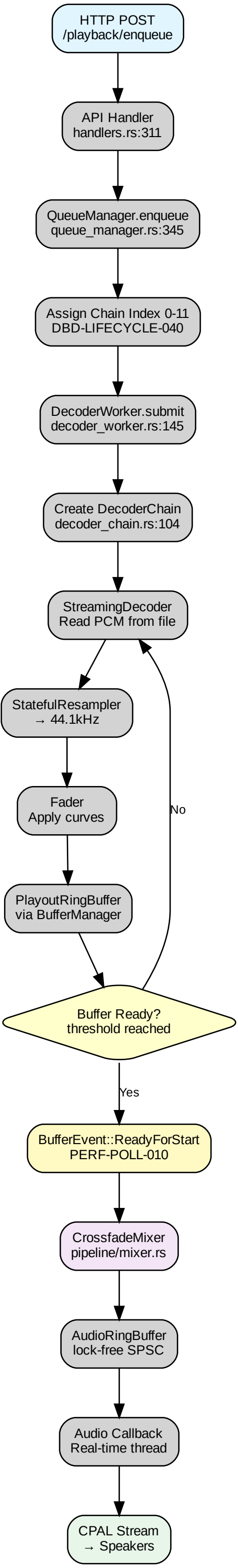
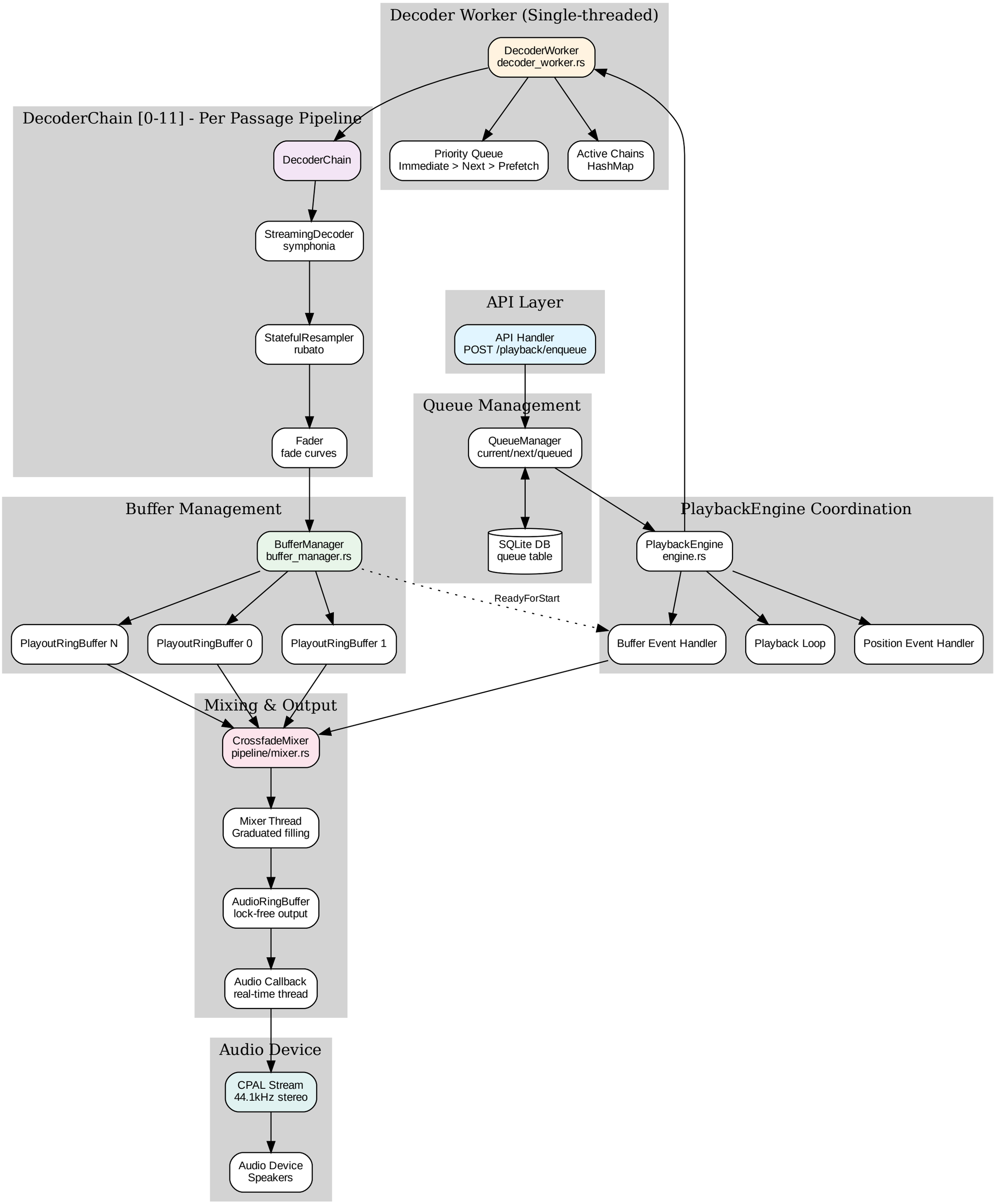
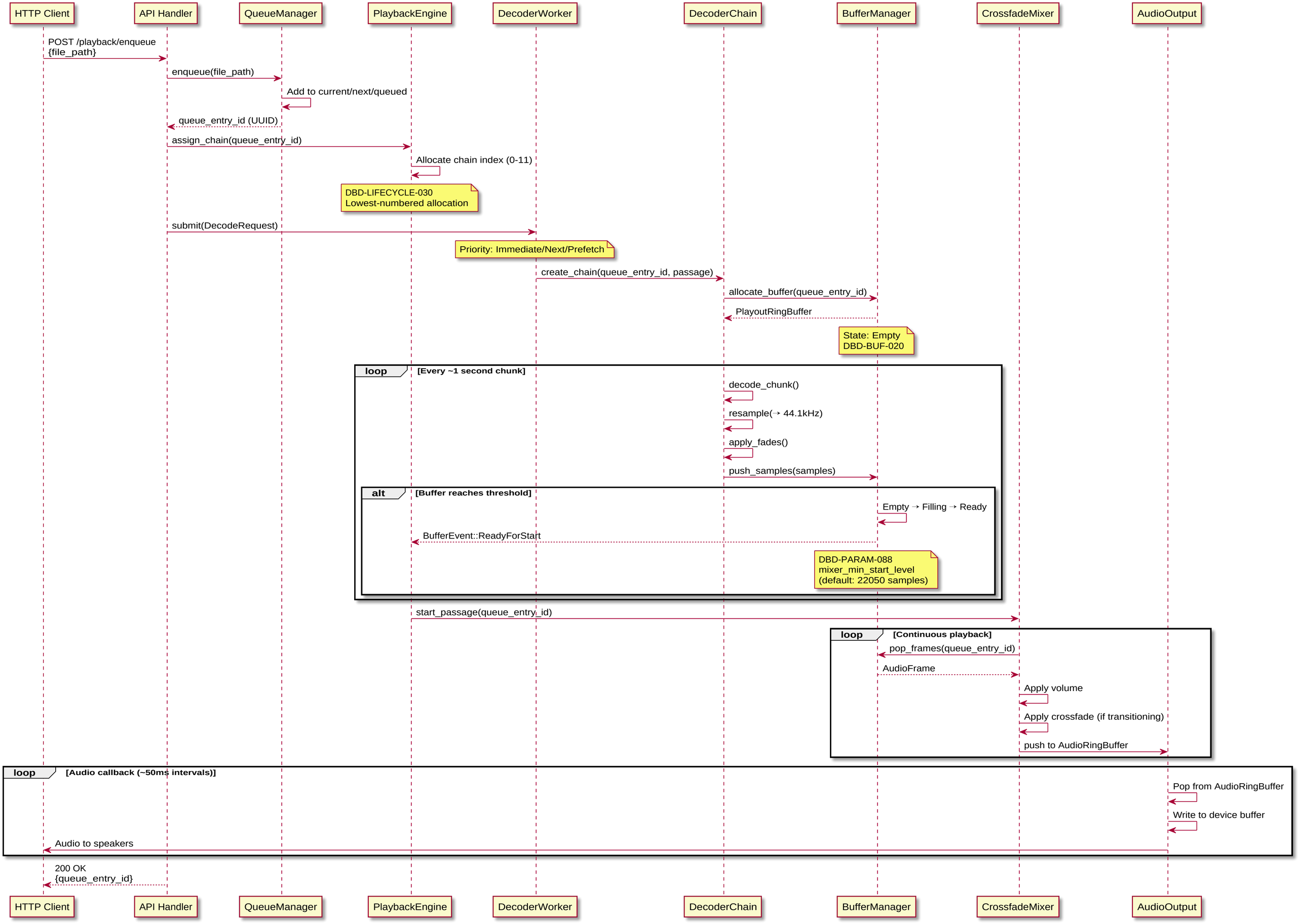
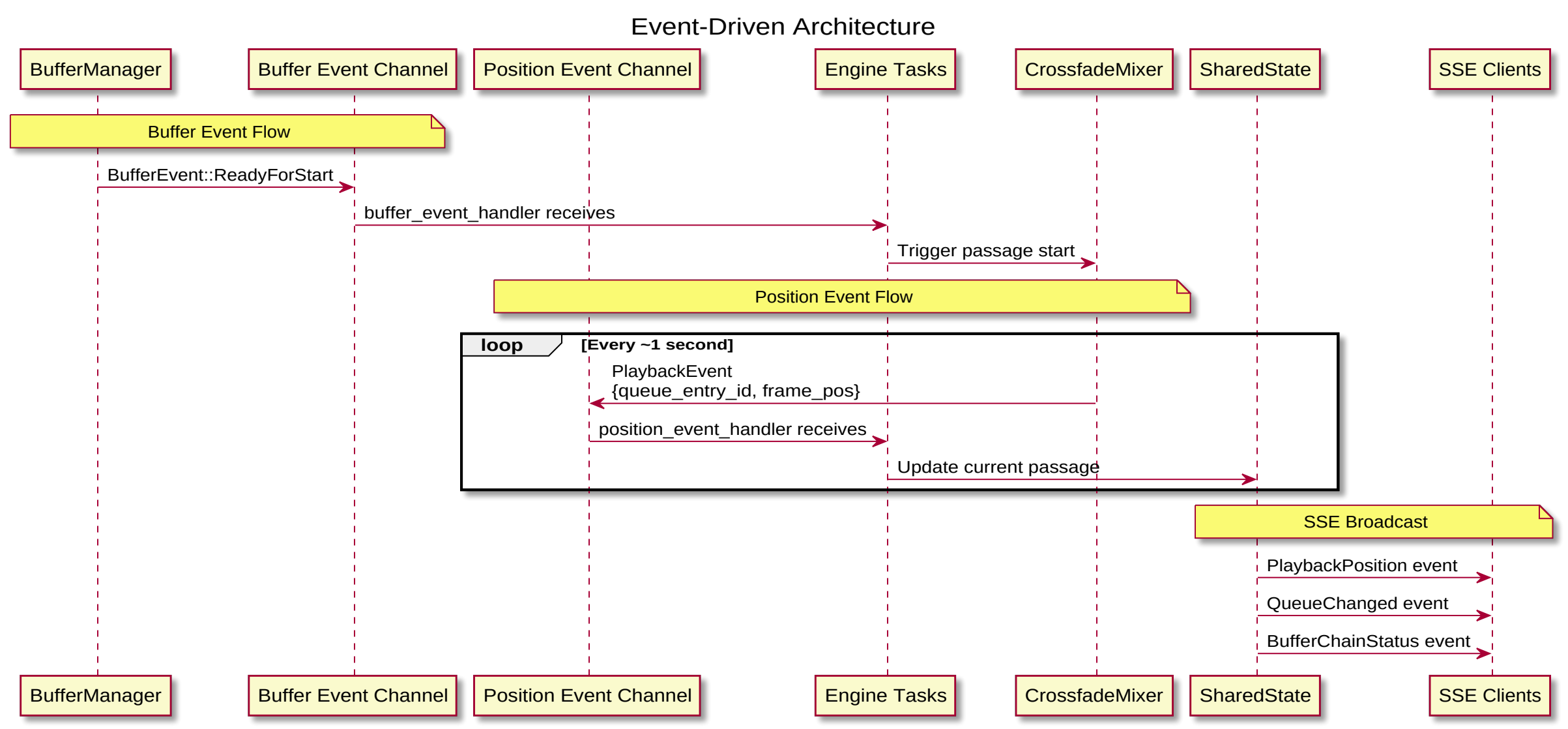

HTTP POST
/playback/enqueue
API Handler
handlers.rs:311
QueueManager.enqueue
queue_manager.rs:345
Assign Chain Index 0-11
DBD-LIFECYCLE-040
DecoderWorker.submit
decoder_worker.rs:145
Create DecoderChain
decoder_chain.rs:104
StreamingDecoder
Read PCM from file
StatefulResampler
→ 44.1kHz
Fader
Apply curves
PlayoutRingBuffer
via BufferManager
No
Buffer Ready?
