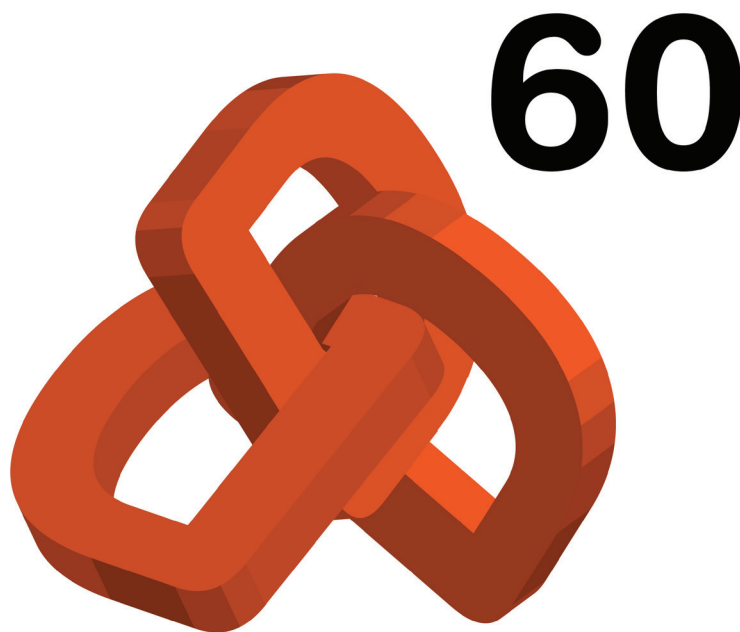# DDD60

High Quality VR for Film TV Industry Professionals

GUIDELINES FOR MASTER FILE CREATION OF 360° FILMS

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List of Acronyms

OMAF	Omnidirectional Media Application Format
VR	Virtual Reality
VoD	Video on Demand
VRIF	Virtual Reality Industry Forum

1. Introduction

The purpose of the guidelines presented in this document is to help Virtual Reality (VR) and 360° content providers to prepare master files with the highest possible quality for submission to film festivals, film markets, online Video-on-Demand (VoD) platforms, or archiving systems. Master files produced according to these guidelines will enable service providers to generate compressed versions for high quality screenings to target viewers.

This document includes a set of recommendations on video and audio parameters, exporting formats, and file formats or containers. These guidelines have been created as part of the DDD60 project, and are the result of the collaboration between the project partners that include media technology companies and film festivals and markets, and content creators and artists.

The guidelines presented in this document are aligned with those provided by the VR Industry Forum (VRIF) group to facilitate the creation of next generation VR applications, and meet the specifications given in the Omnidirectional Media Application Format (OMAF) standard.

The document can be subject to changes if new formats or media parameters become popular for content providers.

2. Master File Creation

The master file with multimedia VR and 360° content is the highest-quality file that can be obtained after post-production. The quality of the original master content depends on the artistic and technical resources utilized in the production (camera) and post-production (stitching, color grading, editing, exporting software) workflows.

In order to preserve the original quality of the content, the master file should have the less amount of transcoding operations possible, and should be either uncompressed or lightly compressed with post-production codecs, such as ProRes or Cineform.

The set of preferred video and audio parameters, codecs, and formats listed in the next sections mostly fulfills the common working procedure for VR content creation. However, for further details or questions, the reader can be referred to the VRIF guidelines or contact the authors of the document.

2.1. Video Parameters

Bit Depth
In order of preference
12-bit
10-bit

Color Sampling
In order of preference
4:4:4
4:2:2

Color Space
ITU Rec. 709
(gamut levels within the threshold defined by EBU R103)

Frame Rate
In order of preference
100 / 120 frames/s
75 / 90 frames/s
50 / 60 frames/s
24 / 25 / 30 frames/s

Video Codec
In order of preference
ProRes (422HQ or 4444)
Cineform
DNxHD
DPX
TIFF

Scan
Progressive

Resolution Mono
In order of preference
Beyond 8Kx4K
8Kx4K: 8192x4096
6Kx3K: 6144x3072
4Kx2K: 4096x2048

