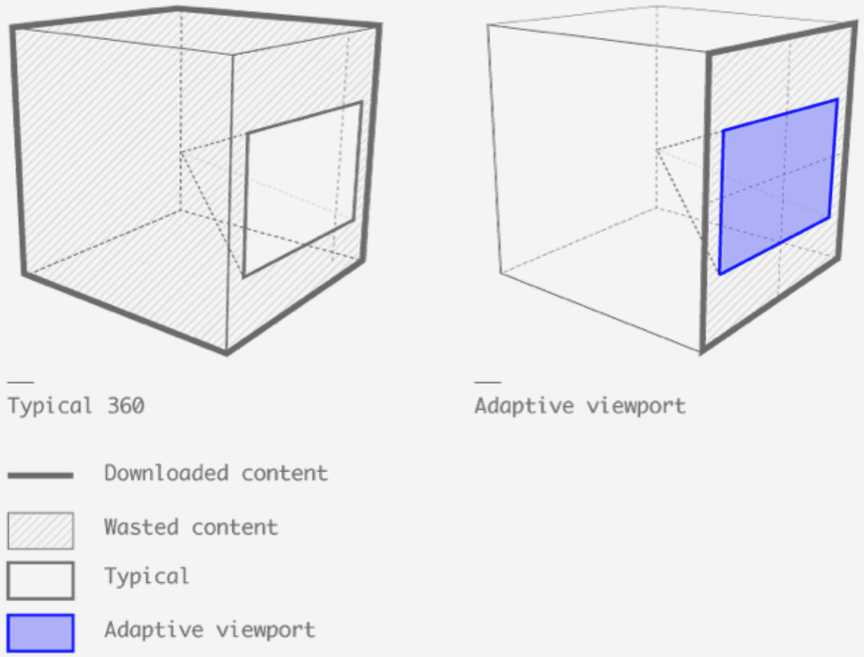
Due to rudimentary handling, 360 video playback severely undermines the experience for most viewers!

The Adaptive Viewport

NeuroCast is based on the adaptive viewport. It's an interface through which users can interact with video or data being provided. It consists of sub-entities which can be dynamically created to display a given stream of data and work concurrently.

With the NeuroCast workflow, the video is divided into a grid (AdaptiveGrid) of videos upon upload, effectively splitting the original content into several smaller ones. These are then streamed, mapped onto a required shape (cube, sphere, etc) and played back concurrently. The difference is only the fragments of the grid which are currently viewed by the user are streamed and played back in high quality. The parts of the video that are not visible can be streamed in low quality or even omitted.

This allows to stream only a fraction of the content and manage bitrate a lot more effectively.



Adaptive Grid

Once the video is divided into a grid, it can be mapped to most of the current market standards, such as the cube or the sphere. It will retain full functionality regardless of final mapping. While NeuroCast supports all common market standards when it comes to mapping content, we strongly encourage using cube mapping (e.g. https://code.facebook.com/posts/1638767863078802/under-the-hood-building-360-video/)

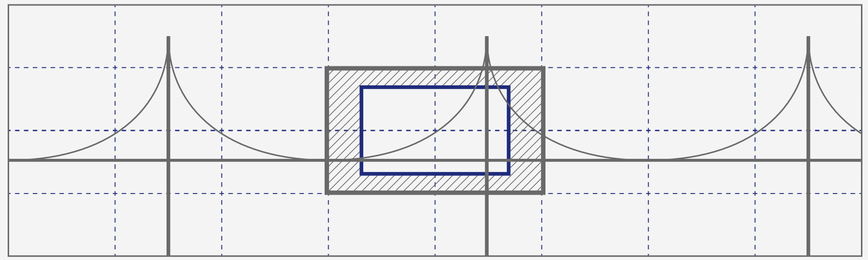
Static Equal & Static Focused Grid Types

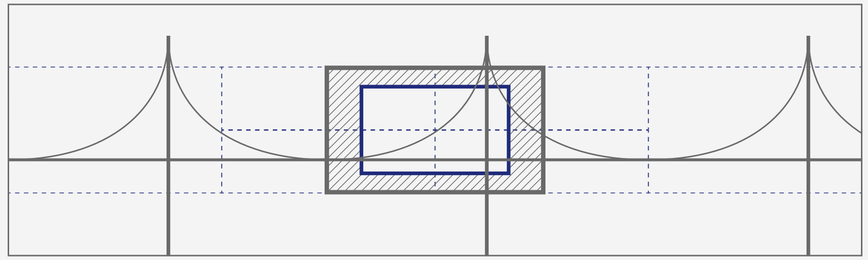
Statict Equal

Upon upload, the video is divided into a grid composed of equal parts, which are dynamically stream and played back depending on the user's FOV and center of attention. The parts of the grid not currently in the FOV can be streamed in LQ or omitted.

