Synamedia

# CDN Performance Evaluation with Edge-Embedded Watermarking

Gwendal Simon
Gwenaël Doërr
John Prakash

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# Piracy flow

## Forensic Watermarking

- Insertion of marks into video
- Contains a unique identifier
- Fidelity, robustness, throughput

Deploy Anti Piracy Technology

Orchestrate for High-Impact Disruption

Monitor Pirate Streams with Intelligence

Leakage

Pirate Content Sources

Pirate IPTV Wholesaler

Pirate Resellers

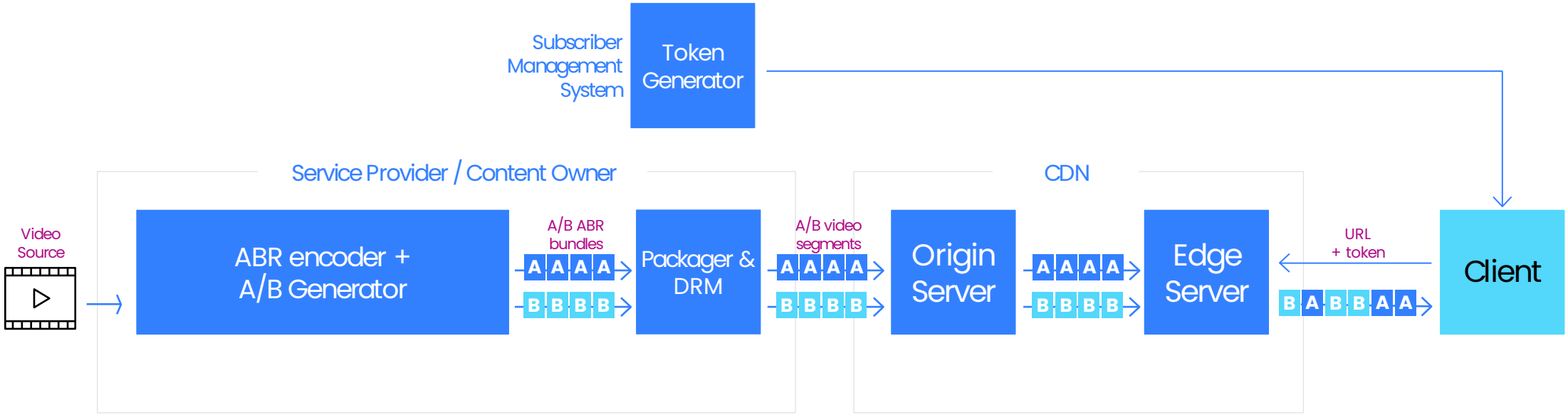
Pirate Subscribers

Legitimate video distribution

Leakage

Piracy supply chain

# A/B Watermarking

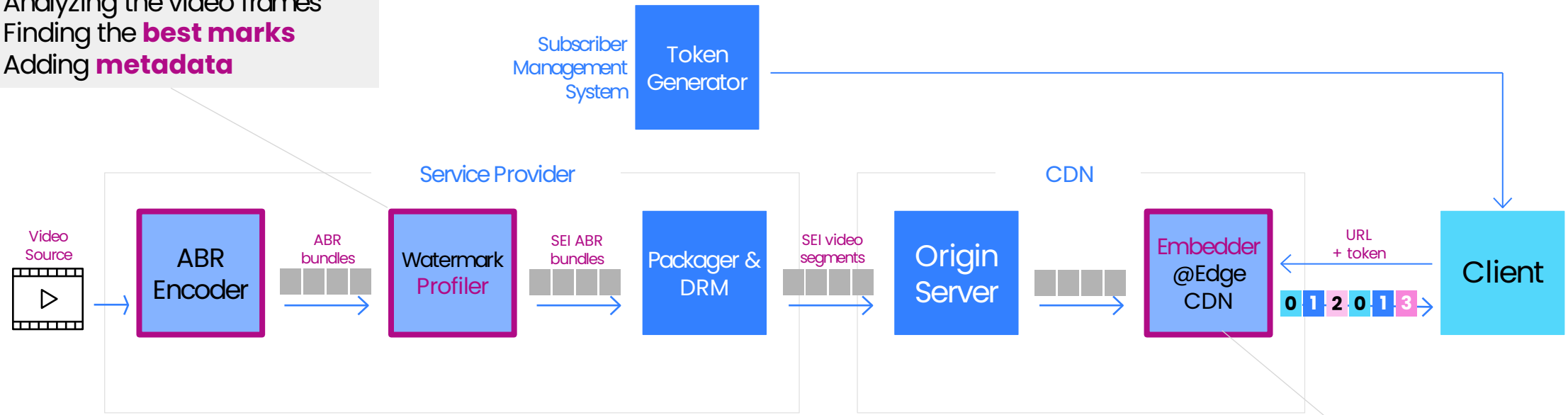



## Weaknesses

- Only two variants of segments
- Double footprint
- Complex pipeline synchronization

# Edge-Embedded Watermarking

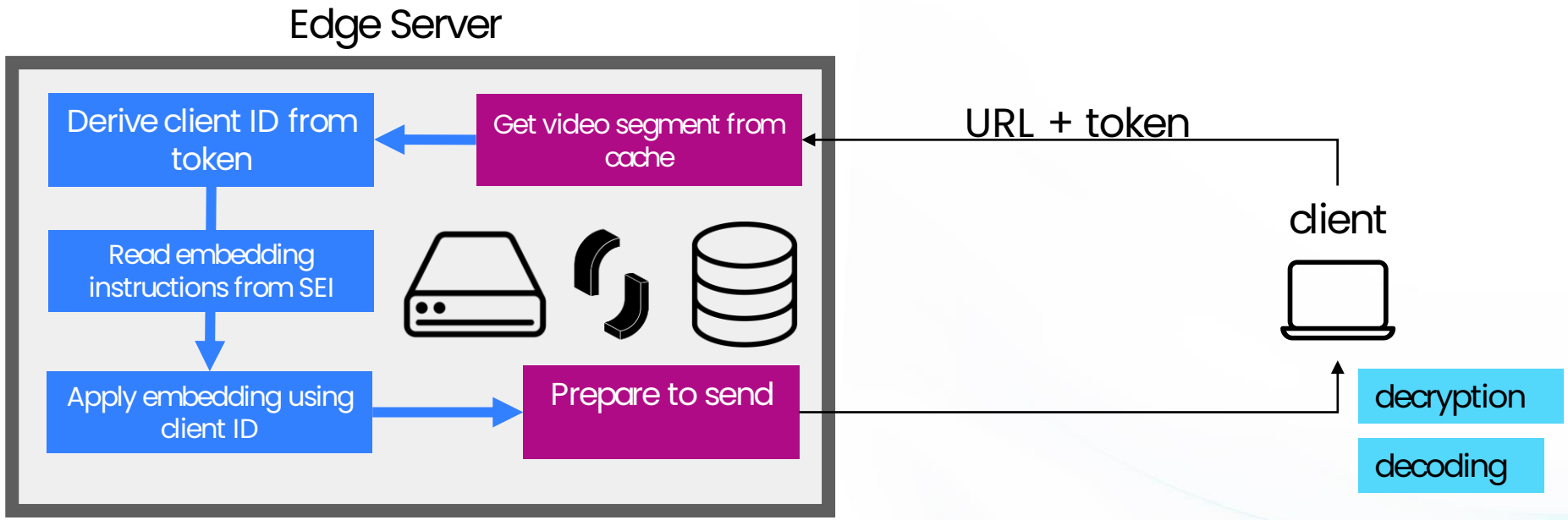
- Analyzing the video frames
- Finding the **best marks**
- Adding **metadata**