Resolution Stereo
In order of preference
Beyond 8Kx4K per eye
8Kx4K per eye: 8192x4096
6Kx3K per eye: 6144x3072
4Kx2K per eye: 4096x2048

Layout Stereo
Top-bottom (L-R)

Projection Format
Equirectangular with no visible stitching artefacts

2.2. Audio Parameters

Bit Depth

In order of preference
32 bit floating point
16 bit

Sampling Rate

48 KHz

Non-spatial Format (Mandatory)

In order of preference
7.1
5.1
2.0

Spatial Format (Optional*)

In order of preference
2nd order ambiX
1st order ambiX

Audio Codec

In order of preference
WAV
AAC

*Please, ask the service provider (e.g., the organizer of a VR/360° library for film festivals) for information about spatial audio support.

2.3. Container
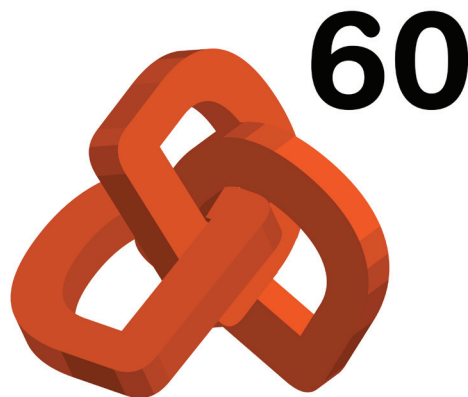
ProRes, Cineform, DNxHD

MOV

RAW

DPX
TIFF

2.4. Metadata

The MOV format includes metadata describing the projection method (equirectangular, cubemap) and the stereo-3D layout (top-bottom, side-by-side). This information can be embedded in the distribution file and conveyed for the decoding and rendering operations in the media player.

3. About the DDD60 Project

DDD60 is an Innovation Action project funded by the European Commission Horizon 2020 program. DDD60 will introduce cutting edge video compression and delivery technology to deliver high-quality VR content to Film and TV professionals. DDD60 will show immersive content in some of the leading Film and TV markets worldwide.
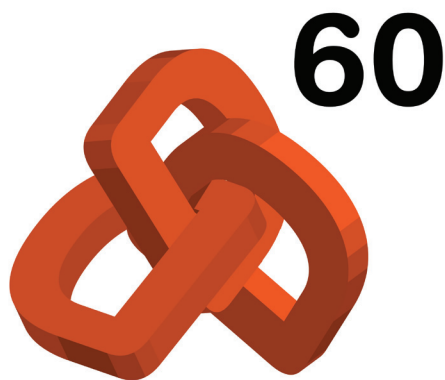
3.1. What is DDD60

One major obstacle for the distribution of VR content is the file size as high quality VR requires very high resolution video. And since the internet infrastructure does not grow as quickly as the size of VR files, content distributors, in an effort to minimize file size, have to greatly reduce the quality of the content they show online – if they can show it at all. In addition, storing big files is expensive, especially for the budget of creative industry SMEs.

DDD60 will greatly enhance the quality of VR content delivering online: By improving compression technology and transcoding mechanisms, the size of the files and the amount of information to be delivered through the internet will be reduced greatly, giving distributors the chance to deliver higher quality. And by improving storage and delivery workflows the efficiency and the cost for delivery will be reduced to an extent that will make the online screenings of VR content a viable business for European SMEs.

3.2. Partners

Reelport GmbH

Reelport GmbH has been working with film professionals online for 14 years. Its mission is to provide innovative and smart solutions that make managing film files and film data more effective and to contribute to the exposure of films worldwide. PicturePipe is a full range of VoD services for the film and TV industry. PicturePipe can upgrade any existing website to implement video-on- demand services, from uploading to streaming, including user registration, submission forms, quality control, viewing statistics, permission management, payment systems, advanced security features, etc.