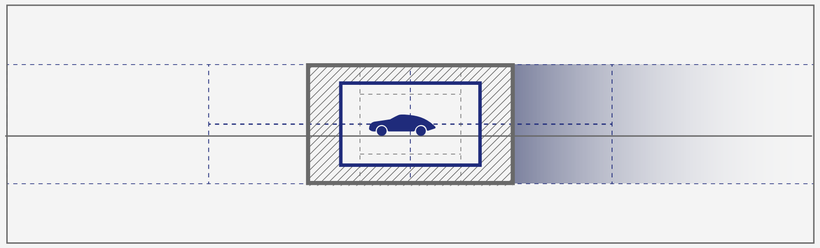
Static Focused

The grid is divided into parts that are not equal. The center parts, which contain the most dynamic content, are handled via a higher number of grid fragments. Since most static content in a 360 video is located either at the top or at the bottom, these parts are handled by a single grid fragment.



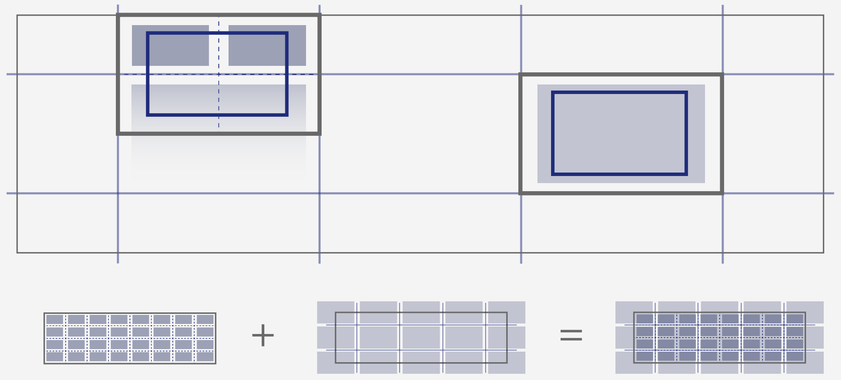


Dynamic Focused & Composite Grid Types



Dynamic Focused

Most of the grid fragments are focused of the most dynamic parts of the content provided. The grid follows the action, providing ultra high quality in anticipation of the viewer’s shifted focus.

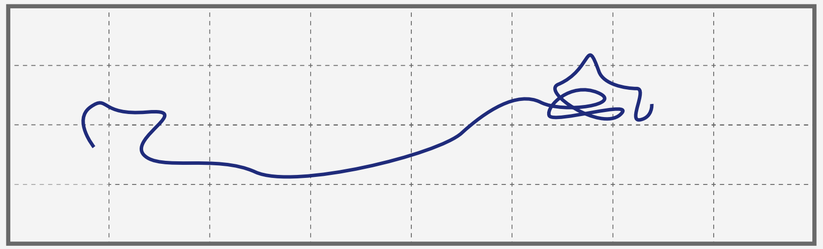


Composite

Several grids and grid types can be layered onto each other, e.g. several dynamic focus points can be layered with several dynamic grids, providing high quality playback of multiple interesting parts of the 360 video while retaining the functionality of not downloading the parts outside of the FOV.

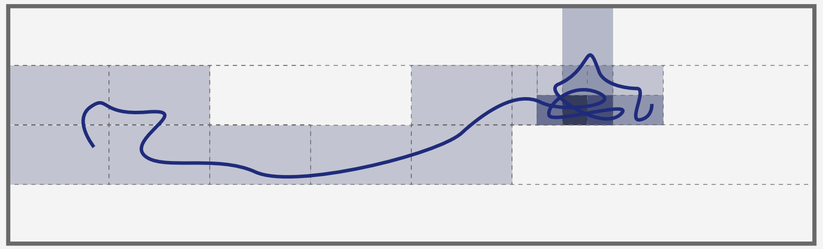
Behavioral & Predictive Grid Types

Still in development - Coming Soon!



