



Recommendation ITU-R BT.2154-0
(12/2022)

**High-level system architecture
for immersive video for presentation
on various types of display devices**

BT Series
Broadcasting service (television)



Foreword

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Series of ITU-R Recommendations

(Also available online at <http://www.itu.int/publ/R-REC/en>)

Series	Title
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P	Radiowave propagation
RA	Radio astronomy
RS	Remote sensing systems
S	Fixed-satellite service
SA	Space applications and meteorology
SF	Frequency sharing and coordination between fixed-satellite and fixed service systems
SM	Spectrum management
SNG	Satellite news gathering
TF	Time signals and frequency standards emissions
V	Vocabulary and related subjects

Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.

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RECOMMENDATION ITU-R BT.2154-0

High-level system architecture for immersive video for presentation on various types of display devices

(Questions ITU-R 140-1/6 and ITU-R 143-2/6)

(2022)

Scope

This Recommendation provides a high-level system architecture for immersive video to be presented on various types of display devices. The architecture consists of video objects, scene description, renderer, and player as a minimum set of components. This Recommendation also identifies information to be transferred between the renderer and player.

Keywords

Immersive video, 6DoF, scene description, volumetric video, device adaptation

The ITU Radiocommunication Assembly,

considering

- a) that immersive video, which enables end users to move around in a video space and watch video omnidirectionally from free viewpoints, provides a new enhanced visual experience;
- b) that immersive video is represented by arranging video objects such as volumetric video, omnidirectional video and two-dimensional video in a three-dimensional space;
- c) that various types of display devices are available for end-users such as head-mounted displays, smartphones and tablets, needing to be considered for presenting immersive video;
- d) that an increasing number of interactive delivery platforms are available for distributing content to audiences;
- e) that servers on networks including cloud and edge with increased computational power will effectively be used for rendering immersive video adapting to different types of display devices with different computing and display capabilities;
- f) that a common architecture for immersive video to be presented on various types of display devices will facilitate the development of immersive video systems and applications,

recognizing

- a) the suite of standards ISO/IEC 23090 – Information technology – Coded representation of immersive media;
- b) Recommendation ITU-R BT.2123 – Video parameter values for advanced immersive audio-visual systems for production and international programme exchange in broadcasting;
- c) Report ITU-R BT.2420 – Collection of usage scenarios of advanced immersive sensory media systems,

recommends

that immersive video systems targeting various types of display devices should be designed according to the high-level system architecture described in the Annex.

Annex

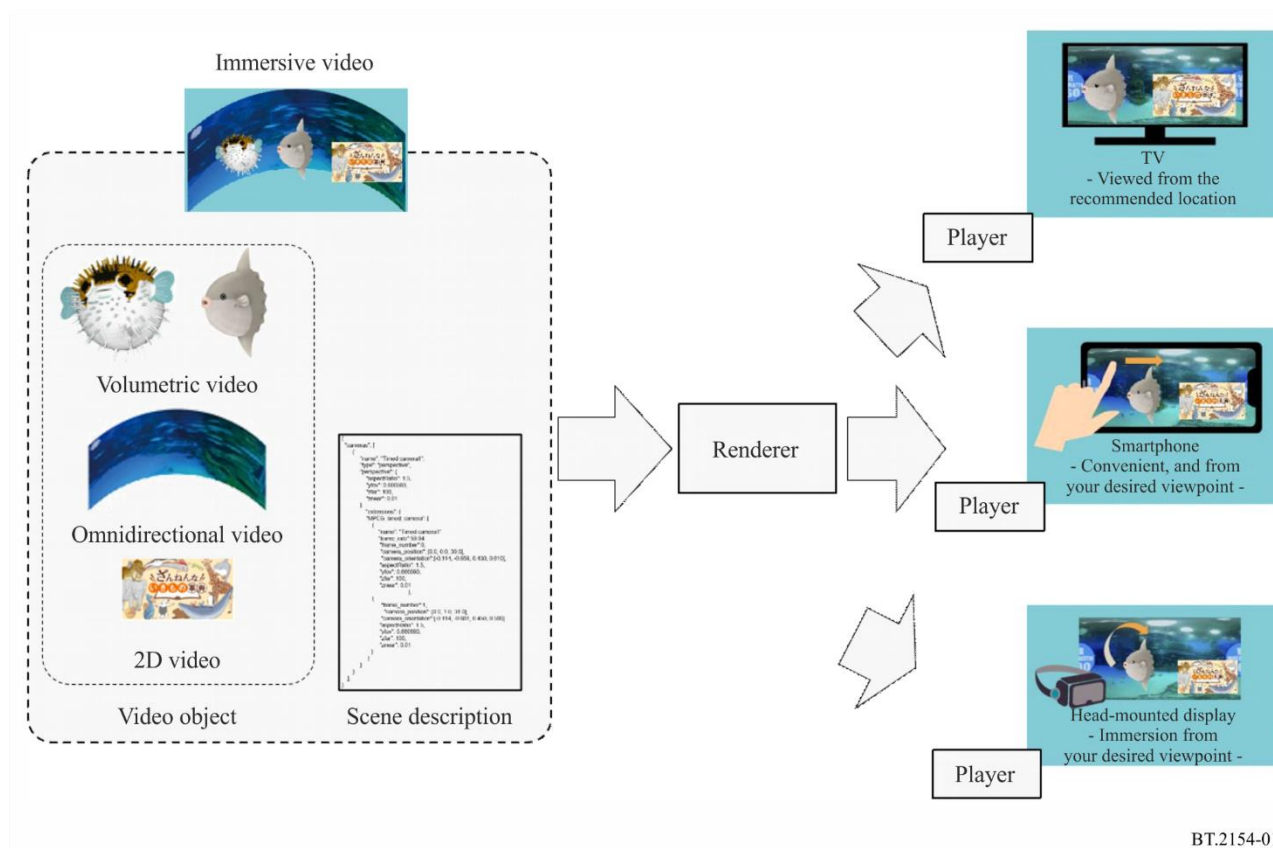
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1 Overview

Figure 1 illustrates an overview of the system architecture for immersive video from composition to presentation on various types of display devices.

Immersive video is composed of scene description and multiple video objects referred from the scene description including volumetric video, which can represent the three-dimensional shape and texture of objects, omnidirectional video surrounding the objects, and two-dimensional video so that users can watch the video from any positions in any directions. Omnidirectional video and 2D video may have their depth information. Scene descriptions provide a time-series three-dimensional representation of immersive video such as position, orientation, and size of each object as well as their spatial and temporal arrangement in three-dimensional space.

FIGURE 1
Overview of immersive video from composition to presentation



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A renderer constructs a three-dimensional space from various video objects indicated by the scene description and produces video to be viewed from the user's position and direction. The player of each display device presents the video from the rendered video in a way that best suits the device in accordance with user's viewing position and direction.