## Advantages

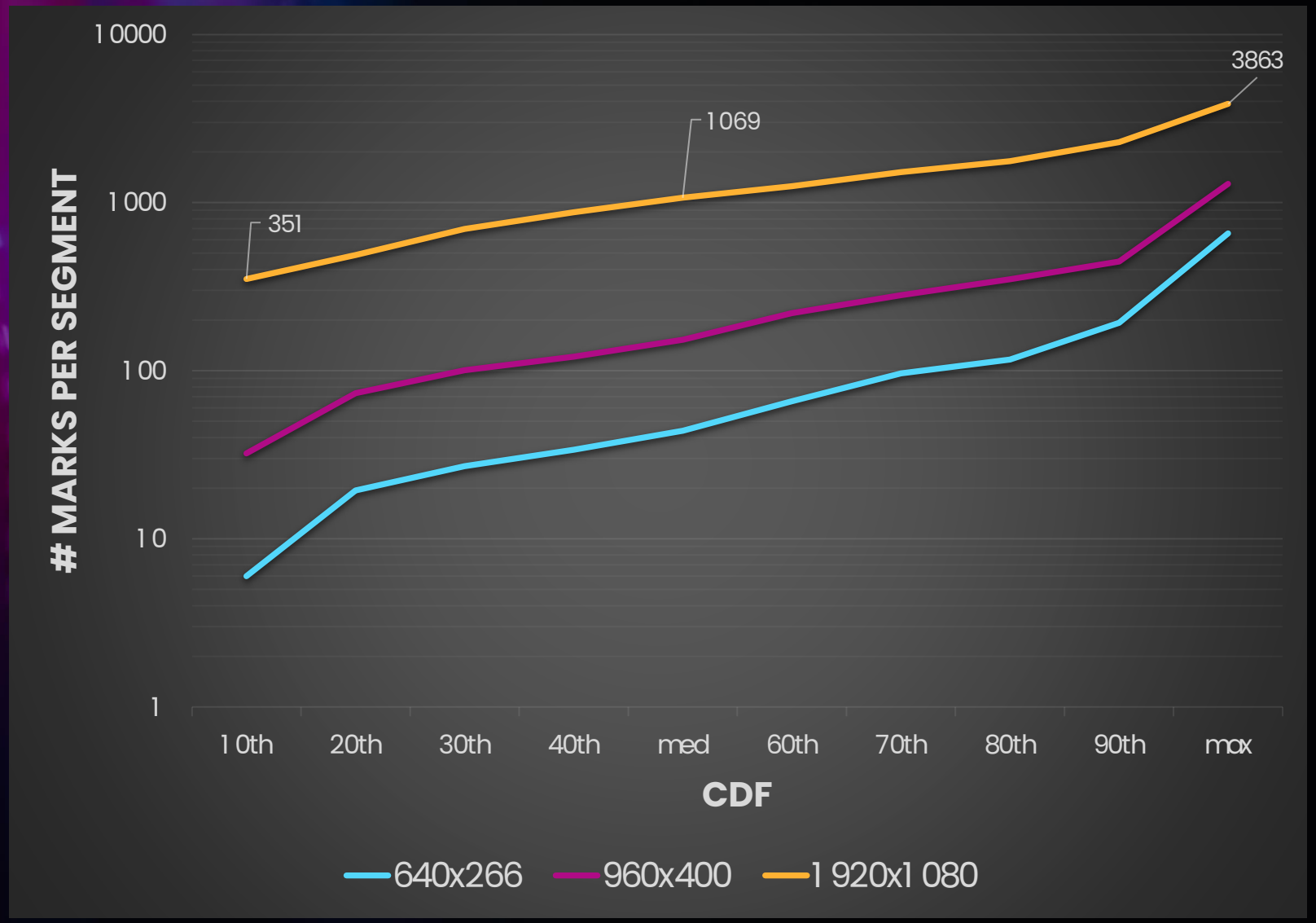
- Simplified pipeline (no dependency to segment filename)
- Single footprint
- Multiple segment *variants*