threshold reached
Yes
BufferEvent::ReadyForStart
PERF-POLL-010
CrossfadeMixer
pipeline/mixer.rs
AudioRingBuffer
lock-free SPSC
Audio Callback
Real-time thread
CPAL Stream
→ Speakers

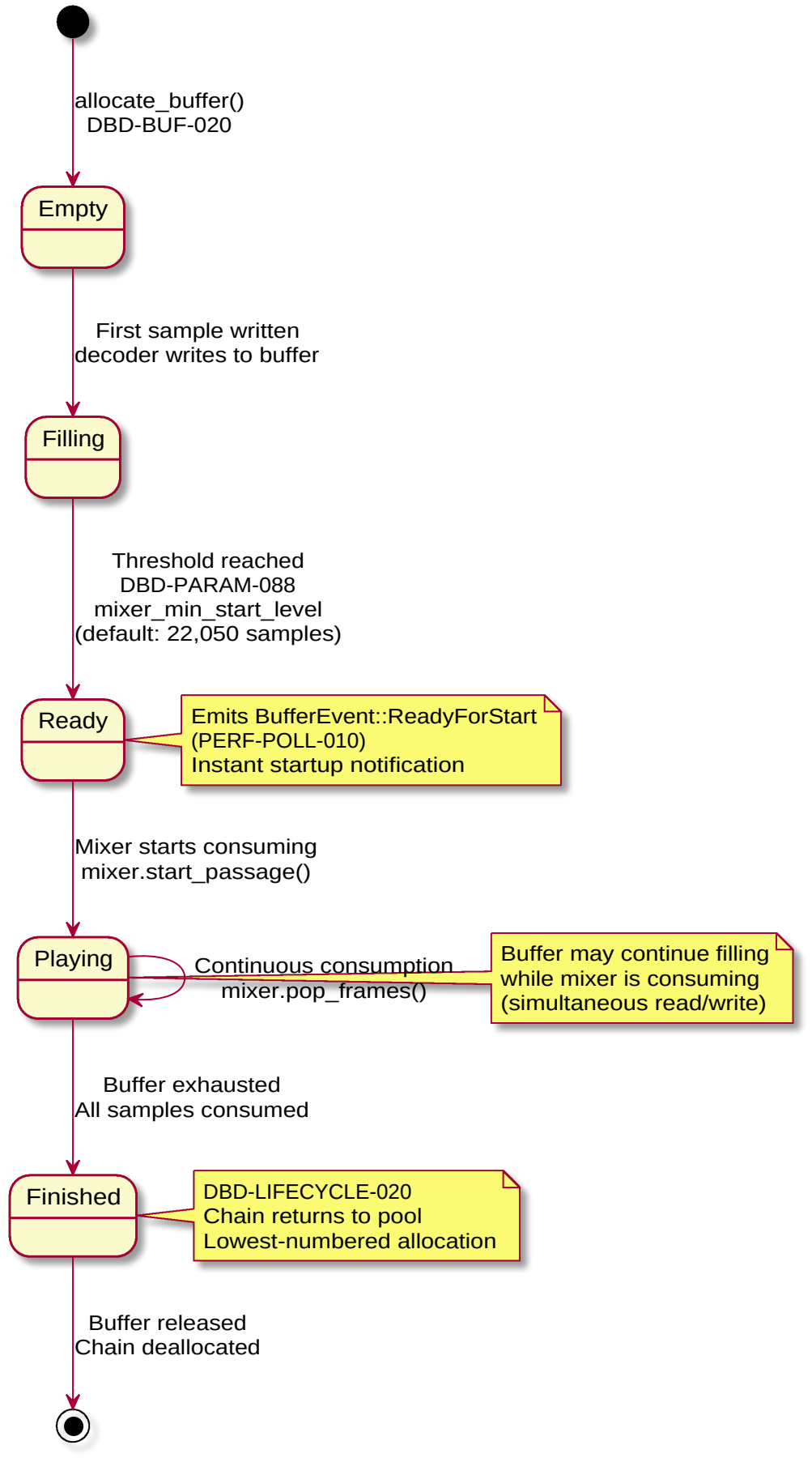

Decoder Worker (Single-threaded)
DecoderWorker
decoder_worker.rs
Priority Queue
Immediate > Next > Prefetch
Active Chains
HashMap
DecoderChain [0-11] - Per Passage Pipeline
DecoderChain
StreamingDecoder
symphonia
StatefulResampler
rubato
Fader
fade curves
API Layer
API Handler
POST /playback/enqueue
Queue Management
QueueManager
current/next/queued
SQLite DB
queue table
Buffer Management
BufferManager
buffer_manager.rs
PlayoutRingBuffer N
PlayoutRingBuffer 0
PlayoutRingBuffer 1
ReadyForStart
PlaybackEngine Coordination
PlaybackEngine
engine.rs
Buffer Event Handler
Playback Loop
Position Event Handler
Mixing & Output
CrossfadeMixer
pipeline/mixer.rs
Mixer Thread
Graduated filling
AudioRingBuffer
lock-free output
Audio Callback
