

JVT-T051

Some considerations about restriction on priority_id syntax element

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research & development



Context

- High level syntax for SVC NAL units
- Following discussion on the reflector of the AHG on high level syntax
 - consensus on D. Singer's proposal
 - *"Priority_ids MUST be assigned in such a way that, given a valid stream with N being the highest priority_id, any subset of that stream which includes all NALUs with priority_id $\leq M$, where is $M \leq N$, must also be a valid stream."*
- Aim of this contribution
 - to illustrate the concept of this restriction
 - thanks to a new graphical representation of an SVC stream
 - to provide a more general restriction formulation
 - to raise additionnal constraints on priority_id

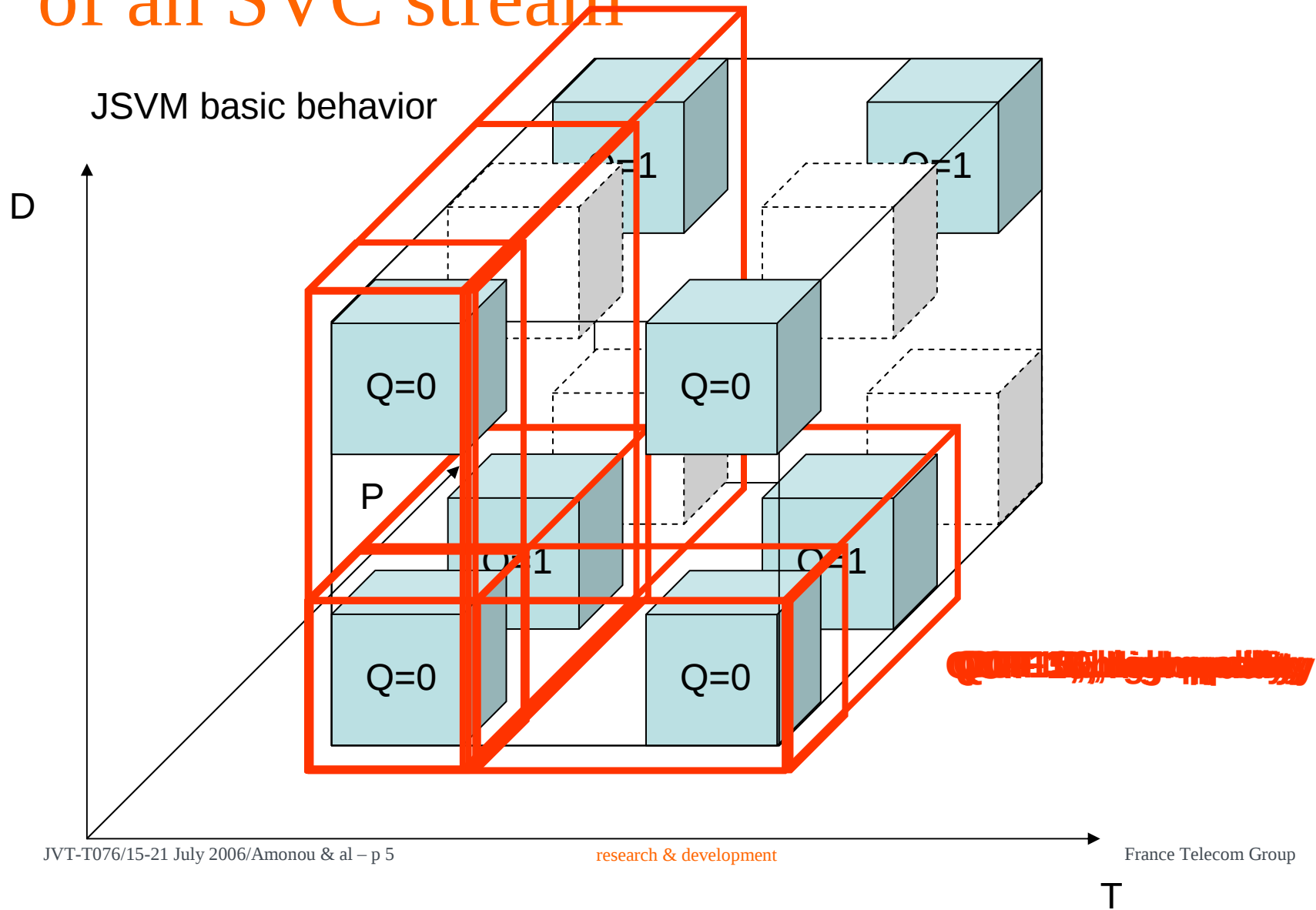
High level syntax

- SVC NAL unit header provides high level informations
 - (simple_)priority_id
 - discardable_flag
 - temporal_level
 - dependency_id
 - quality_level
- Ongoing discussions about the use of priority_id since months
 - inside JVT
 - but also outside...
 - MPEG File Format, IETF/RTP
 - some would like to have $P=f(D,T,Q)$ or $(D,T,Q) = g(P)$, but not all...

Consensus of the AHG on high level

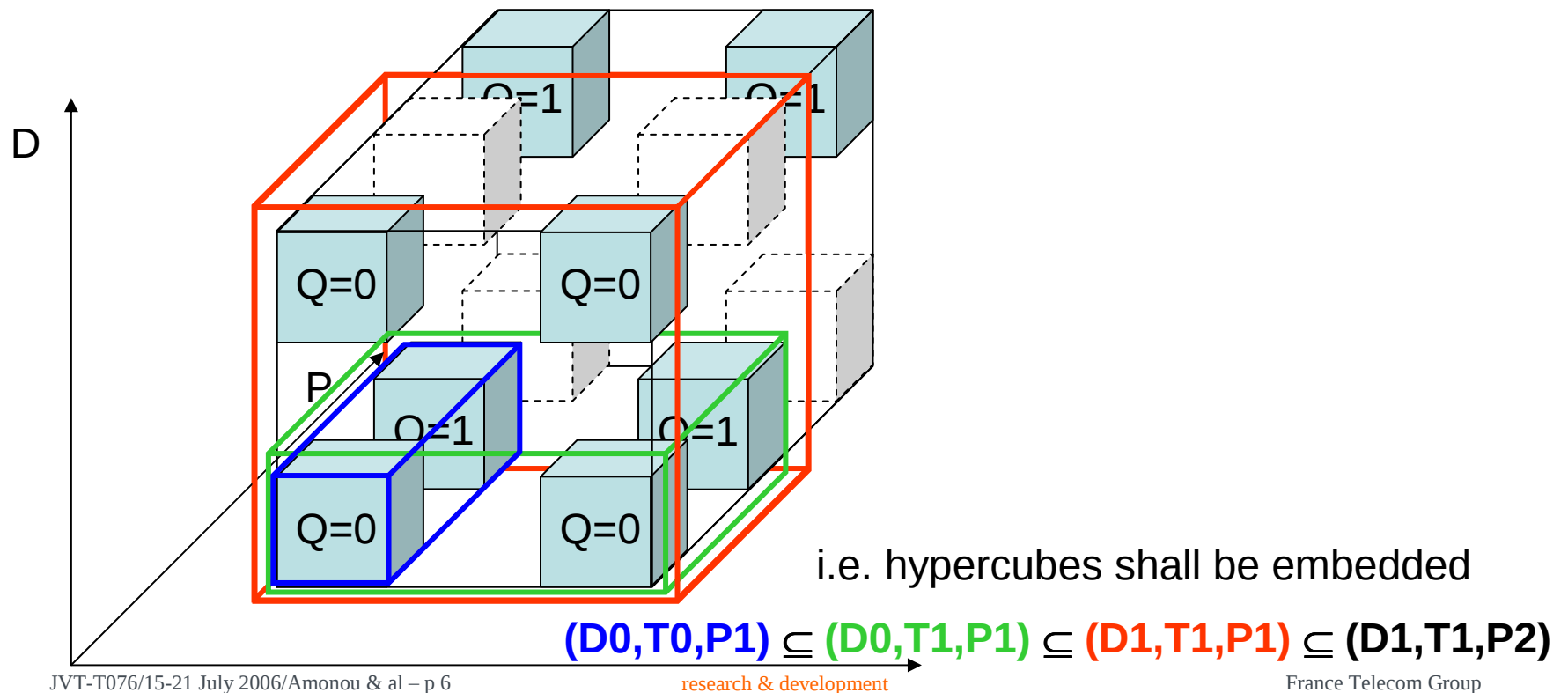
- D. Singer's proposal (on the AHG's reflector)
 - *"Priority_ids MUST be assigned in such a way that, given a valid stream with N being the highest priority_id, any subset of that stream which includes all NALUs with priority_id $\leq M$, where is $M \leq N$, must also be a valid stream."*
- *Dave's proposal is OK...*
 - *but lead to naive thinning scenario...*
- *We will show that*
 - *this property forbids the mapping $P=f(D,T,Q)$*
 - *this restriction is not sufficient*

