How Audio is Encoded for Spotify

Information and Coding - DETI
Adriano Costa , Guilherme Santos & Nuno Pinho

Table of contents

01

Introduction

02

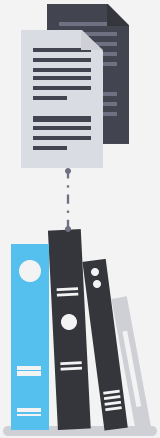
Audio Compression

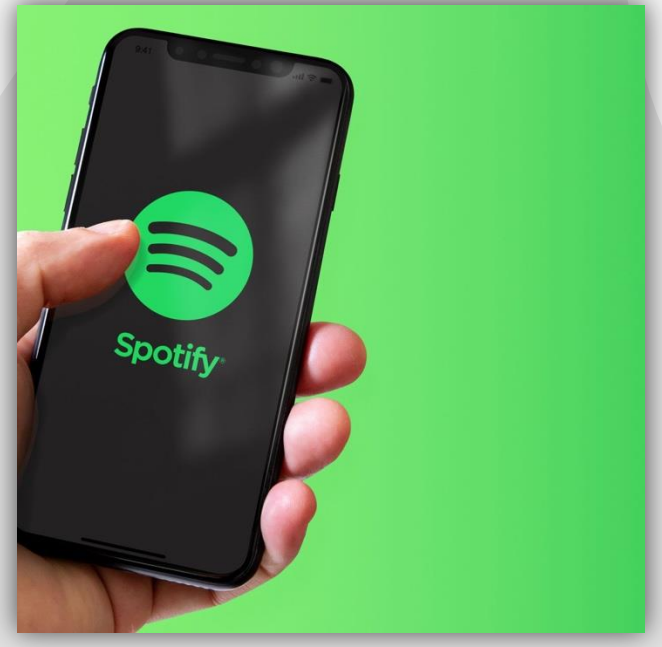
03

Audio Formats

04

Conclusion





01
Introduction

What is Spotify?

Streaming of audio content: Music and Podcast Streamin Platform

Launched in 2008. With Over 500 million users globally.

Over 100 million songs from global artists.

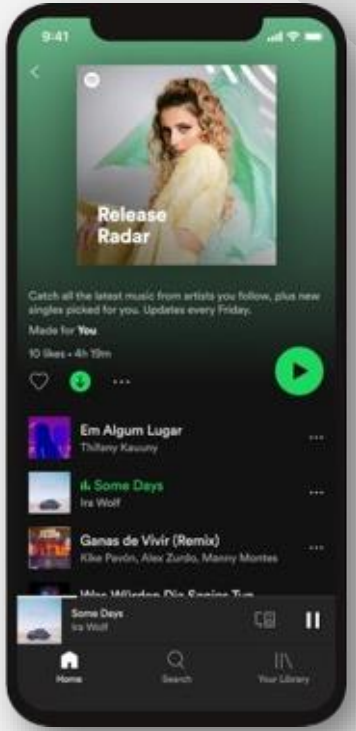
A diverse library **of 5+ million podcasts.**

Introduction

Purpose of Audio Encoding: Audio encoding transforms music data into compact format for more efficient streaming.

Spotify's Encoding Approach: Spotify optimizes audio formats for audio quality streaming at various bitrates.

Impact for listeners: Audio compression reduces data usage without sacrificing noticeable streaming quality.



02

Audio Compression

Audio Compression

The audio compression plays a key part in optimizing quality and efficiency

Minimizing file sizes

Compression reduces audio file sizes, making streaming feasible on mobile and limited-bandwith networks

Preserving Sound Quality

Advanced algorithms maintain sound fidelity even in reduced sizes preserving the quality

Essential for Streaming platforms

Audio Compression enables smooth, high quality playback across global netwotks

03
Audio Formats

Audio Codecs

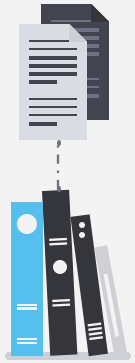
Spotify's Audio Codecs

•**Ogg Vorbis**:
Primary format used for streaming on **desktop** and the **android app**, it balances quality and file size. Ogg Vorbis is used where Spotify **controls** the **environment**.