Behavioral

Automatically implementing what heat maps allow to discover, the video is divided with grid focus points being placed on parts that attract the most viewer attention based on prior viewing experiences.



Predictive

Combining the above two, this grid model will allow to dynamically optimize the grid layout even for recently uploaded content. The layout will automatically update itself based on recent user behavior and the video content itself, as well as patterns from related content and overall usage statistics/heat maps etc.

Additional Features: Stability & Ease of Use

Multiple Transport Technologies

When it comes to video streaming MPEG-DASH has introduced native support for multiple CDNs at the protocol level through Base URLs. It allows broadcasters to diversify risks and provide additional (backup) CDNs that would help keep the perfect user experience no matter what. This is a much more scalable solution than serving your clients different HLS playlists to basically achieve the same result.

NeuroCast takes this idea a step further. It expands video streaming to data streaming. And with that it provides support for multiple delivery technologies at a per stream or per grid fragment definition level. This means that the same clients can download audio via HTTP servers from different CDNs and download video streams via a mix of WebRTC (Server to Client UDP), P2P (client to client UDP) and HTTP or QUIC.

Emergency Fallback

Whenever an error with the Grid system occurs, NeuroCast will dynamically fall back to a standard 1x1 Grid (streaming the entire content) with a HLS/DASH workflow, which is the currently agreed upon market standard with wide support in browsers, workflows etc.

Dedicated Workflow

NeuroCast is being developed as an end-to-end solution. It currently supports a complete workflow, which, as soon as 360 video content is uploaded, will automatically apply the Grid system. The video will be divided into smaller videos ready for concurrent streaming, which will then be mapped accordingly onto a shape of your choice and streamed to viewers. Feel free to provide your own content to fully test the solution.

Additional Features: Viewer Experience

Still in development - Coming Soon!

Natural Blur

Accommodation is the natural way of the vertebrate eye changing optical power to maintain a clear image or focus on an object. Whenever a drastic shift in focus occurs, the human eye requires a small amount of time to regain it’s composure and properly focus on the new environment being processed.

NeuroCast builds on this natural phenomenon to ease the transition between Grid elements which are displayed in HQ and those displayed in LQ (or even omitted).

When content is loaded, every Grid fragment apart from the viewer’s FOV is blurred. This becomes the baseline. When the user switches his focus onto a new Grid fragment, instead of a pixelated image or simple blackness, he sees a blurred outline of this fragment. It then comes into focus as HQ frames are loaded, while the previous Grid fragment is blurred and switched to LQ.

Dynamic Content-Related Grid

The grid’s focus point (place where there is a high concentration of grid elements) is dynamically adjusted based on what’s going on in the video without having to be pre-defined. Places with high concentration of dynamic events will be more tightly gridded than e.g. the bottom portion.

This is especially useful for enabling and streamlining user uploaded 360 content without the need for pre-processing and defining where each Grid element should be located.

It can also server as an error correction mechanism, when the Grid type assigned to the given video turns out to not be optimal.