real-time thread
Audio Device
CPAL Stream
44.1kHz stereo
Audio Device
Speakers

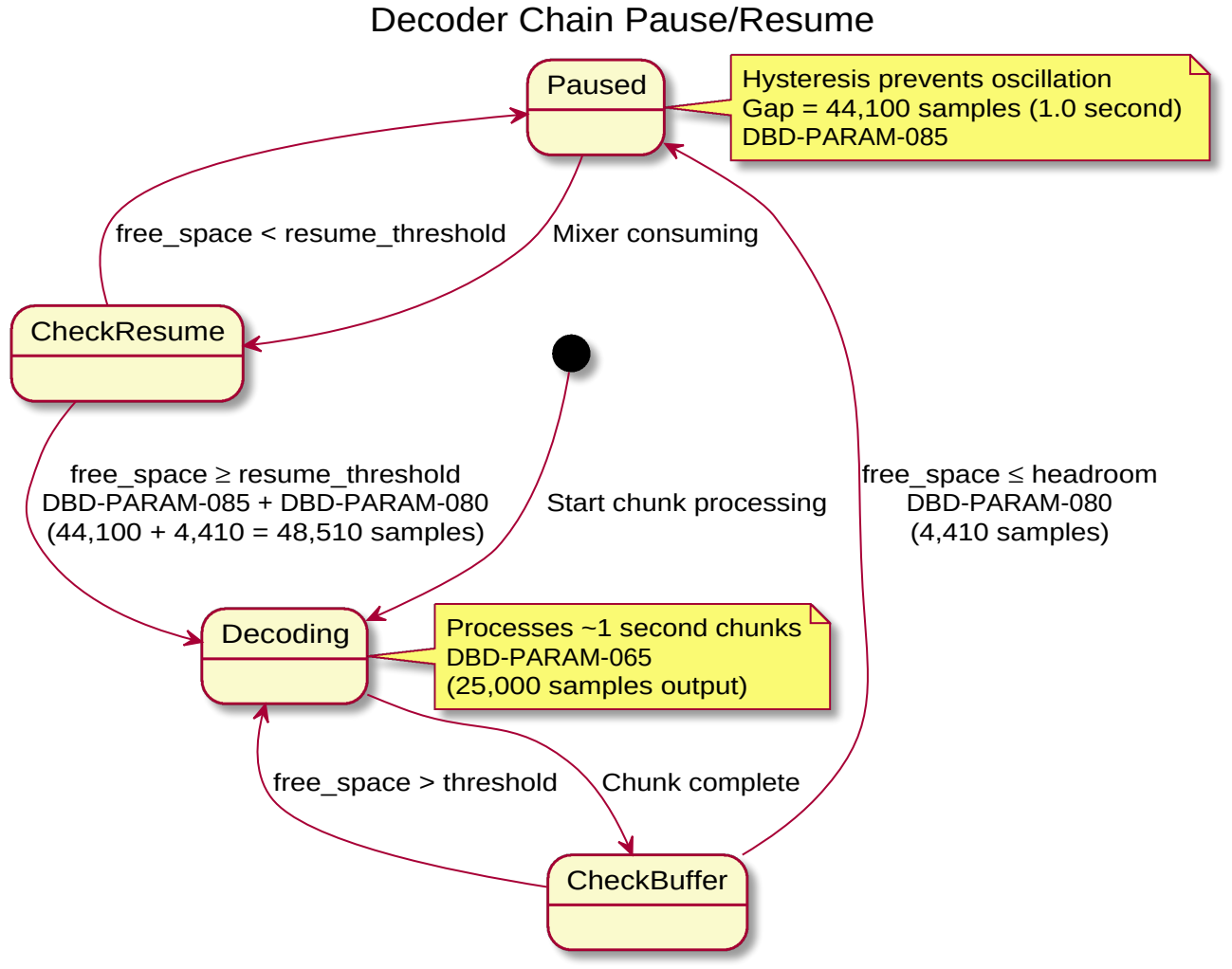
Enqueue to Playback Flow

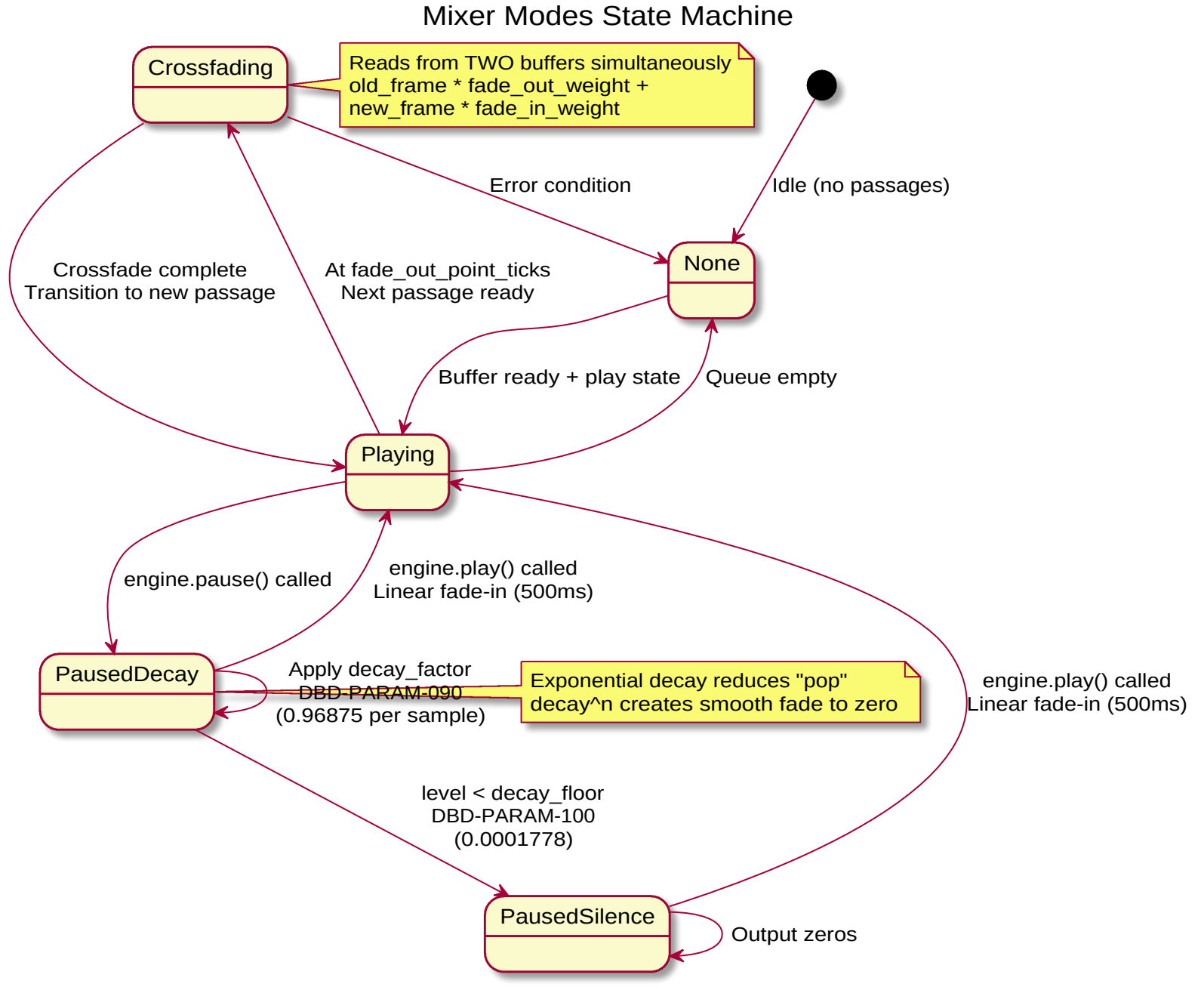


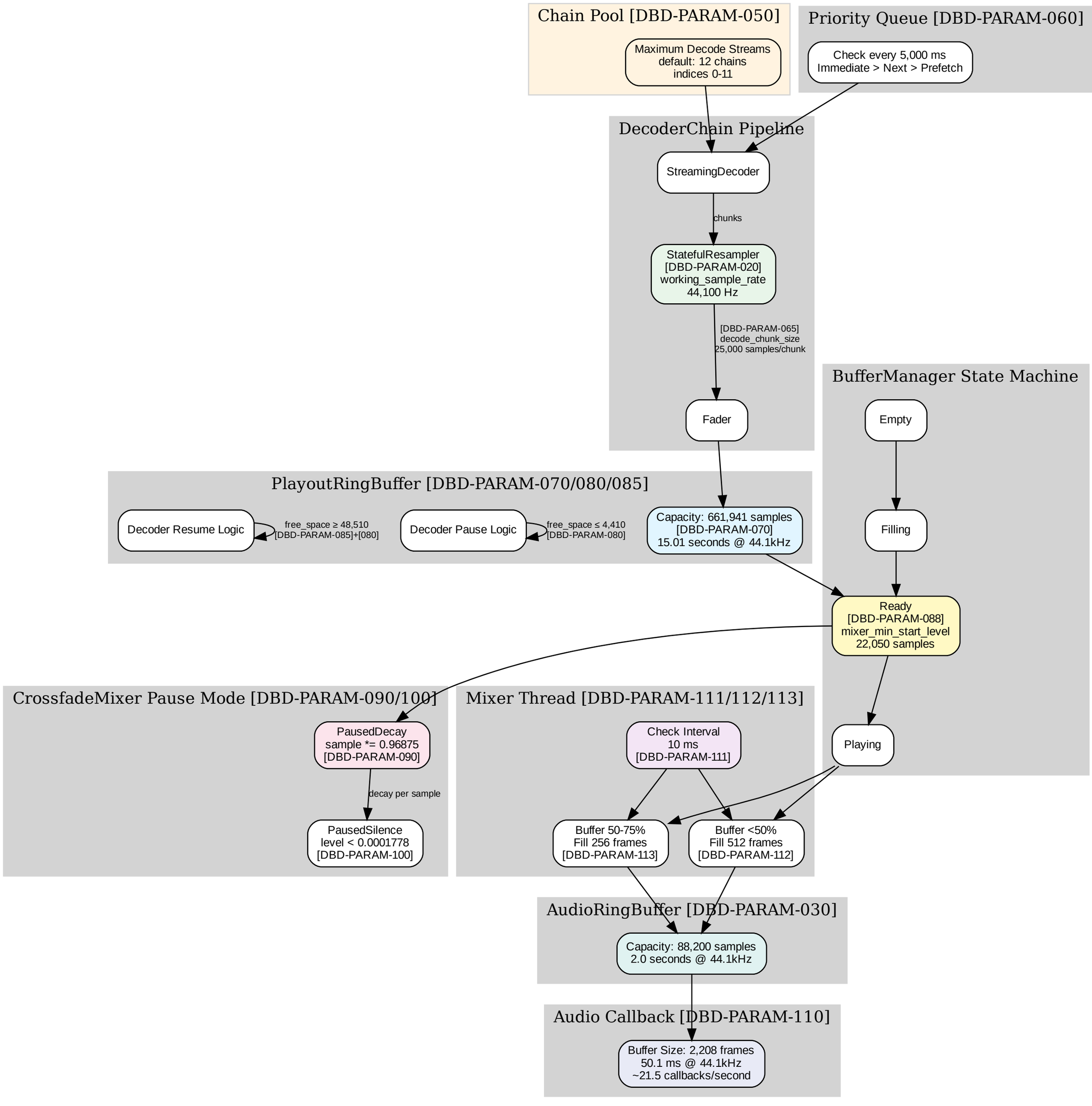

Event-Driven Architecture
BufferManager
Buffer Event Channel
Position Event Channel
Engine Tasks
CrossfadeMixer
SharedState
SSE Clients
Buffer Event Flow
BufferEvent::ReadyForStart
buffer_event_handler receives
Trigger passage start
Position Event Flow
loop
[Every ~1 second]
PlaybackEvent
{queue_entry_id, frame_pos}
position_event_handler receives
Update current passage
SSE Broadcast
PlaybackPosition event
QueueChanged event
BufferChainStatus event
BufferManager
Buffer Event Channel
Position Event Channel
Engine Tasks
CrossfadeMixer
SharedState
SSE Clients

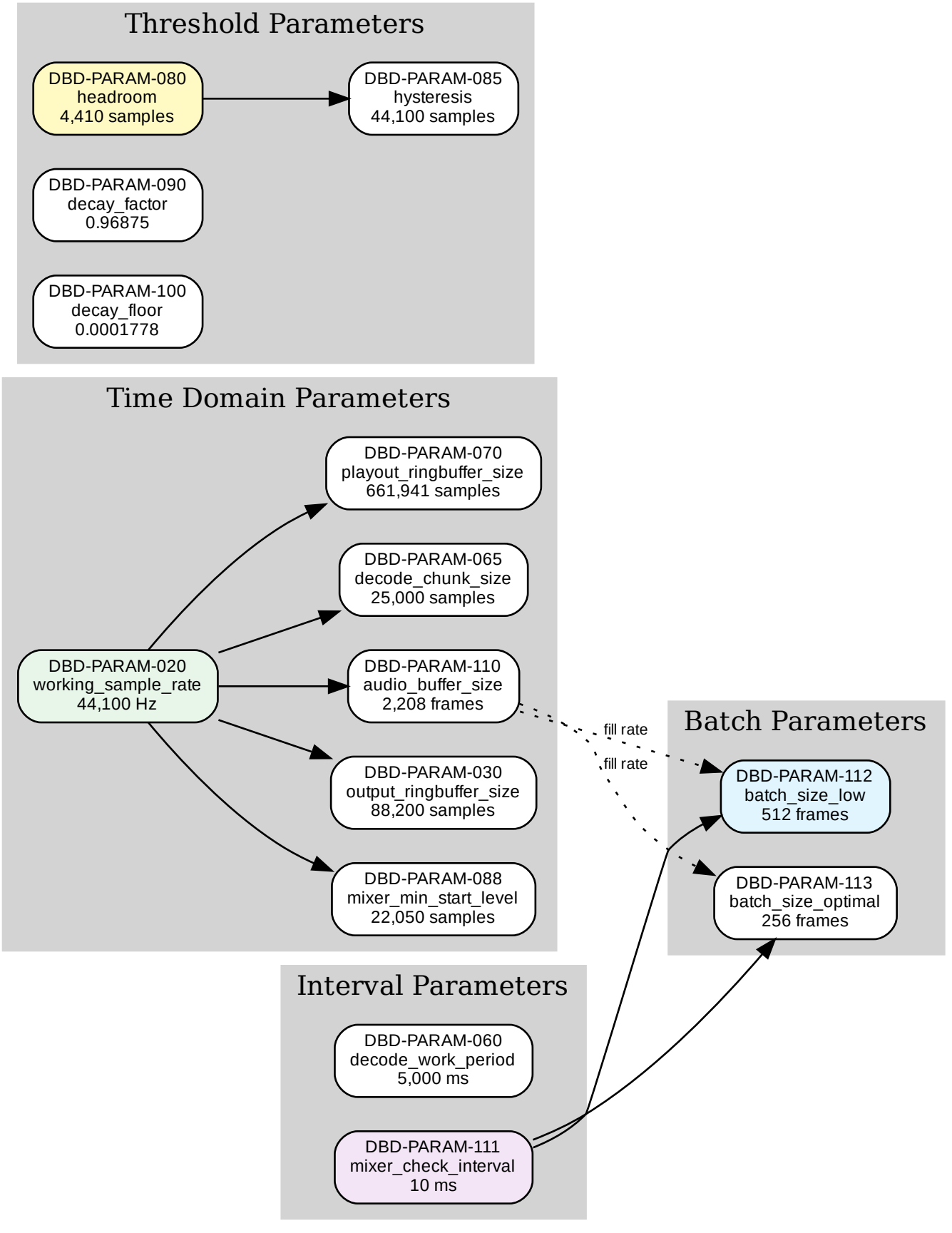
Buffer Lifecycle State Machine




Decoder Chain Pause/Resume
Paused
Hysteresis prevents oscillation
Gap = 44,100 samples (1.0 second)