# Watermark Embedder at Edge



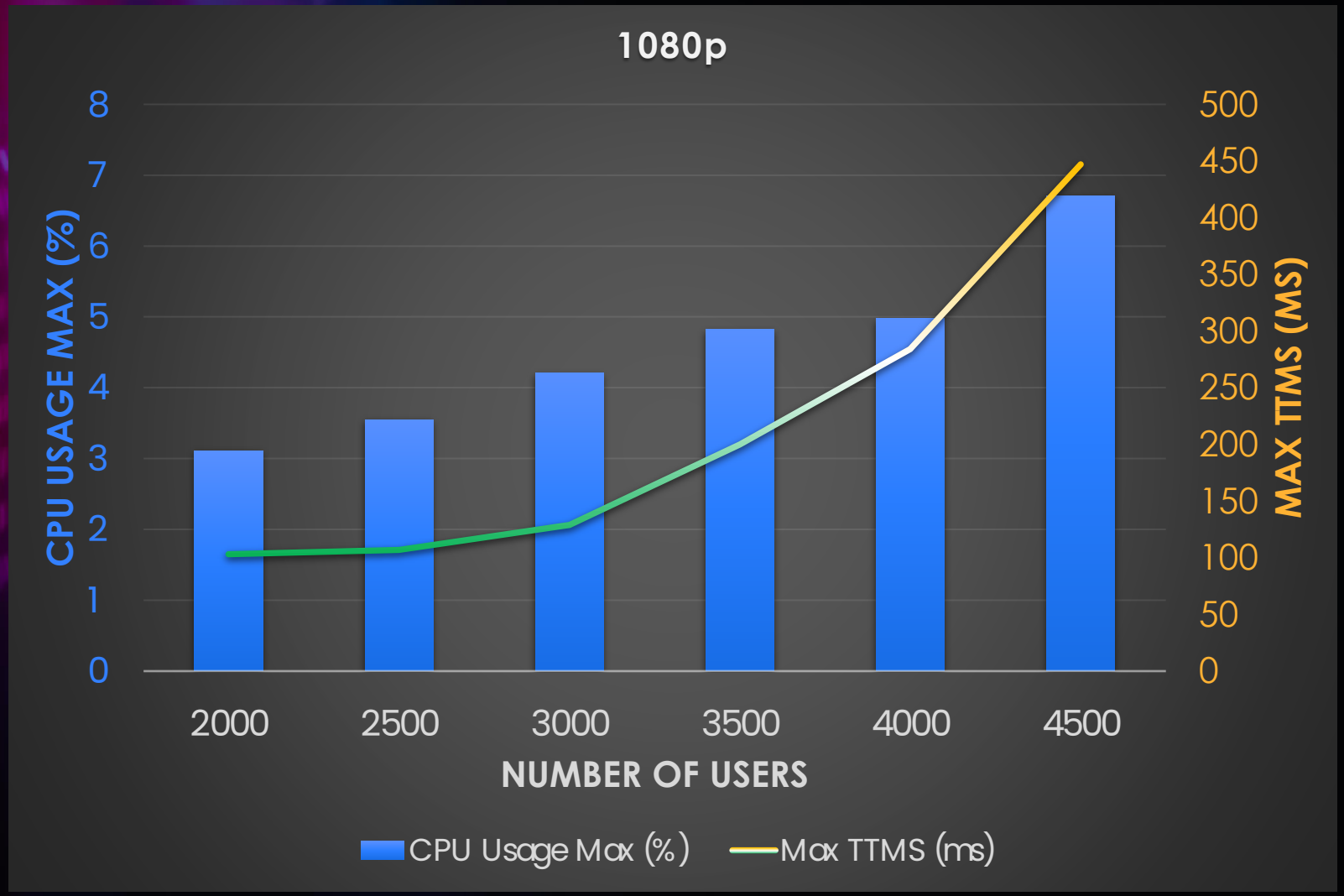

- The SEI is a metadata and does not encode video content
  - ➔ The embedding instructions are extracted **without video decoding/re-encoding**
- The SEI is not encrypted by the content protection layer (DRM)
  - ➔ The SEI instruction enables watermark embedding **without decryption/re-encryption**
- **A single cached segment** can generate ***multiple*** **segment variants**