New (DTP) graphical representation of an SVC stream



Enhanced restriction definition

- *"Priority_ids must be assigned in such a way that any subset of that stream which includes all NALUs with priority_id ≤ P, dependency_id ≤ D, temporal_level ≤ T, where (P,D,T) are integer values, must also be a valid stream "*



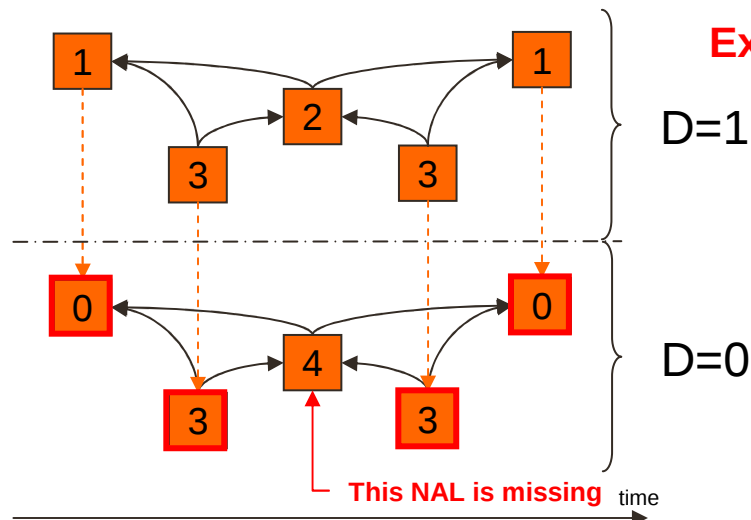
Why restriction on P-based extraction is not sufficient

■ Context:

- layered scalability built upon a combined scalability-enabled stream

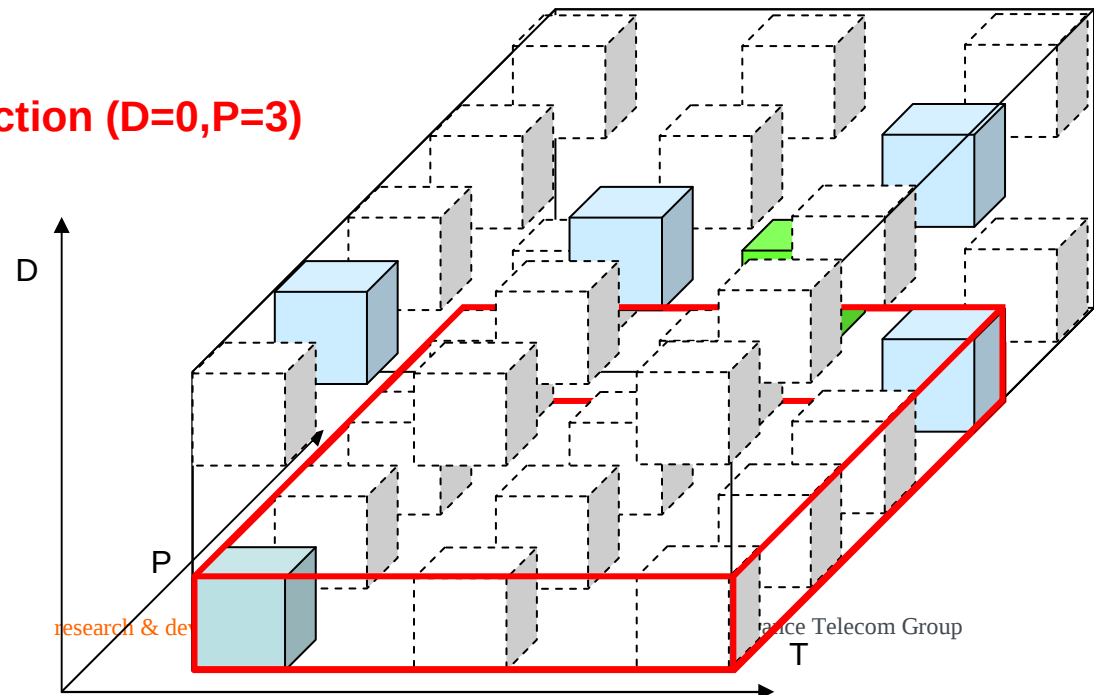
P	0	1	2	3	4
Operation point	CIF15	SD15	SD30	SD60	SD60 + discard

■ Stream organisation with one discardable NAL unit



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Extraction (D=0,P=3)



Layered stream organisation

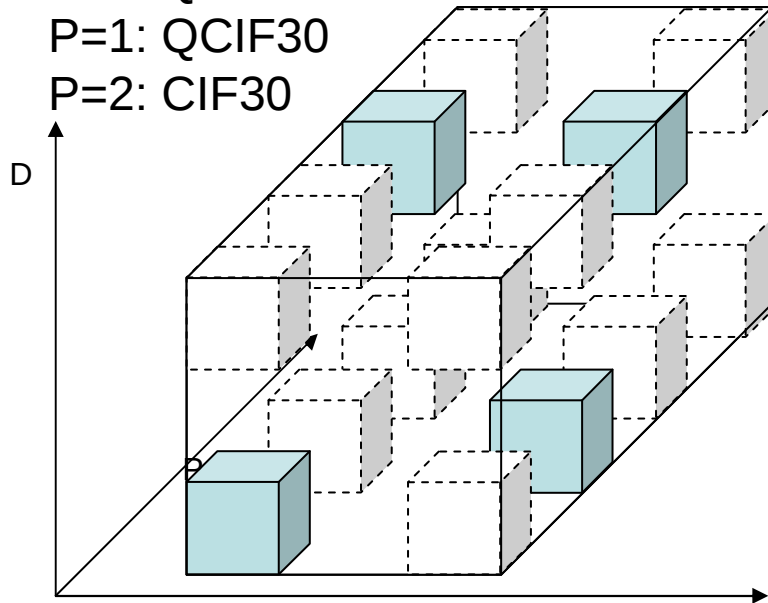
- QCIF15 $\subseteq$ (QCIF30 | CIF15) $\subseteq$ CIF30 study case

Path:

P=0: QCIF15

P=1: QCIF30

P=2: CIF30

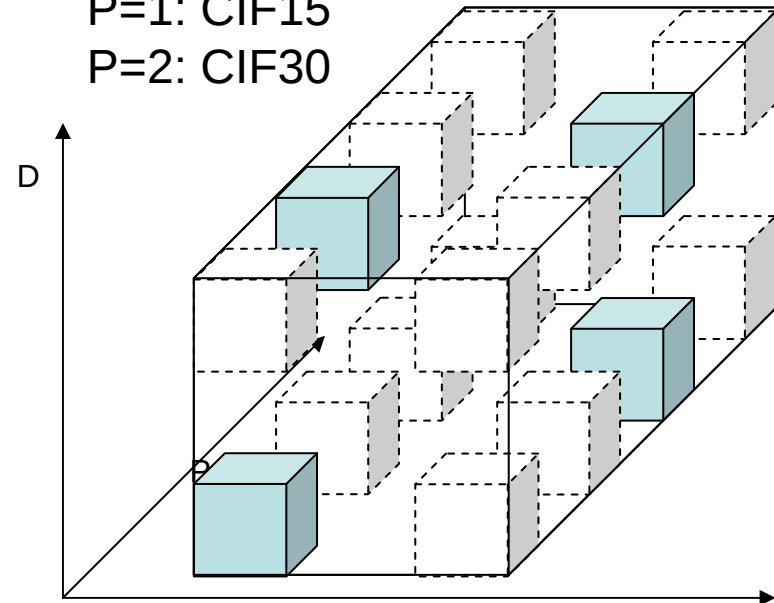


Path:

P=0: QCIF15

P=1: CIF15

P=2: CIF30



- P=2 is affected to different values of (D,T,Q)
- No mapping such as $(D,T,Q) = f(P)$
 - cf. following slide

Layered stream counter example

■ Non valid priority_id assignment

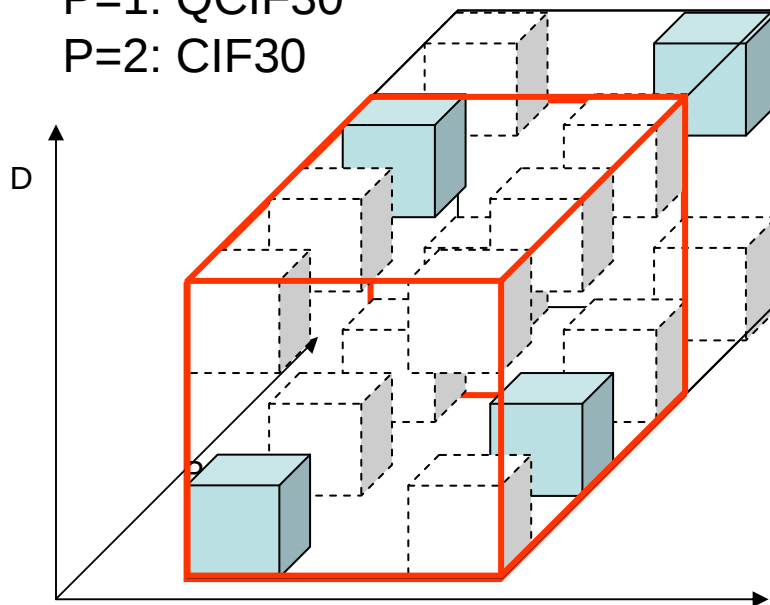
- P=2 is not a valid stream, although p=3 is a valid stream

Path:

P=0: QCIF15

P=1: QCIF30

P=2: CIF30



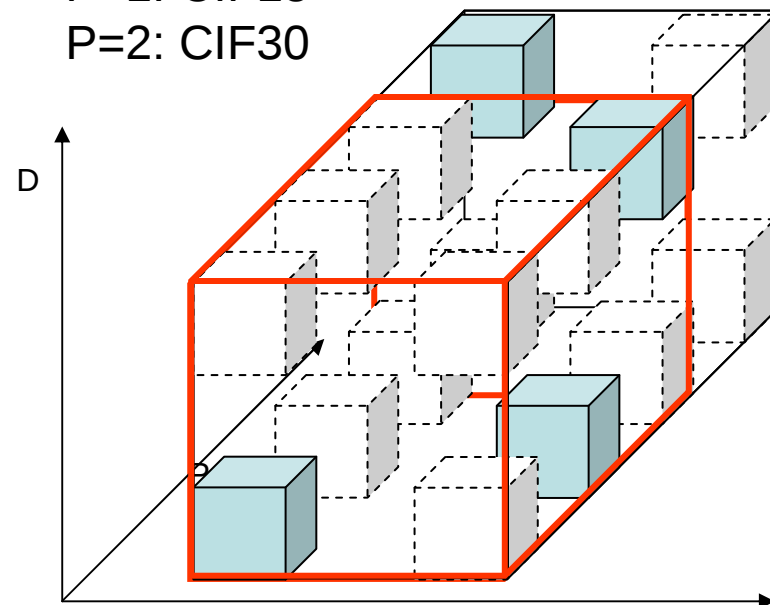
missing CIF30 layer base...

Path:

P=0: QCIF15

P=1: CIF15

P=2: CIF30

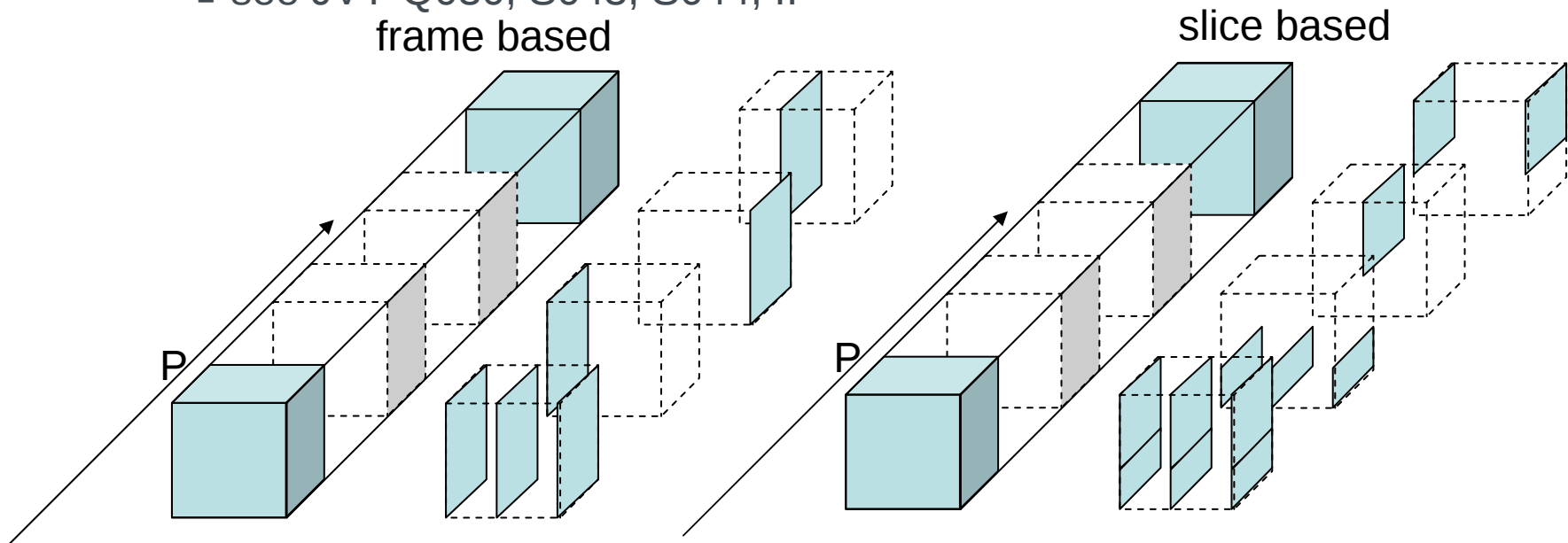


missing CIF15 layer base...

Quality layers and priority_id

- priority_id is used to convey quality layers

- extraction is based on (P,D,T,Q)
- see JVT-Q030, S043, S044, ..