Spin Digital Video Technologies GmbH

Spin Digital develops high-performance video codecs for the next generation of ultra-high-quality video applications. Spin Digital software solutions enable media applications that require the latest image and video processing enhancements including: very high resolution (4K, 8K, and 16K), high dynamic range, high frame rate, wide color gamut, and 360° video and virtual reality. Spin Digital core technology is a high performance and high quality HEVC/H.265 software codec (encoder/decoder). Based on this core technology Spin Digital has developed a complete solution that includes applications (media player and transcoder) as well as a SDK ready to be integrated into custom applications.

Sunny Side of the Doc

SSunny Side of the Doc is the international marketplace dedicated to documentary & specialist factual content, that brings together each year broadcasters, decision makers, distributors, filmmakers and producers from around the world to sell or buy projects and programmes, and to find co-production partners. The 4-day event creates unique opportunities for all +2,000 professionals from 60 countries, to follow the latest industry trends, make new connections and embrace new forms of storytelling through a variety of high-level pitching sessions, panel discussions and the added value of an exhibition space. The 29th edition will be held in La Rochelle from June 25-28, 2017.

Tampere Film Festival

The Tampere Film Festival is a short film festival held every March in the Finnish town of Tampere. It is accredited by the film producers' society FIAPF, and together with the short film festivals in Oberhausen and Clermont-Ferrand, it is among the most important European short film festivals. The first festival was held in 1969, and since 1970 it has been held in its current form, which makes it the oldest short film festival in Northern Europe. Approximately 500 short films are screened during the five days of the festival each year, and there are lots of seminars and other activities surrounding the festival. The festival gathers an audience of 30 000 each year. It is an important meeting place for film professionals and enthusiasts, as well as a traditional local event.

Marché du Film

The Marché du Film is the most important event of the film industry and the meeting point of more than 11,000 professionals, including 3,200 producers, 2,300 distributors, 1,500 sellers and 790 festival organizers. The 2016 edition has closed with a record in registrations, including 11,902 registered participants who attended the Marché du Film, with 1,747 buyers, a total of 5,201 companies and 3,450 films presented. From these titles, 1,426 films had screenings, 790 of which were market premieres. Also, many networking and business opportunities are available to the participants during the market through its Industry Programs. Amongst these programs, NEXT is the innovators' hub at the Marché du Film. It is both an exclusive venue that brings together creative companies as well as conference/screening rooms hosting a daily program of round-tables, workshops and screenings, all focused on the future of cinema. Since 2016, its VR theatre offers a curated selection of the best VR films on the market.

Sheffield Doc/Fest

Sheffield Doc/Fest is a world leading and the UK's premier documentary festival, celebrating the art and business of documentary and all non-fiction visual storytelling. Operating in the heart of the UK, we're a hub for all documentary and non-fiction content across all platforms, from feature length to shorts, and including interactive and virtual reality projects. The Festival comprises: Film programme for the very best international screenings; Alternate Realities for digital and interactive innovation; Talks & Sessions to inspire, inform and debate; Marketplace for international business; Live events and networking; All Year screenings and training for outside the festival period. Sheffield Doc/Fest returns 7-12 June 2018.

4. Useful Web Links

The Virtual Reality Industry Forum, "VRIF Guidelines"
http://www.vr-if.org/guidelines/

FFMPEG commands for uploading 360 videos with spatial audio to YouTube
https://francois.pitie.net/2016/05/05/360-audio-youtube-upload/

Youtube guidelines for 360 video:
https://support.google.com/youtube/answer/6178631?hl=en

Youtube: Use spatial audio in 360-degree and VR videos
https://support.google.com/youtube/answer/6395969?co=GENIE.Platform%3DDesktop&hl=en

Spatial Audio Formats:
https://www.vrtonung.de/en/spatial-audio-support-for-360-video-platform/

VIMEO guidelines for 360 video:
https://help.vimeo.com/hc/en-us/articles/115001877167-Uploading-360-video

Jaunt Submission guidelines:
https://www.jauntvr.com/creators/submissions/guidelines/

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