

P.NATS: Parametric bitstream-based quality assessment of progressive download and adaptive audiovisual streaming services over reliable transport

Phase 1 (P.1203) and towards Phase 2 + VQEG AVHD

Alexander Raake^{1,2,3}, Jörgen Gustafsson⁴

¹Audiovisual Technology Group, Institute for Media Technology, TU Ilmenau, Germany

²Assessment of IP-based Applications (AIPA) Group, TU Berlin, Germany

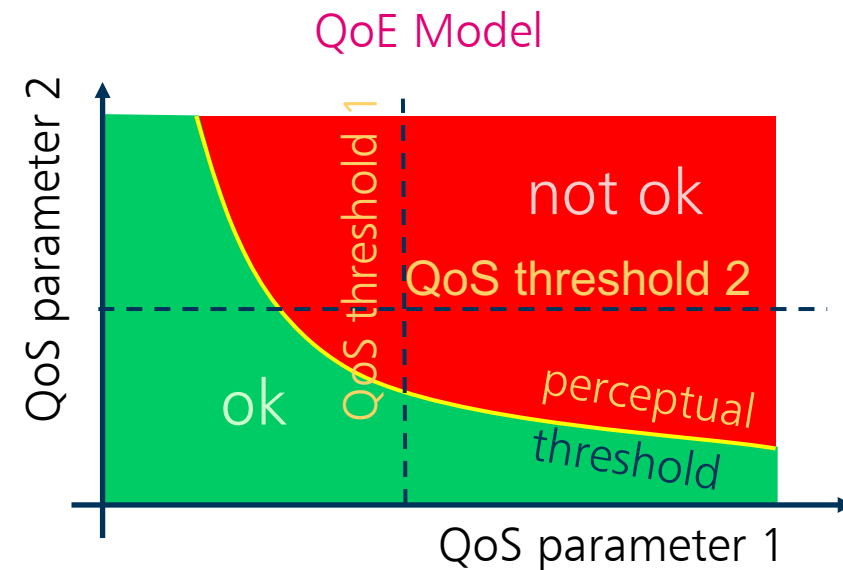
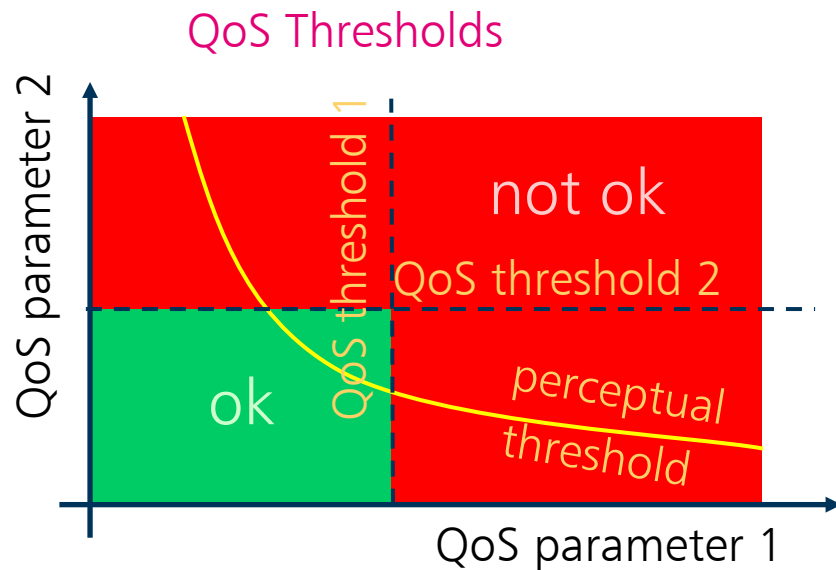
³Telekom Innovation Laboratories, Deutsche Telekom, Berlin, Germany

⁴Ericsson Research, Sweden

Contributors: Marie-Neige Garcia, Werner Robitza, Bernhard Feiten, Peter List, Silvio Borer, Shahid Mahmood Satti, Chris Schmidmer, Kazuhisa Yamagishi, Gunnar Heikkilä, David Lindegren, Lily Jili, Paul Coverdale, Simon Broom, ...