- No mapping such as $P = f(D, T, Q)$

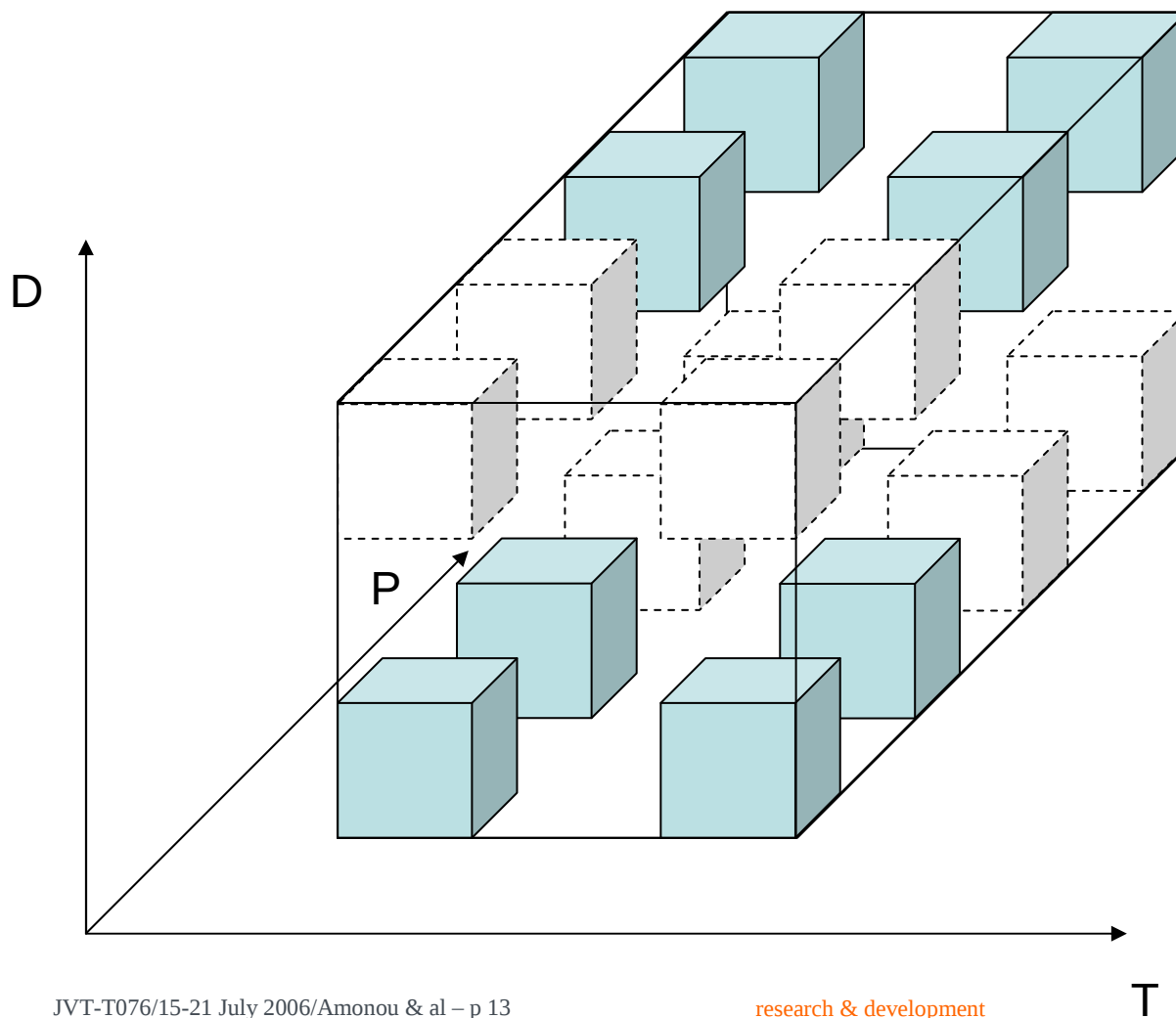
Conclusion - recommendations

- Leave current high level syntax as it is
- Use following restriction formulation instead of Dave's proposal
 - *"Priority_ids must be assigned in such a way that any subset of that stream which includes all NALUs with priority_id $\leq P$, dependency_id $\leq D$, temporal_level $\leq T$, where (P,D,T) are integer values, must also be a valid stream "*
- Do not put any additional restriction on priority_id
 - There should not have any mandatory mapping such as
 - $P=f(D,T,Q)$
 - $(D,T,Q) = g(P)$

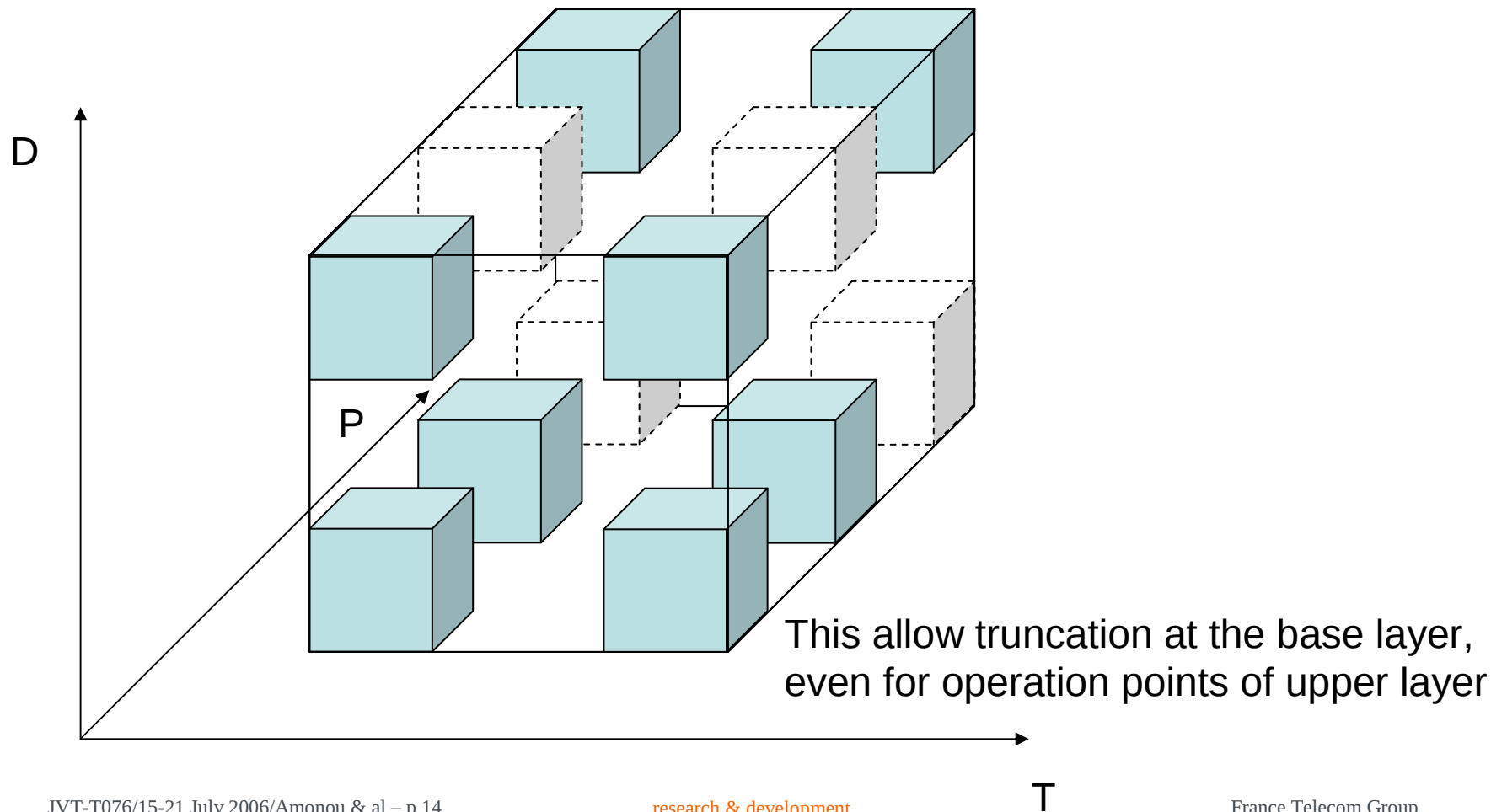
Annex

- Graphical illustration of various SVC stream configurations
 - simple priority_id assignment
 - practical JSVM behavior
 - JSVM behavior and discardable streams
 - frame adaptive Inter Layer Prediction
 - slice adaptive Inter Layer Prediction
 - single path extractions
 - temporal resolution enhancement
 - QCIF15 - (QCIF30 | CIF15) - CIF30 paradigm
 - Quality layers
 - temporal based SNR scalability
 - multi layer quality layers
 - Frame based assignment
 - slice based assignment
 - complex but valid example

