Guided Transcoding Using Deflation and Inflation

Christopher Hollmann
Rickard Sjöberg
Ericsson Research

Packet Video Workshop 2018

Outline

— Video on Demand

— Bit-exact Guided Transcoding — Deflation and Inflation

— New Tools for Deflation and Inflation

— Test Results

Video on Demand

— Different use-cases
    A.   User sitting at home with 4k TV and broadband — wants best quality available
    B.   User standing on commuter train with phone and mobile subscription — low quality is sufficient

— Providers need to have different versions of the same video available

Video on Demand

— Simulcast:
— Encode all representations in advance

— Advantage: No transcoding complexity
— Disadvantage: High storage requirements

— Full Transcoding:
— Store only highest representation
— Create other representations on demand
— Advantage: Low storage requirements
— Disadvantages: High transcoding complexity
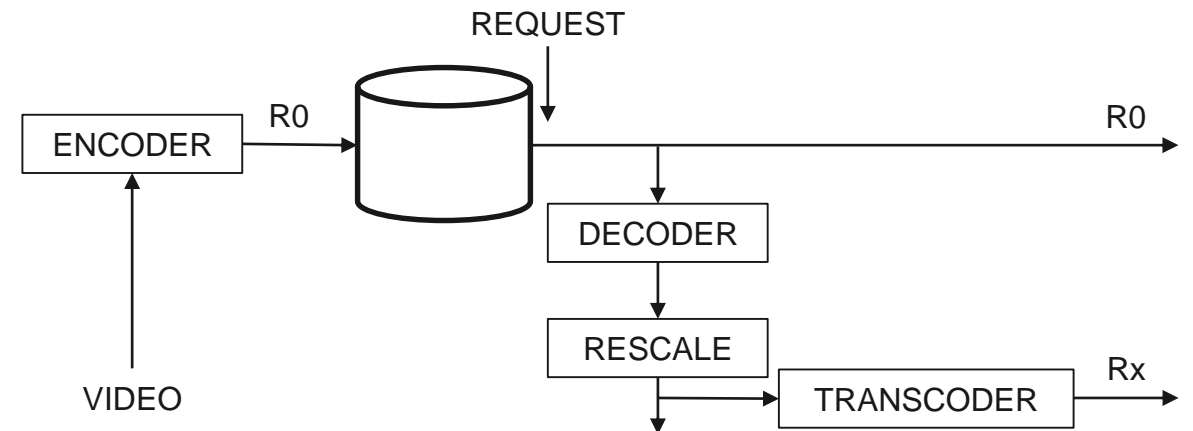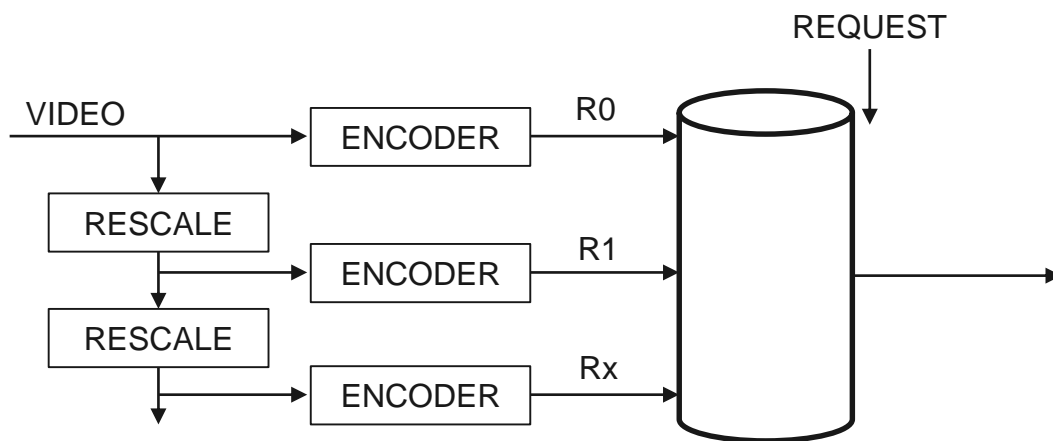
Guided Transcoding
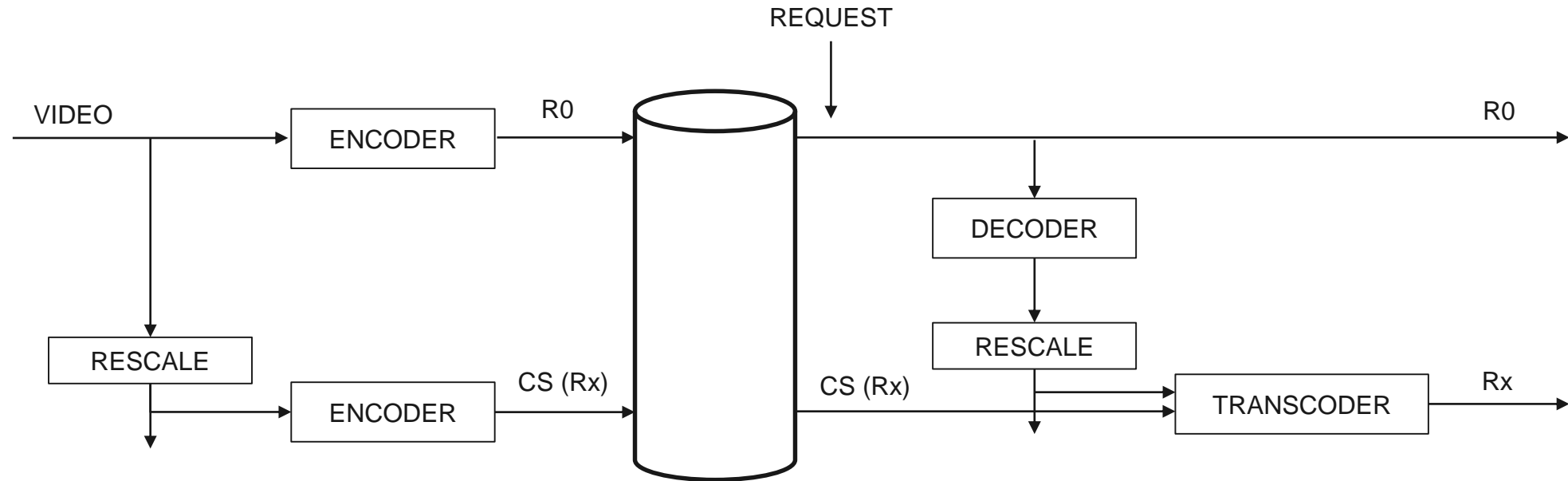
— Guided Transcoding:
  — Store only R0 and create Control Streams (CS) for all other representations (Rx)
  — CS can contain various level of detail (trade-off between storage and transcoding complexity)