Monitoring: From QoS KPI to QoE perspective

- Shift from a QoS / QoE KPI to integrated QoE perspective
- Measurement & prediction of QoE important to avoid service & network over-engineering & prevent dissatisfied customers



(adapted from Barriac. 2002)

Media quality model standardization is needed

Not a measure such as meter or kg!

Often used : mean opinion score (MOS)

excellent	good	fair	poor	bad
5	4	3	2	1



Standardization



Background

- Requirement for defined units/scales:
 $Quality_{\text{model_A}} \neq Quality_{\text{model_B}}$

Approach

- Precise measurement specification & documentation
- Standardization: ITU-T, VQEG
- Reproducible research
- ...

Adaptive Streaming P.NATS



LIKE IF YOU HATE THIS SIGN

YouTube



0:00 / 6:66

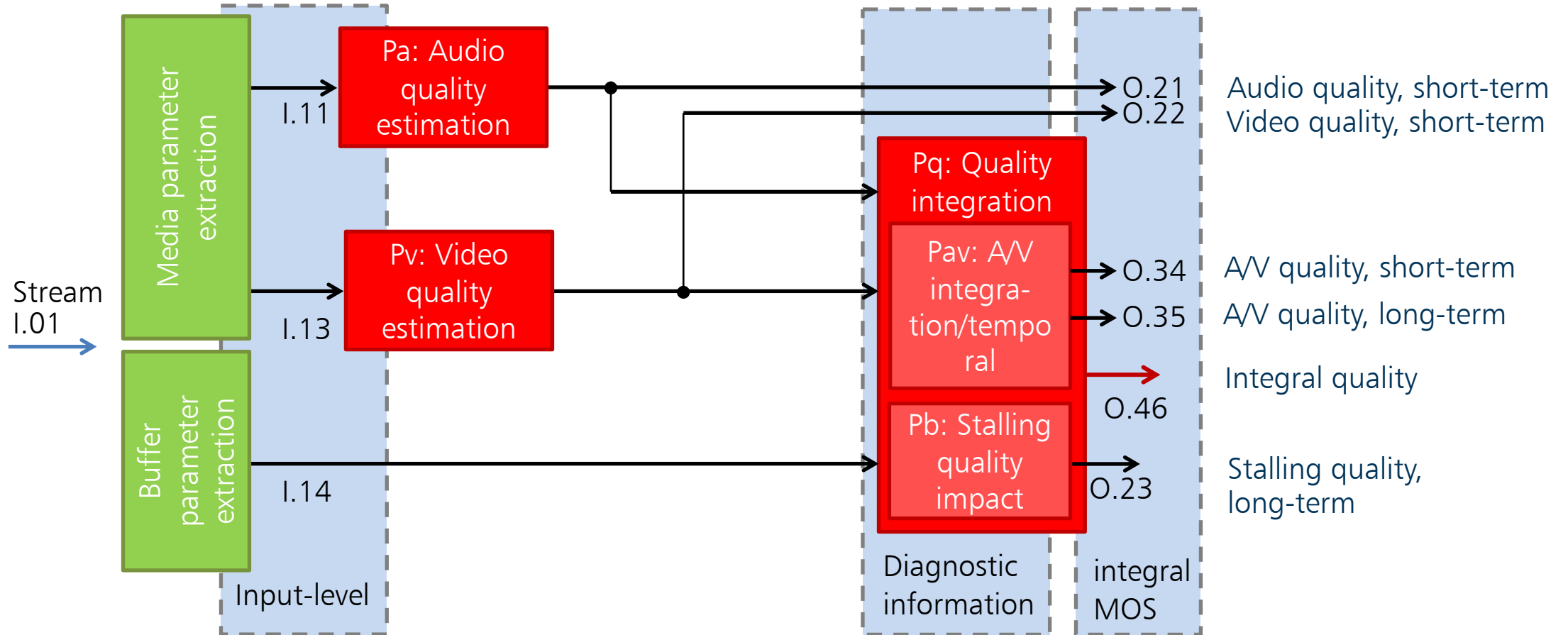


ITU-T P.NATS Phase 1

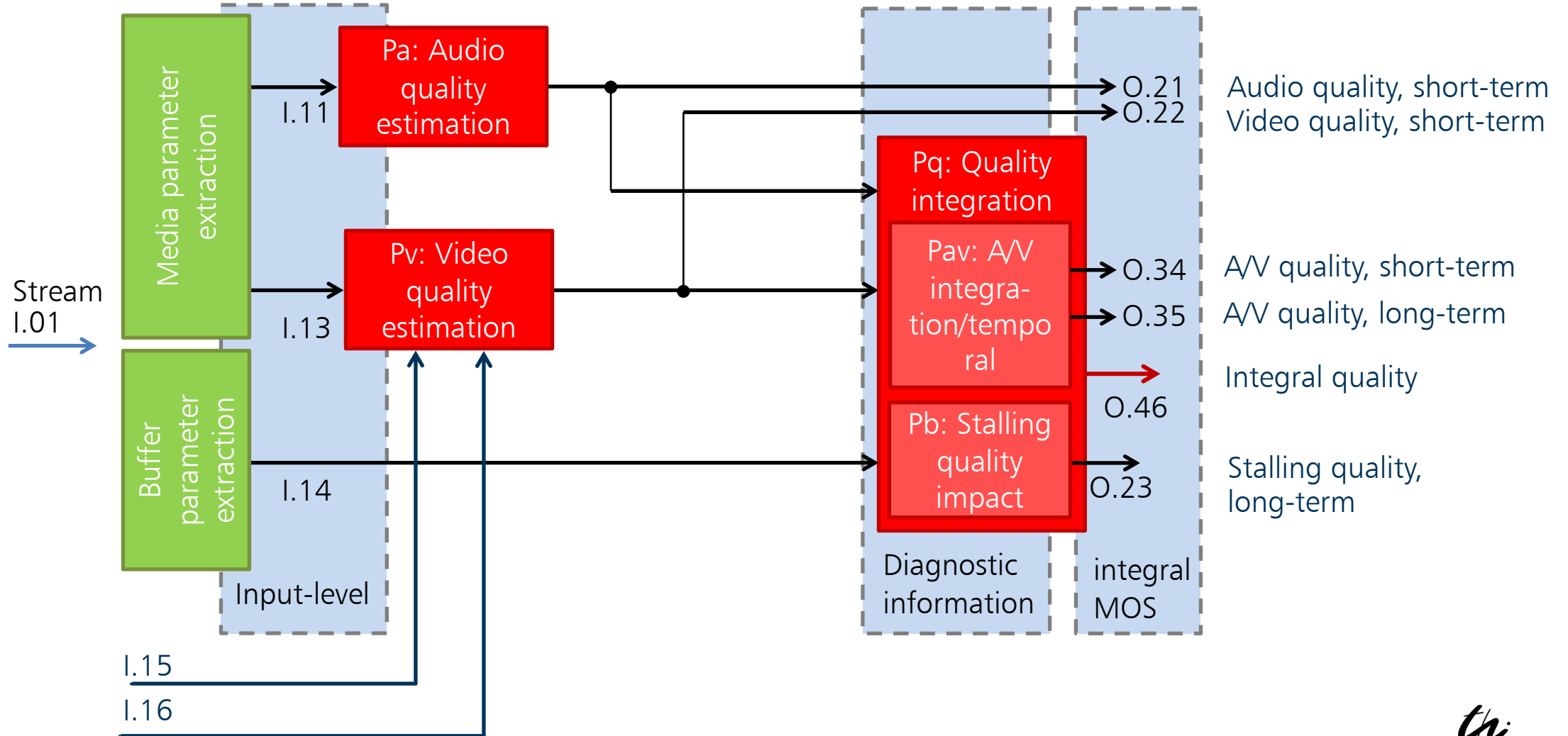
- Work Item in SG12, Q14
- Parametric non-intrusive assessment of TCP-based multimedia streaming quality, considering adaptive streaming
- Model scope:
 - Adaptive quality levels within one sequence
 - Sequences of up to 5 min length
 - PC/TV and mobile phone devices