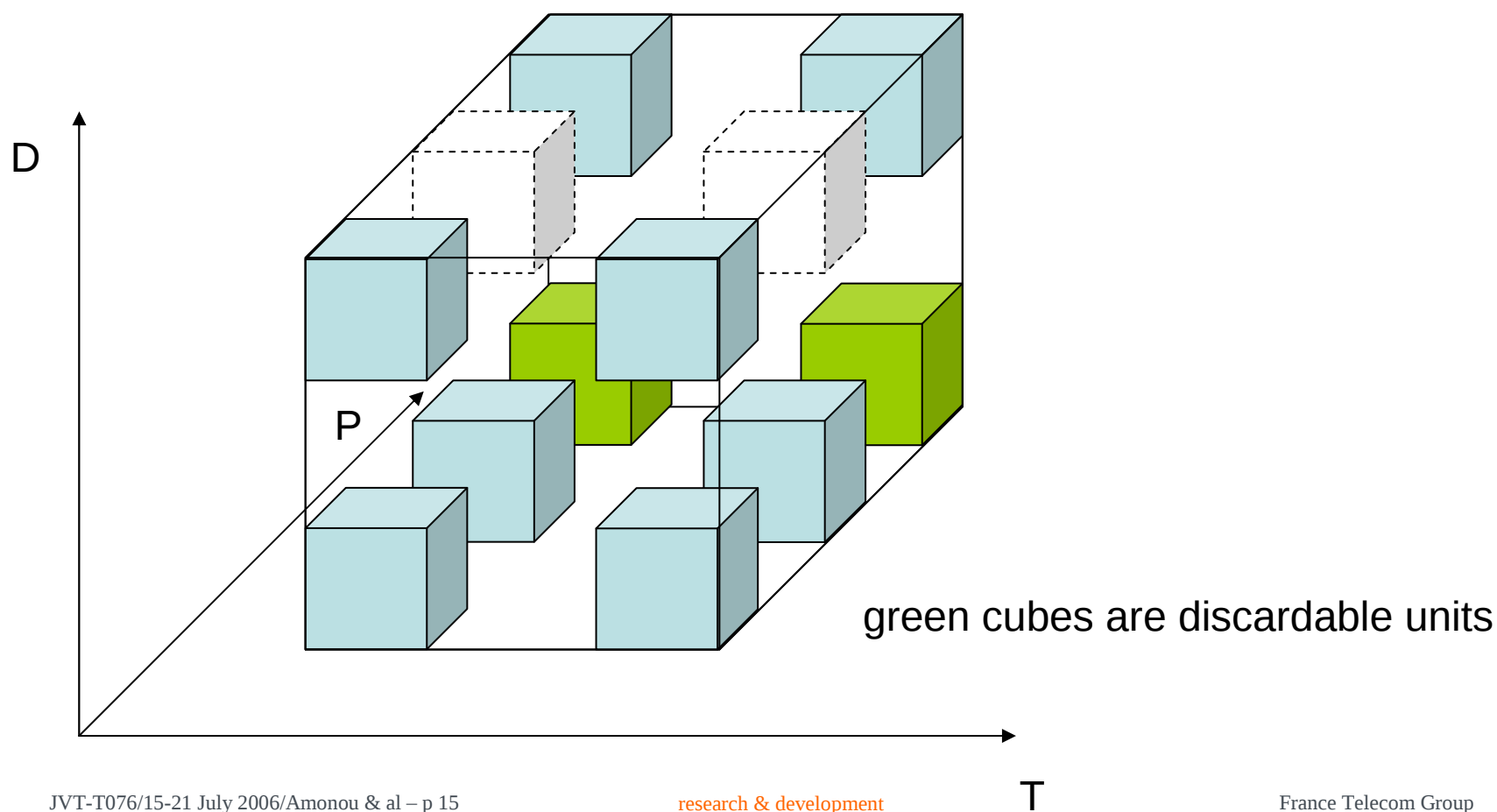
Simple priority_id assignment



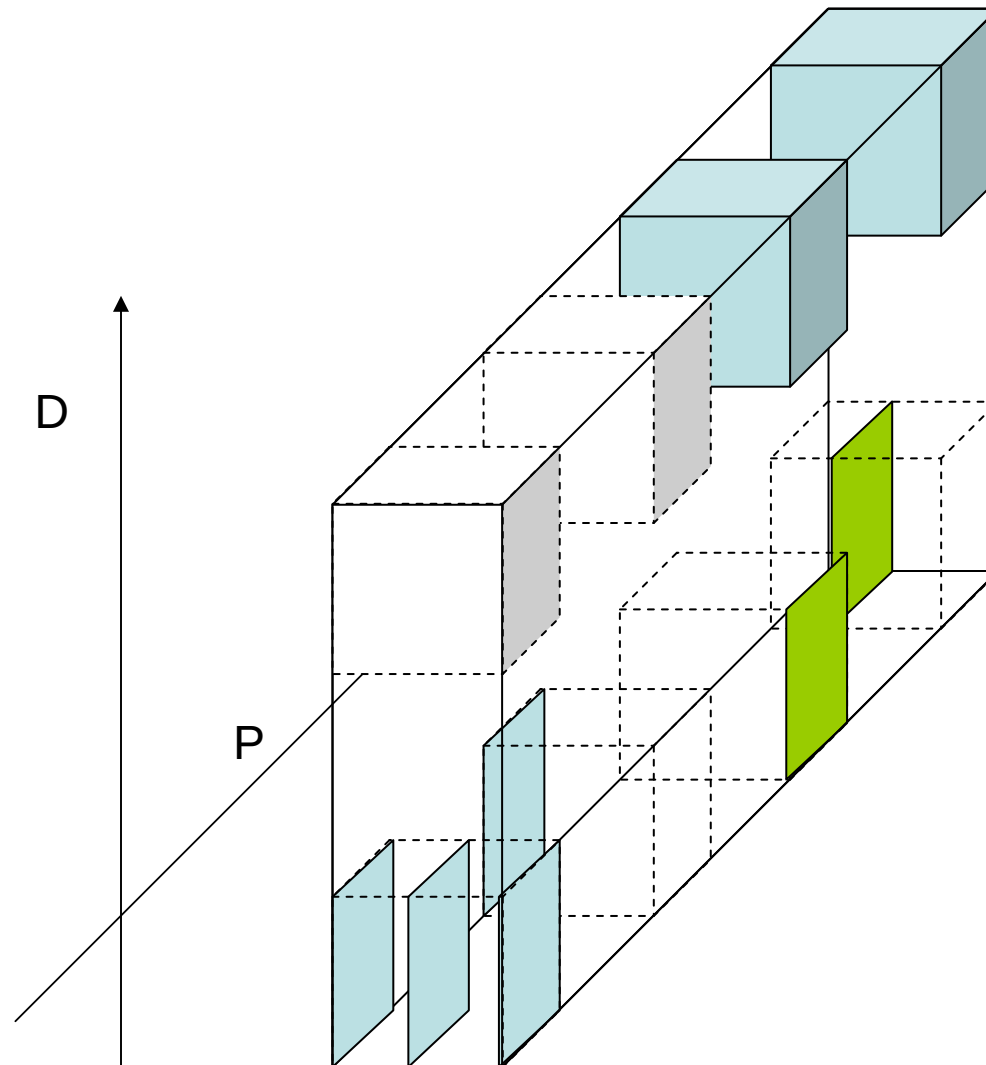
Practical JSVM behavior



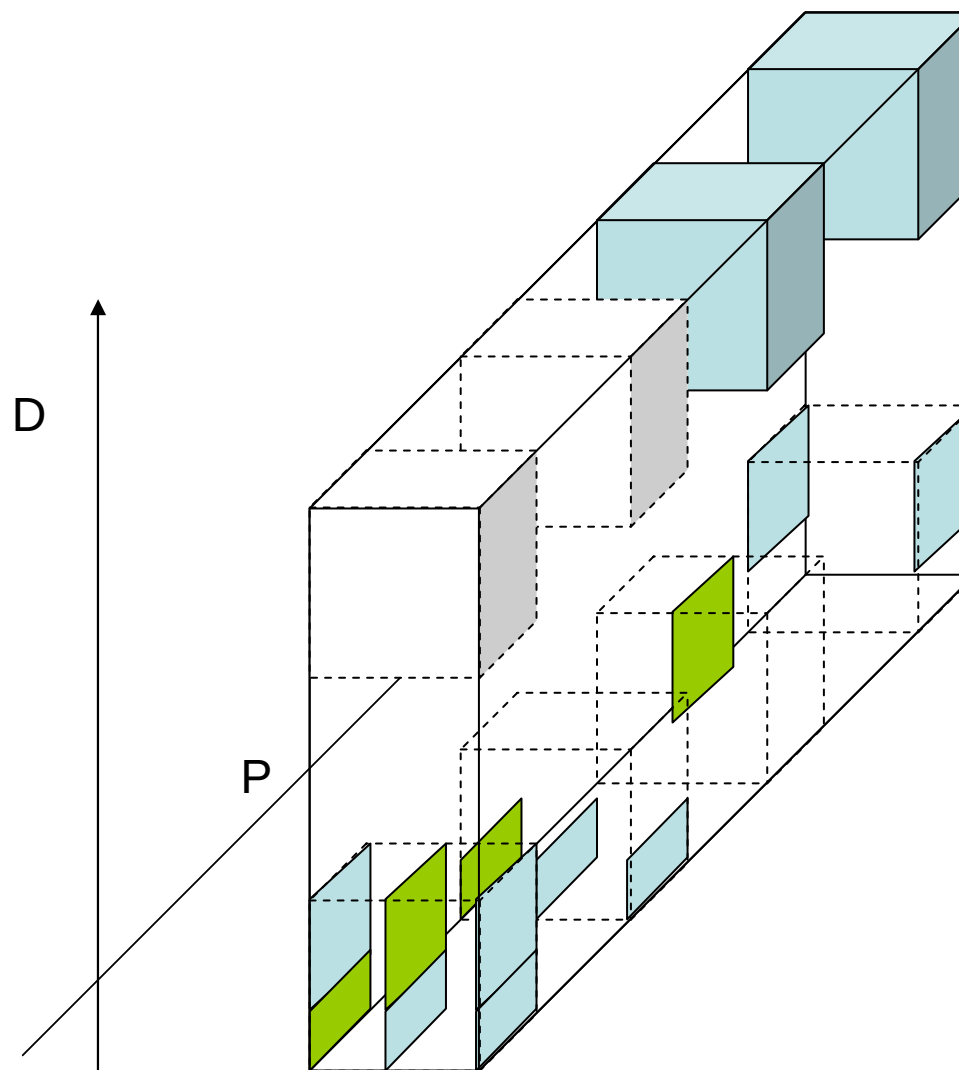
JSVM behavior and discardable streams