— Advantage: less storage than simulcast, less transcoding complexity than full transcoding

— Disadvantage: more storage than full transcoding, higher transcoding complexity than simulcast

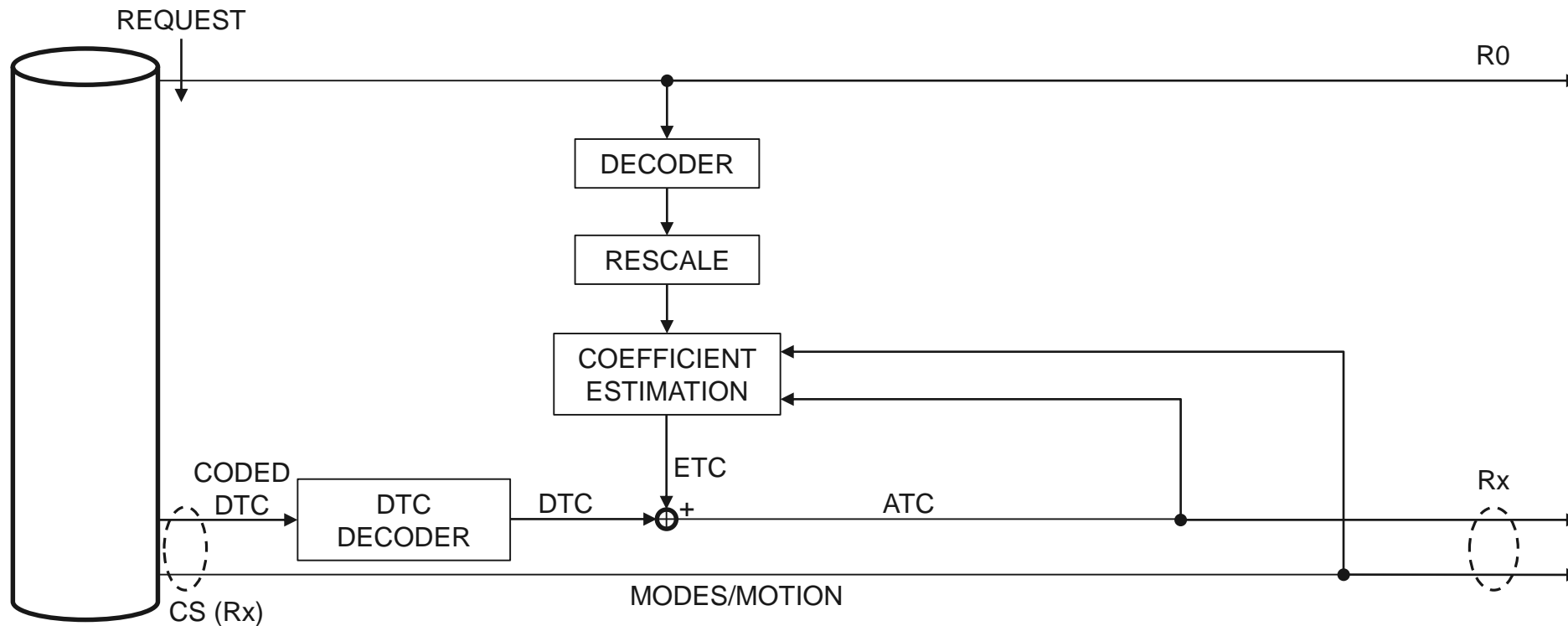# Bit-exact Guided Transcoding: Deflation and Inflation
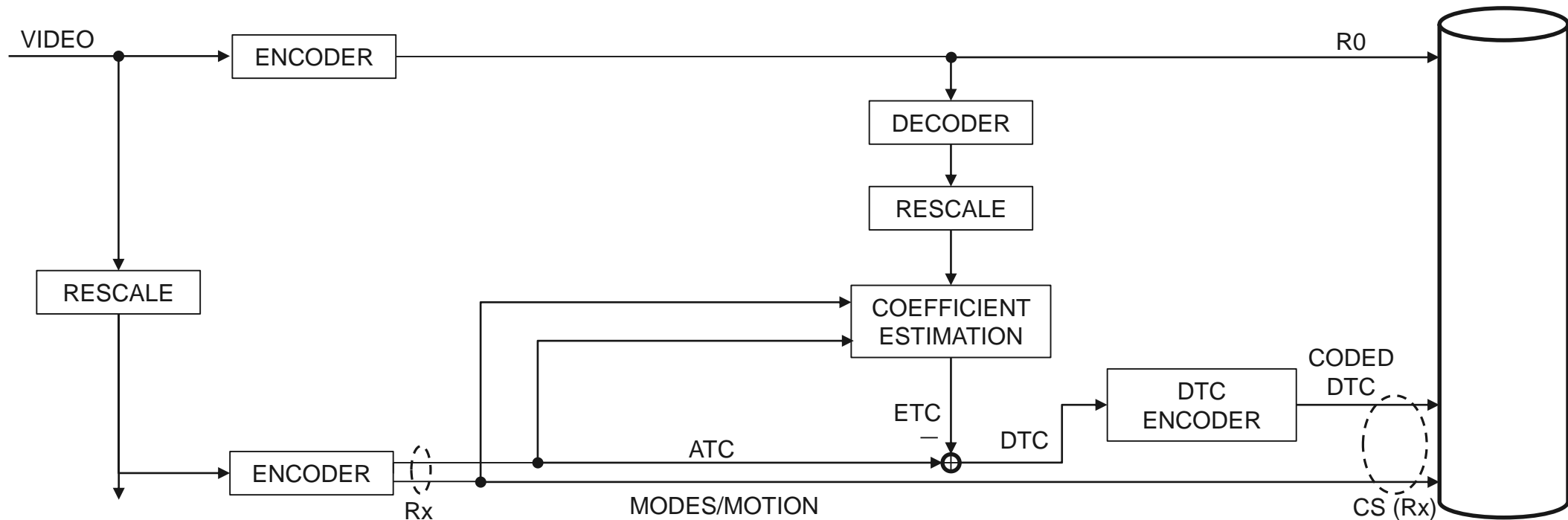
Main idea: - Store highest representation (R0) as-is