P.NATS Phase 1, Track 1

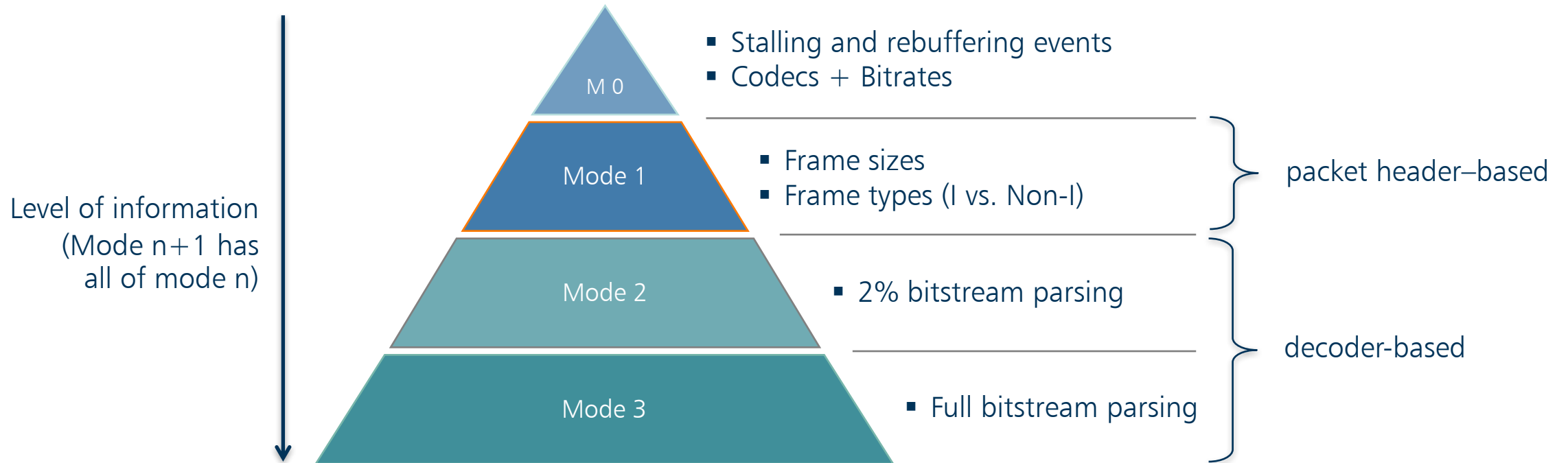


P.NATS Phase 1, Track 2



P.NATS Phase 1, Track 1

Modes of operation



P.NATS Phase 1 → P.1203

Standardization finalized last week, only Track 1

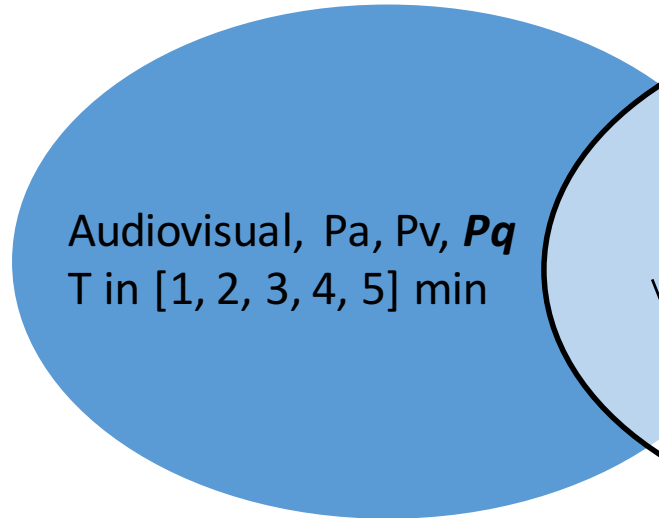
- P.1203: Mother document
- P.1203.1: Video quality estimation module
 - Common core model across all modes, including temporal and spatial resolution impact
 - Only coding-component adjusted per mode → Annexes A to D, same coefficients otherwise
 - Mode 0: Bitrate and bpp
 - Mode 1: Multiplicative frame-size-based content complexity feature