# Profiling




**Variable** number of marks means
- **Variable** *embedding* complexity
- **Variable** *metadata* size

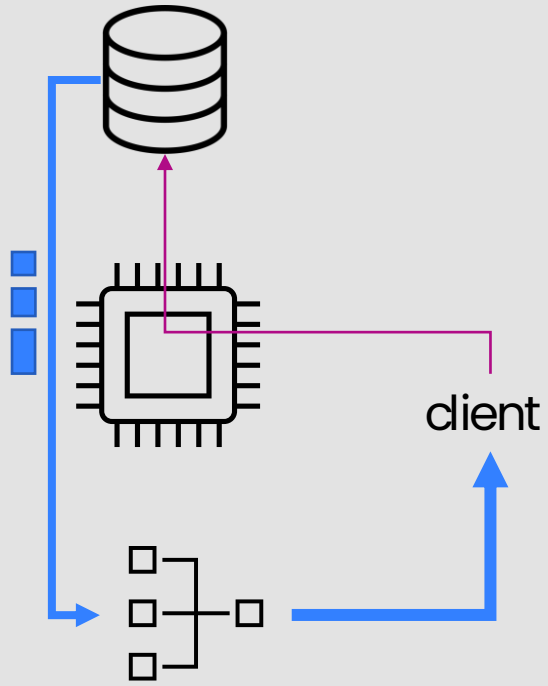
# Embedding



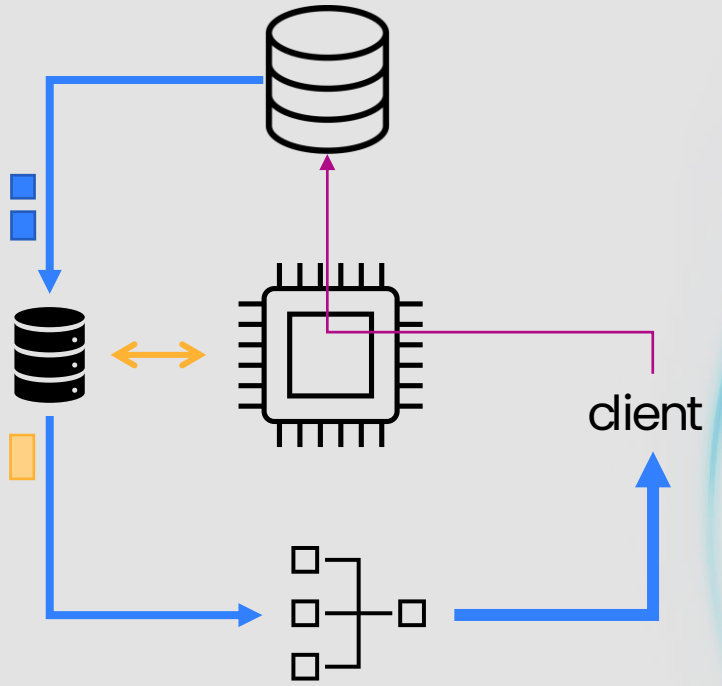

**Negligible** CPU usage

Processing time *dramatic* **growth**

# Internal Edge Processing




**Traditional** edge cache request processing




With video segment payload processing

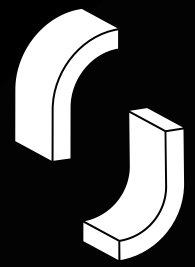
# Takeaway

A **new approach** for server-side watermarking

- Separate profiling and embedding
- Fix the main weaknesses of A/B watermarking

Implementation

- **Marginal** impact on CPU
- **Tricky** memory and thread management



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# ATS Plugin Design