Deflation   - For other representations: Convert transform coefficients to delta coefficients using R0 for coefficient prediction

Bit-exact Guided Transcoding: Deflation and Inflation

Main idea: - Forward highest representation (R0) as-is

Inflation - For other representations: Convert delta coefficients to transform coefficients using R0 for coefficient prediction

New Tools for Deflation/Inflation

Configuration	Storage Reduction[1]	Savings	Complexity Deflation	Complexity Inflation
Without new tools	-22.82%	---	100%	100%
Sign Guess	-25.07%	2.25pp	101.0%	102.0%
Remapping	-24.07%	1.25pp	102.4%	103.2%
Significance Map Context Selection	-23.93%	1.11pp	100.4%	100.5%
All three tools	-27.07%	4.25pp	103.9%	105.3%

[1] Compared to simulcast anchor

Results on MPEG Test Set

— MPEG Call for Evidence in July 2017
— MPEG defined sequences, resolutions and bit rates as well as evaluation methods

	Simulcast anchor	Deflation without new tools	Deflation with new tools	Full transcoding anchor
Storage vs Simulcast	0.0%	-22.8%	-27.1%	-74.6%
Quality vs Simulcast	0.0%	0.0%	0.0%	8.5%
Storage vs Full Transcoding	297.1%	205.9%	189.5%	0.0%
Quality vs Full Transcoding	-6.4%	-6.4%	-6.4%	0.0%
Time vs Full Transcoding	-100.0%	-99.8%	-99.7%	0.0%

Results on MPEG Test Set – Fast Transcoder

— Issue with MPEG CfE: Full transcoding with HEVC reference software HM
— Not usable in reality due to high complexity

— Used transcoder based on x265 instead
— New anchors generated due to differences between encoder configurations

	Simulcast anchor	Deflation without new tools	Deflation with new tools	Full transcoding anchor
Storage vs Simulcast	0.0%	-19.2%	-23.6%	-74.5%
Quality vs Simulcast	0.0%	0.0%	0.0%	23.1%
Storage vs Full Transcoding	296.3%	219.9%	202.7%	0.0%
Quality vs Full Transcoding	-18.3%	-18.3%	-18.3%	0.0%
Time vs Full Transcoding	-100.0%	-94.8%	-94.6%	0.0%