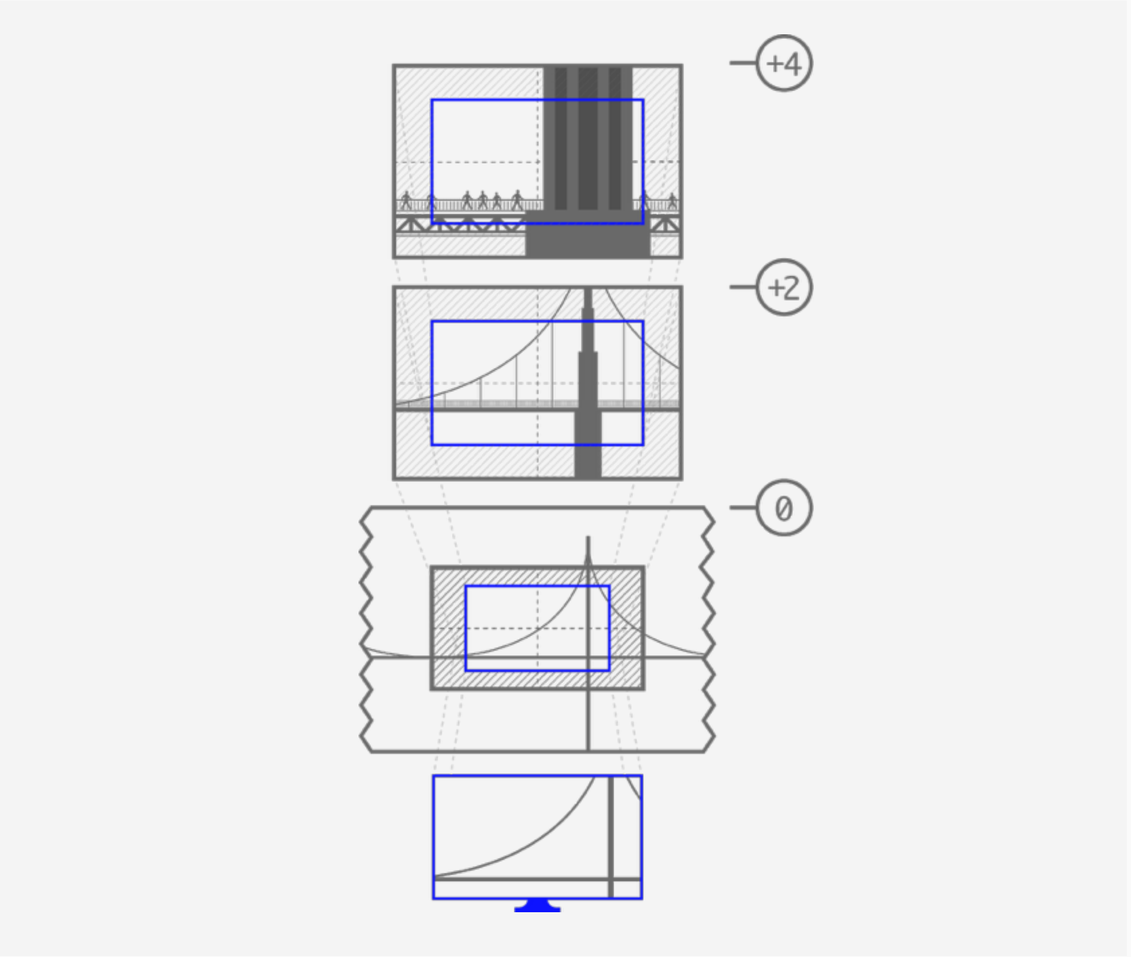
Grid Potential

Zoom & Enhance

It’s an often overused crime drama trope - the only thing the good guys have to go on is a very general picture or video. But by crowding around a computer and uttering the magical phrase “zoom & enhance”, they can get crystal clear images of the bad guy’s face, his license plate and the engraving on the button of his jacket.

With NeuroCast, this can become a reality. The Grid doesn’t have to apply just to 360 video. A standard 2D video can also be divided into elements. And these elements can dynamically become independent videos.

E.g. the viewer starts watching a video that’s recorded in 8K. Since his machine isn’t a hardware titan, the video quality gets downscaled to 1080p. Then we divide it into 4 concurrent videos. The viewer sees something that catches his eye and decides to zoom in on it. 1 of the 4 videos gets zoomed in and takes the place of the previous, bigger one. Then it gets enhanced to 1080p and divided into 4 concurrent videos again. This can be repeated indefinitely, as long as the quality of the source content (e.g. 8K) lasts.



Preliminary Results

3xQuality
3xCapacity

From our preliminary testing, depending on content type (e.g. dynamic vs static) and viewing angle (how many grid elements are being simultaneously viewed), NeuroCast can save 58-82% of bitrate and potentially bandwidth compared to even the most recognizable 360 video streaming solutions on the market.

With NeuroCast you triple the quality of the content your viewers receive or triple your effective 360 video audience without upgrading your infrastructure. It also drastically lowers the 360 video entry point, allowing viewers with slower internet connections and less powerful machines to also enjoy 360 content.

Want to talk more? Contact us at contact@polygoncast.com

Thank you for your interest

NeuroCast is part of the PolygonCast Video Platform.

We are always happy to answer any questions you may have.

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