 - Mode 2 & 3: Specific QP-feature based on P-/B-frames, plus Mode 0, 1 features
- P.1203.2: Audio quality estimation module
 - Same as in P.1201.2 → coverage of a number of audio codecs and bitrates
- P.1203.3: Quality integration module
 - Two components
 - Weight 0.75: Classical parameter-based approach
 - Weight 0.25: Random forest model
- Performance: RMSE between 0.41 (Mode 0) and 0.33 (Mode 3)

P.NATS Phase 2: Collaboration with VQEG AVHD

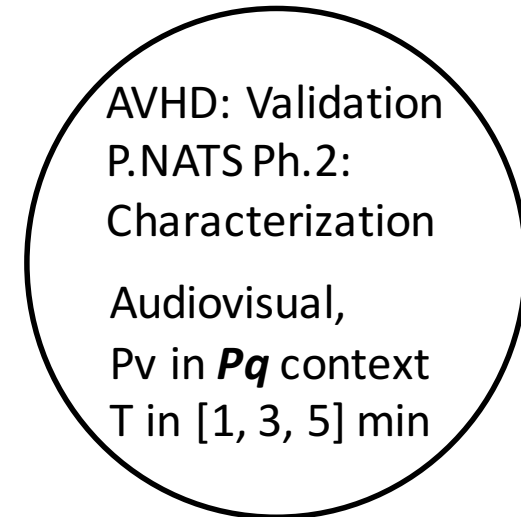
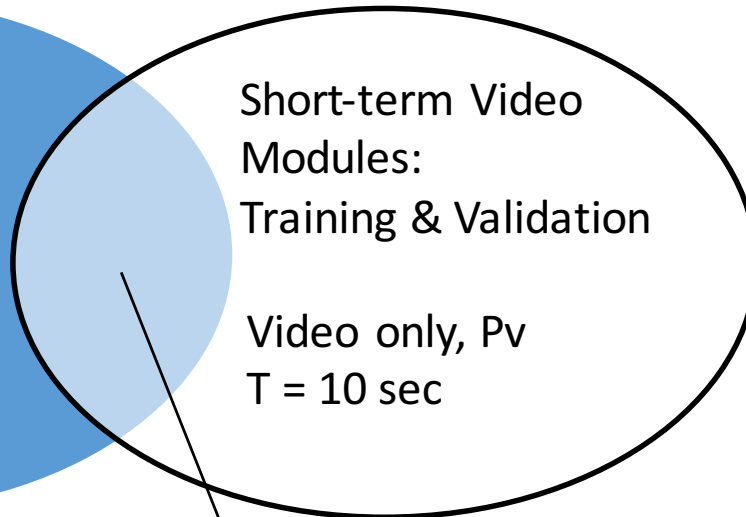
→ "AVHD/P.NATS Phase 2"