DBD-PARAM-085
free_space < resume_threshold
Mixer consuming
CheckResume
free_space ≥ resume_threshold
DBD-PARAM-085 + DBD-PARAM-080
(44,100 + 4,410 = 48,510 samples)
Start chunk processing
free_space ≤ headroom
DBD-PARAM-080
(4,410 samples)
Decoding
Processes ~1 second chunks
DBD-PARAM-065
(25,000 samples output)
free_space > threshold
Chunk complete
CheckBuffer


Mixer Modes State Machine
Crossfading
Reads from TWO buffers simultaneously
old_frame * fade_out_weight +
new_frame * fade_in_weight
Error condition
Idle (no passages)
None
Crossfade complete
Transition to new passage
At fade_out_point_ticks
Next passage ready
Buffer ready + play state
Queue empty
Playing
engine.pause() called
engine.play() called
Linear fade-in (500ms)
PausedDecay
Apply decay_factor
DBD-PARAM-090
(0.96875 per sample)
Exponential decay reduces "pop"
decay^n creates smooth fade to zero
engine.play() called
Linear fade-in (500ms)
level < decay_floor
DBD-PARAM-100
(0.0001778)
PausedSilence
Output zeros


Chain Pool [DBD-PARAM-050]
Maximum Decode Streams
default: 12 chains
indices 0-11
Priority Queue [DBD-PARAM-060]
Check every 5,000 ms
Immediate > Next > Prefetch
DecoderChain Pipeline
StreamingDecoder
chunks
StatefulResampler
[DBD-PARAM-020]
working_sample_rate
44,100 Hz
[DBD-PARAM-065]
decode_chunk_size
25,000 samples/chunk
Fader
BufferManager State Machine
Empty
Filling
Ready
[DBD-PARAM-088]
mixer_min_start_level
22,050 samples
Playing
PlayoutRingBuffer [DBD-PARAM-070/080/085]
Decoder Resume Logic
free_space ≥ 48,510
[DBD-PARAM-085]+[080]
Decoder Pause Logic
free_space ≤ 4,410
[DBD-PARAM-080]
Capacity: 661,941 samples
[DBD-PARAM-070]
15.01 seconds @ 44.1kHz
CrossfadeMixer Pause Mode [DBD-PARAM-090/100]
PausedDecay
sample *= 0.96875
[DBD-PARAM-090]
decay per sample
PausedSilence
level < 0.0001778
[DBD-PARAM-100]
Mixer Thread [DBD-PARAM-111/112/113]
Check Interval
10 ms
[DBD-PARAM-111]
Buffer 50-75%