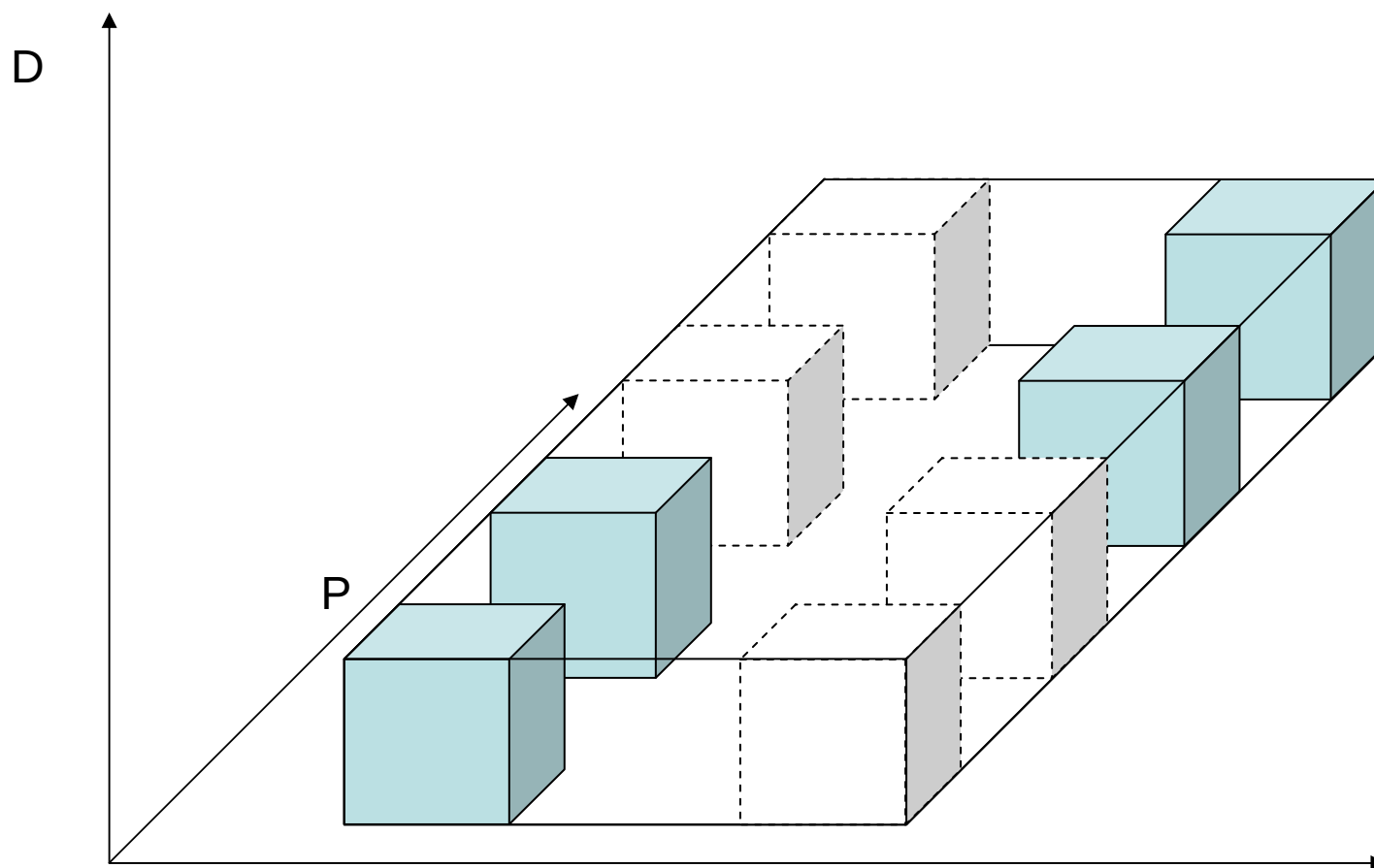
Frame adaptive ILP



Slice adaptive ILP



Single path extraction temporal resolution evolution



Single path extraction

QCI15-(QCI30|CIF15)-CIF30

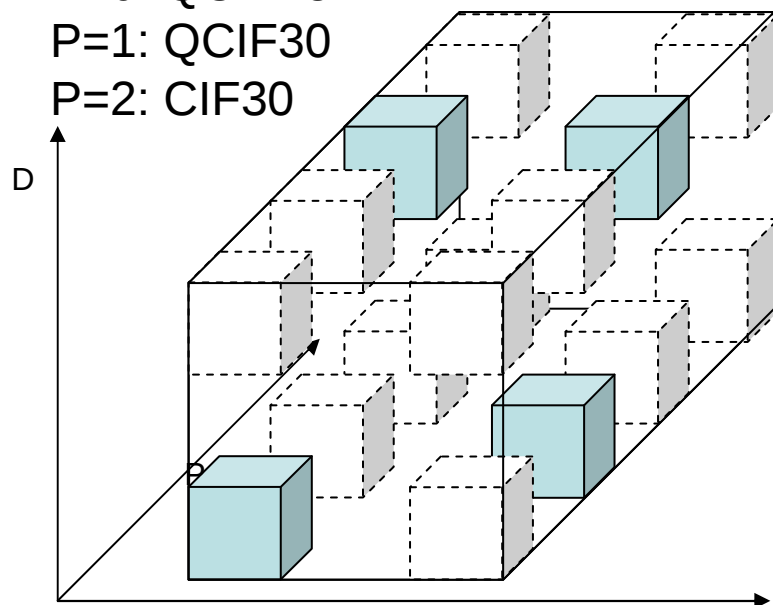


Path:

P=0: QCIF15

P=1: QCIF30

P=2: CIF30

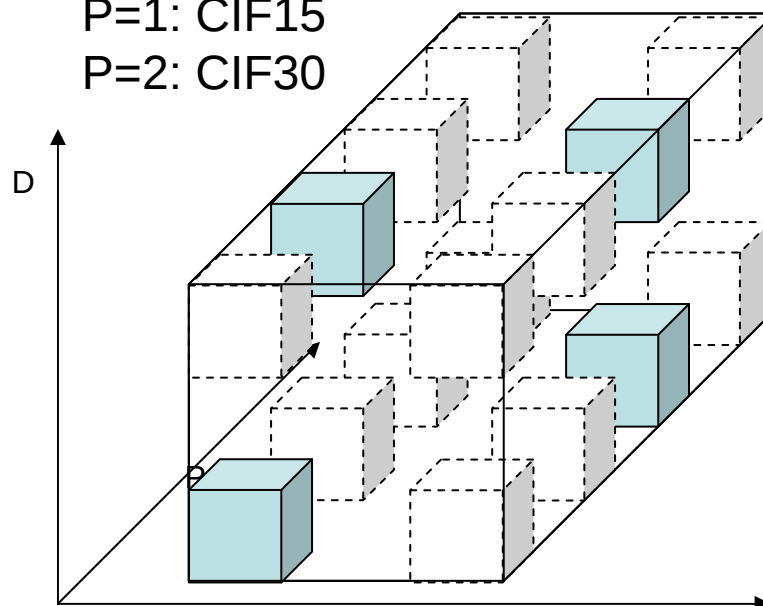


Path:

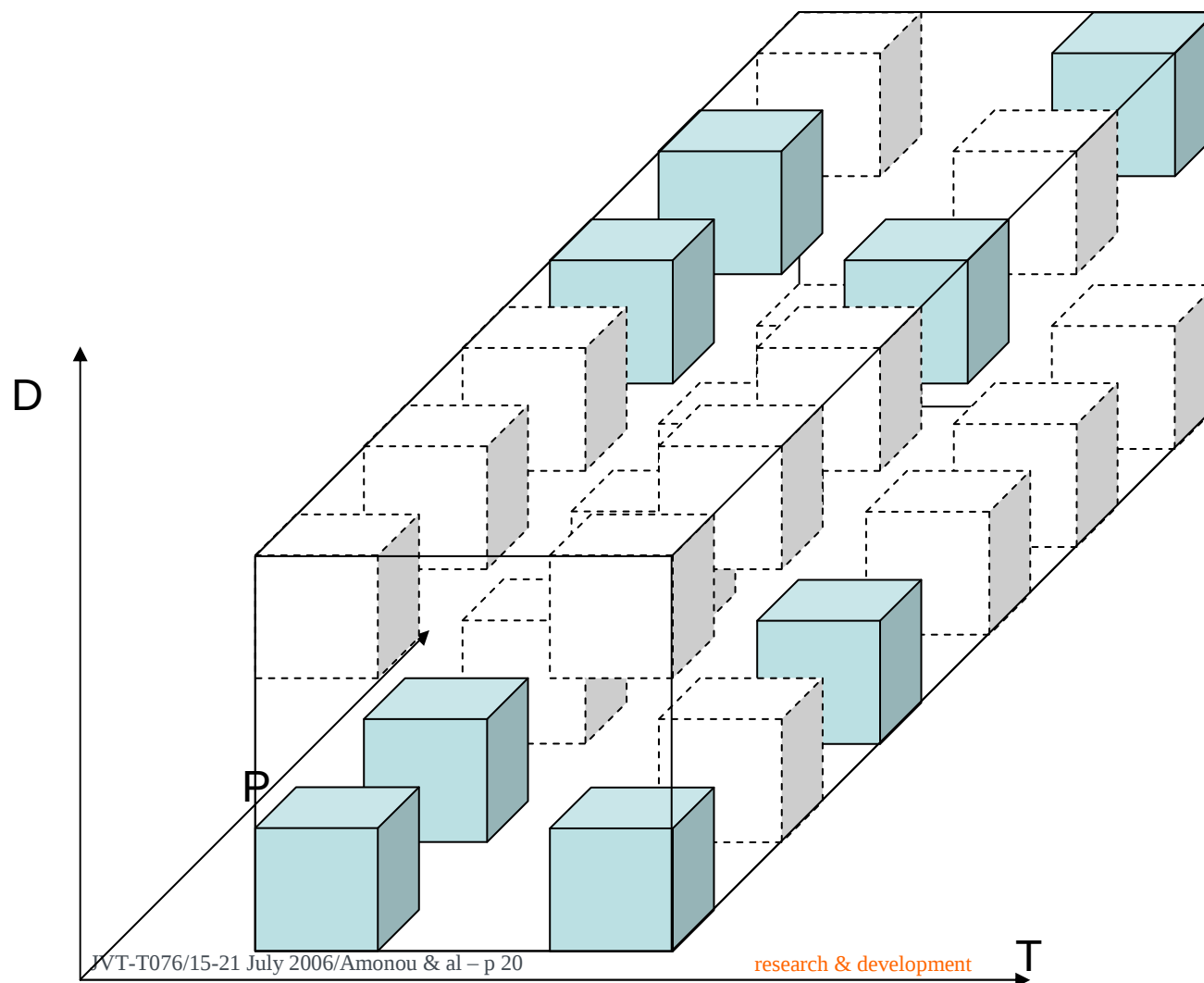
P=0: QCIF15

P=1: CIF15

P=2: CIF30

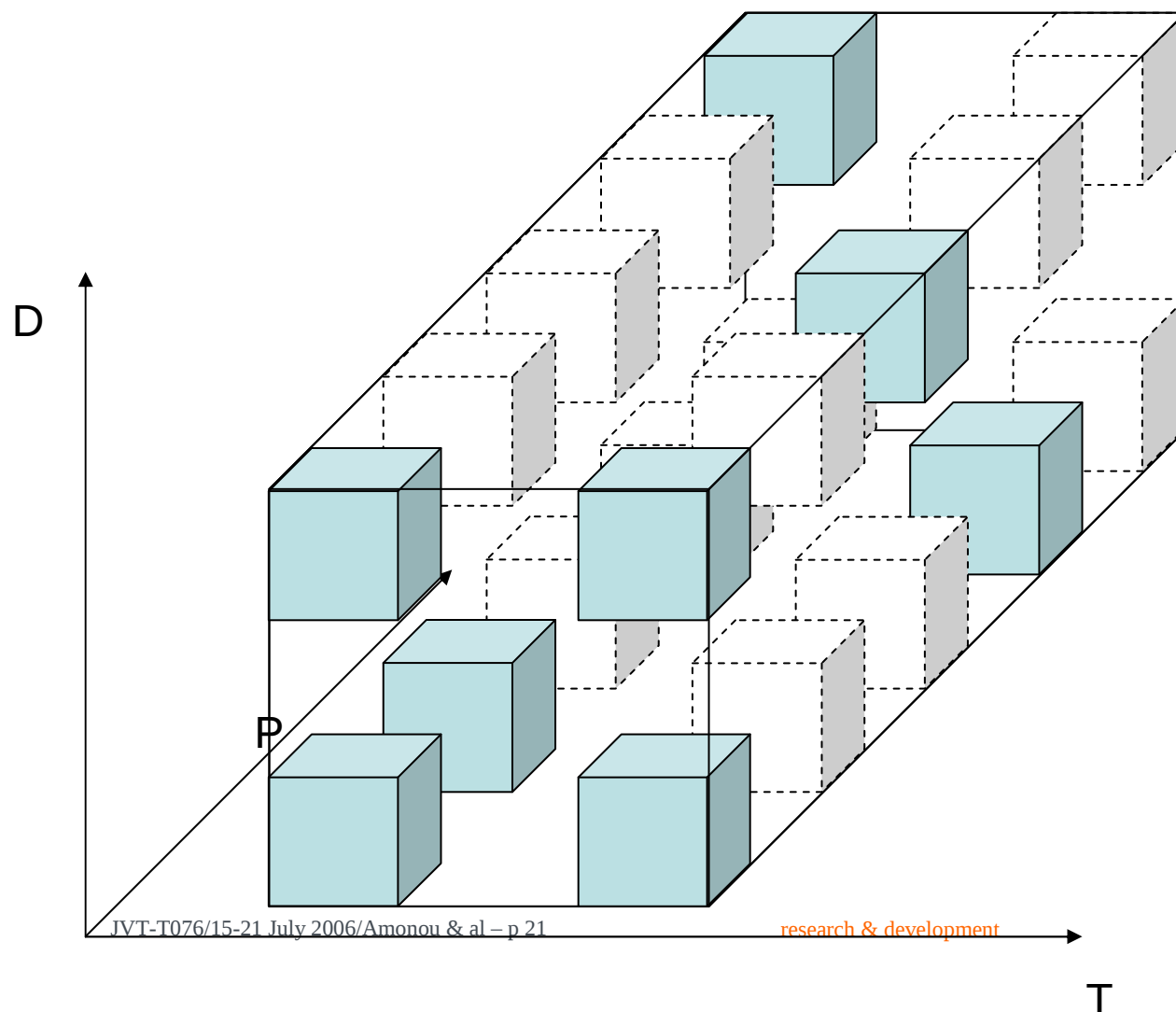


Quality layers temporal based SNR scalability

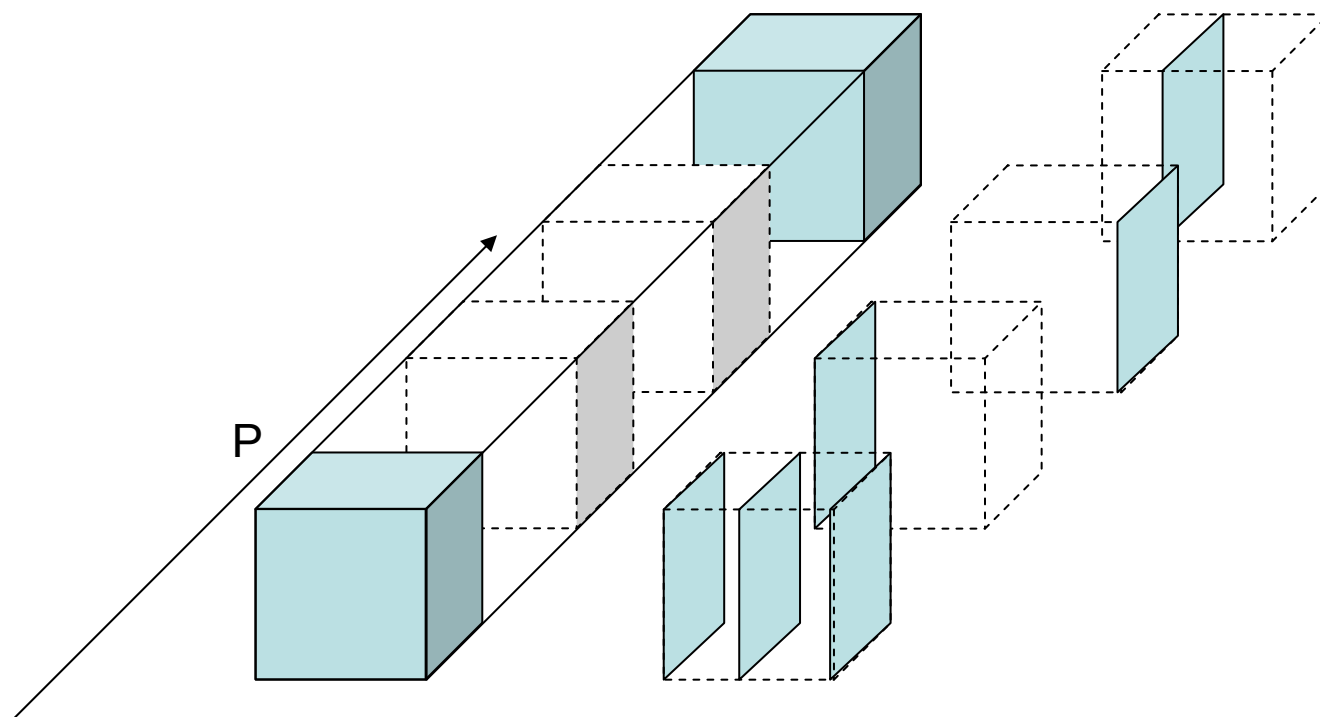


Quality layers

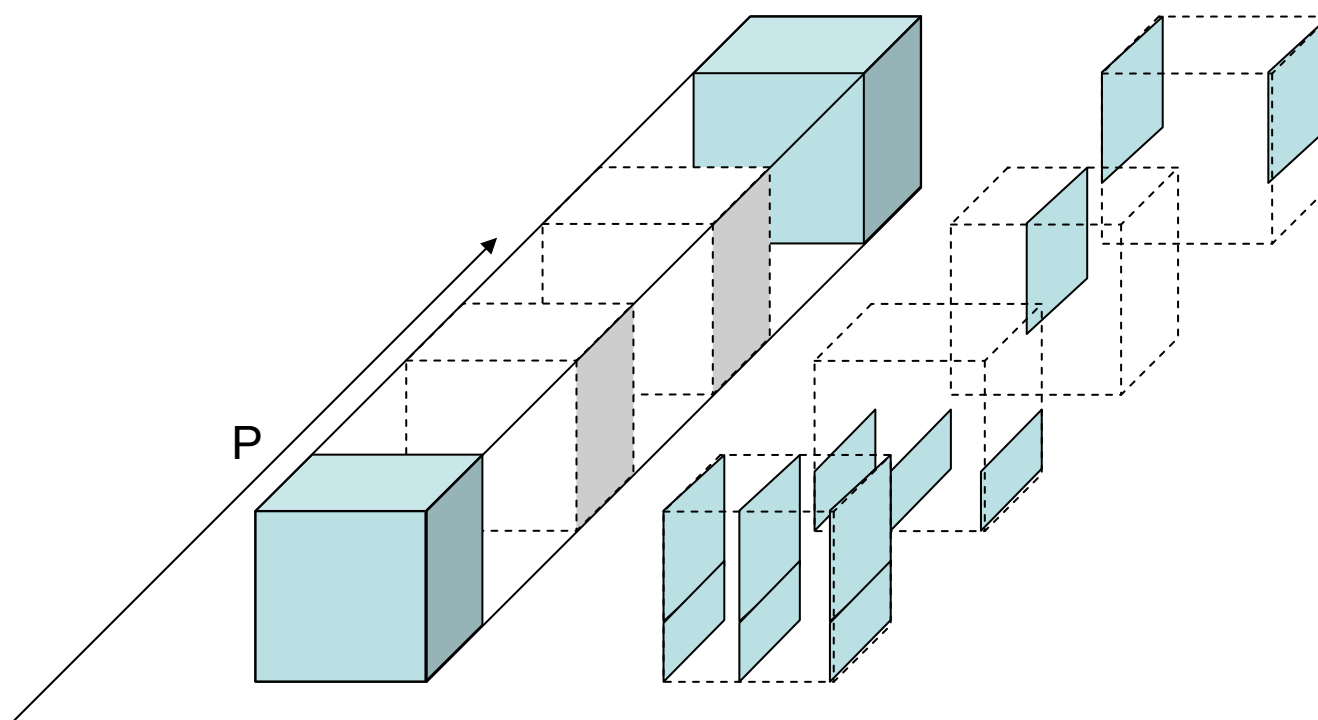
Multi-layers quality layers



Quality layers frame based assignment



Quality layers slice based assignment



Complex but valid assignment