P.NATS Phase 1

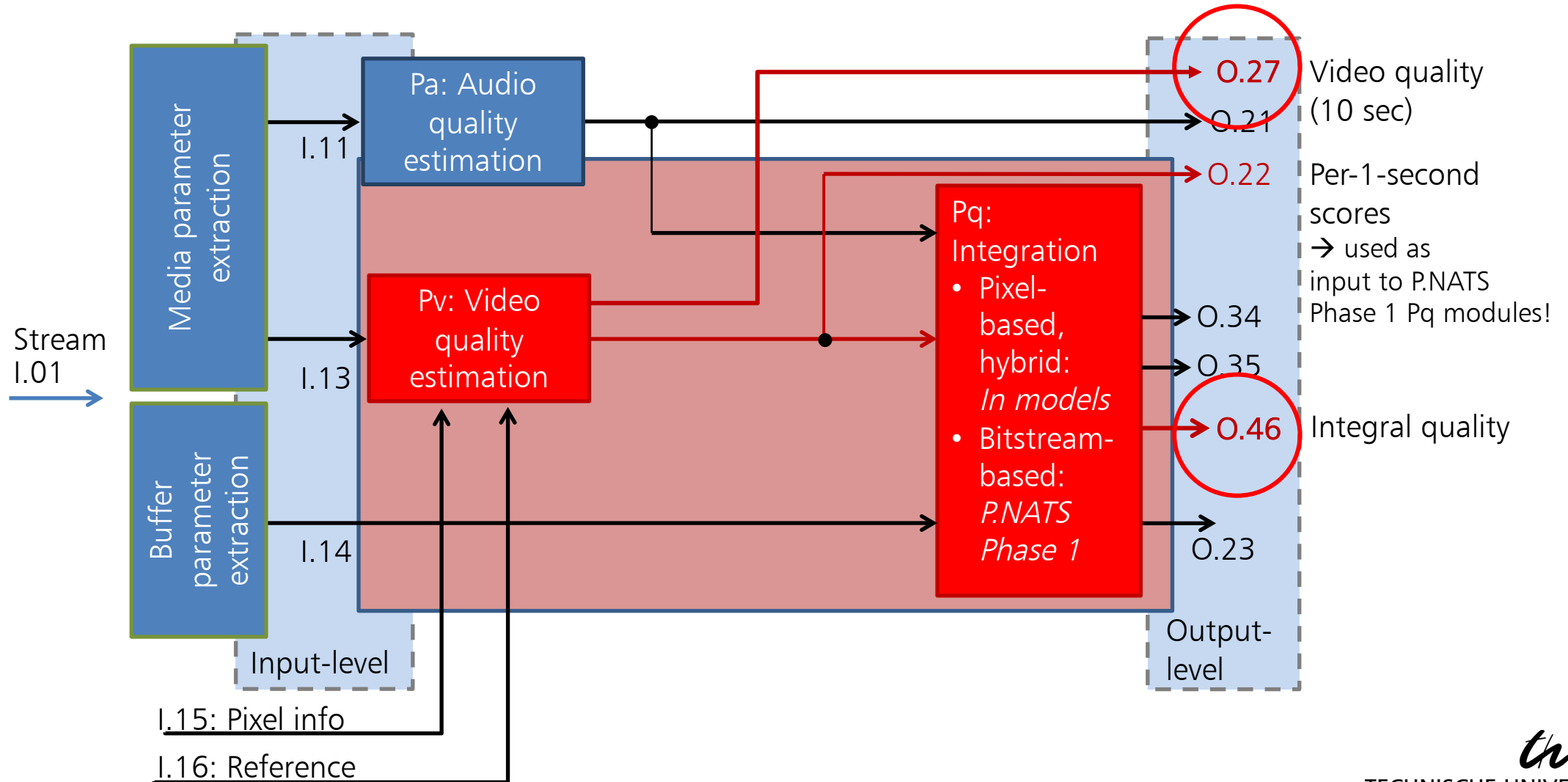


AVHD / P.NATS Phase 2



Re-use some conditions
representative of P.NATS Phase 1

VQEG AVHD/P.NATS Phase 2 – video only



AVHD/P.NATS Phase 2

- Model types
 - Signal-based: FR, RR, NR
 - Bitstream-based
Modes 0, 1, 2, 3
 - Hybrid: NR
- Technology
 - UHD-1, HD
 - HFR
- Video codecs
 - H.264
 - HEVC/H.265
 - VP9

Questions?

Next: ToR, discussions
→ Shahid, Silvio