•**AAC (Advanced Audio Coding)**:
Used mainly for **web players** and the **ios app**, optimized for reliable performance, AAC is used where device or browser **limitations** make Ogg Vorbis impractical.

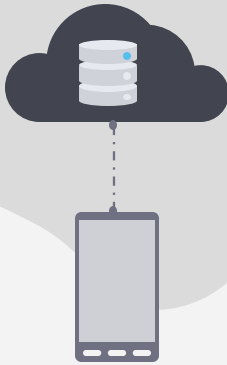
Why These Formats?

Spotify uses these formats to ensure **high-quality audio** with **efficient streaming**, adapting to different devices and network conditions.



Audio Codecs

Ogg Vorbis



How it works

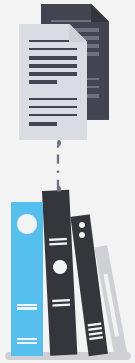
Ogg Vorbis is an open-source, **lossy audio** format that compresses sound by analyzing frequencies and removing less audible data.

Quality

Ogg Vorbis offers great **sound quality** at **low bitrates**, ideal for streaming and storage, with **dynamic compression** to maintain fidelity.

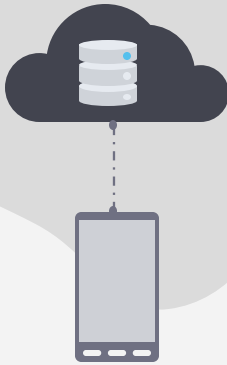
Bitrate

Provides **24kbps -> 320kbs** of compression.
From the **higher compression** with basic quality, to the **lowest compression** with the better quality.



Audio Codecs

Advanced Audio Coding (AAC)



How it works

AAC compresses audio by breaking it into **small parts**, analyzing which sounds are most important to human ears, and removing sounds we can't easily hear. It then quantizes the remaining data.

Quality

By focusing on perceptible frequencies and discarding inaudible or redundant data, **AAC** delivers **higher** perceived **quality** at **lower bitrates**.

Bitrate

Provides **24kbps -> 256kbs** of compression.
From the **higher compression** with basic quality, to the **lowest compression** with the better quality (lower than Ogg).

Ogg Vorbis vs AAC

File size

Ogg Vorbis is efficient at lower bit rates, but **AAC** generally **achieves better quality at similar or lower file sizes.**

Quality

Both offer high-quality audio and a **real-time bitrate adjustment**, but AAC tends to perform better at lower bit rates, providing clearer sound.
Ogg has a higher bitrate ceiling.

Licensing

Ogg Vorbis is **open-source** and free to use, while **AAC** requires **licensing** fees for commercial use.

Compatibility

Ogg Vorbis for controlled environments like its apps and AAC for environments requiring broad compatibility, such as web browsers and Apple devices.

04
Conclusion

Conclusion

Key points:

Quality Vs Efficiency

Spotify has mastered the art of balancing high-quality audio with streaming efficiency.

In the Future

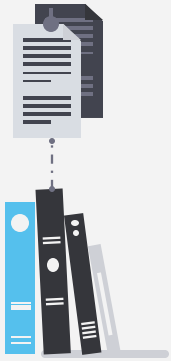
Spotify may explore advancements like lossless streaming, AI-powered compression, or emerging codecs to further improve user experience.

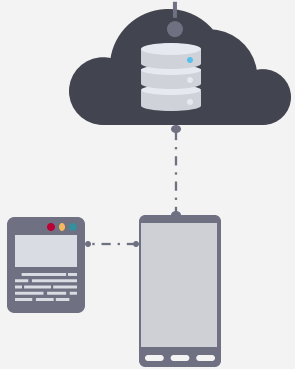
Dynamic Adaptability

Spotify's ability to adapt audio quality based on user subscription tiers, internet speeds, and device capabilities ensures consistent performance

Innovation

Spotify uses the audio format that best balances quality and file size, ensuring efficient streaming while delivering a great listening experience tailored to the user's device and network conditions.





THANKS

Any Questions?