Fill 256 frames
[DBD-PARAM-113]
Buffer <50%
Fill 512 frames
[DBD-PARAM-112]
AudioRingBuffer [DBD-PARAM-030]
Capacity: 88,200 samples
2.0 seconds @ 44.1kHz
Audio Callback [DBD-PARAM-110]
Buffer Size: 2,208 frames
50.1 ms @ 44.1kHz
~21.5 callbacks/second


Threshold Parameters
DBD-PARAM-080
headroom
4,410 samples
DBD-PARAM-085
hysteresis
44,100 samples
DBD-PARAM-090
decay_factor
0.96875
DBD-PARAM-100
decay_floor
0.0001778
Time Domain Parameters
DBD-PARAM-070
playout_ringbuffer_size
661,941 samples
DBD-PARAM-065
decode_chunk_size
25,000 samples
DBD-PARAM-020
working_sample_rate
44,100 Hz
DBD-PARAM-110
audio_buffer_size
2,208 frames
DBD-PARAM-030
output_ringbuffer_size
88,200 samples
DBD-PARAM-088
mixer_min_start_level
22,050 samples
fill rate
fill rate
Batch Parameters
DBD-PARAM-112
batch_size_low
512 frames
DBD-PARAM-113
batch_size_optimal
256 frames
Interval Parameters
DBD-PARAM-060
decode_work_period
5,000 ms
DBD-PARAM-111
mixer_check_interval
10 ms