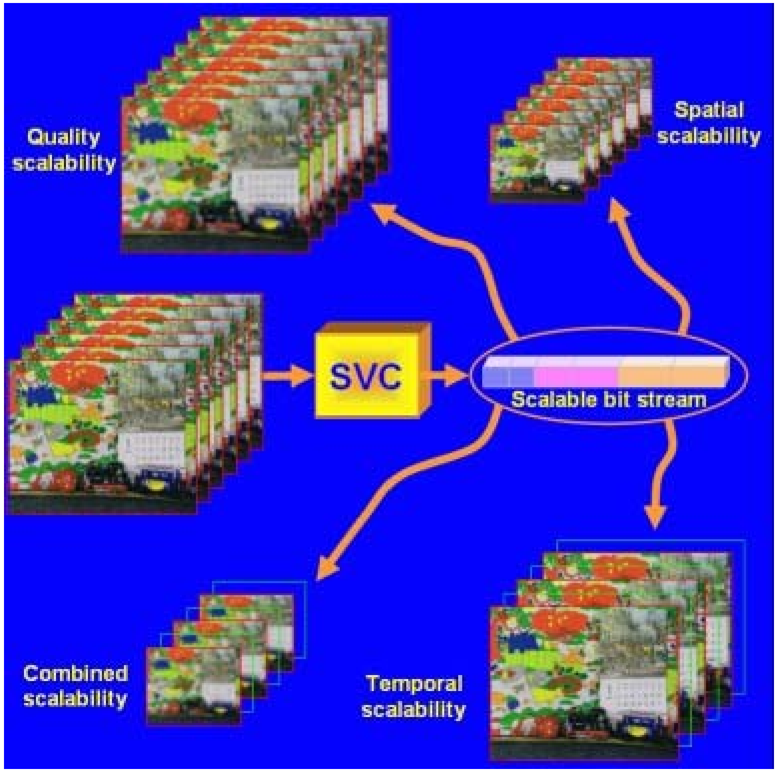
MPEG-2
And Scalability Support



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MPEG-2 Target

- "...Generic coding method of moving pictures and associated sound for ...digital storage, TV broadcasting and communication..."
- Dedicated for high quality services
  e.g. HDTV, Networked data services etc.
- Developed from CCIR-601, CCIR-648, JPEG, H.261 and MPEG-1 former standards

Profiles and Levels

- Each profile defines a set of capabilities, e.g. interlaced video support, B pictures, etc.
- Each level defines spatial and temporal resolutions
- Examples:

  - Main profile at main level (mp@ml) is used for standard TV
  - Main profile at high level (mp@hl) is used for HDTV

MPEG-2 Levels

- Low Level : 352x240 Pixel/Frame
  Match CPB MPEG 1
- Main Level : 720x480 Pixel/Frame
  Standard for NTSC-Broadcast-Quality
- High1440 Level : 1440x1152 Pixel/Frame
  High Definition TV
- High Level : 1920x1080 Pixel/Frame
  High Definition TV

MPEG-2 Profiles

Profiles indicate limitations for MPEG2-Syntax

- Main-Profile : Match MPEG1-Syntax Compatible with Interlacing
- Simple-Profile : Main, with no B-Frames

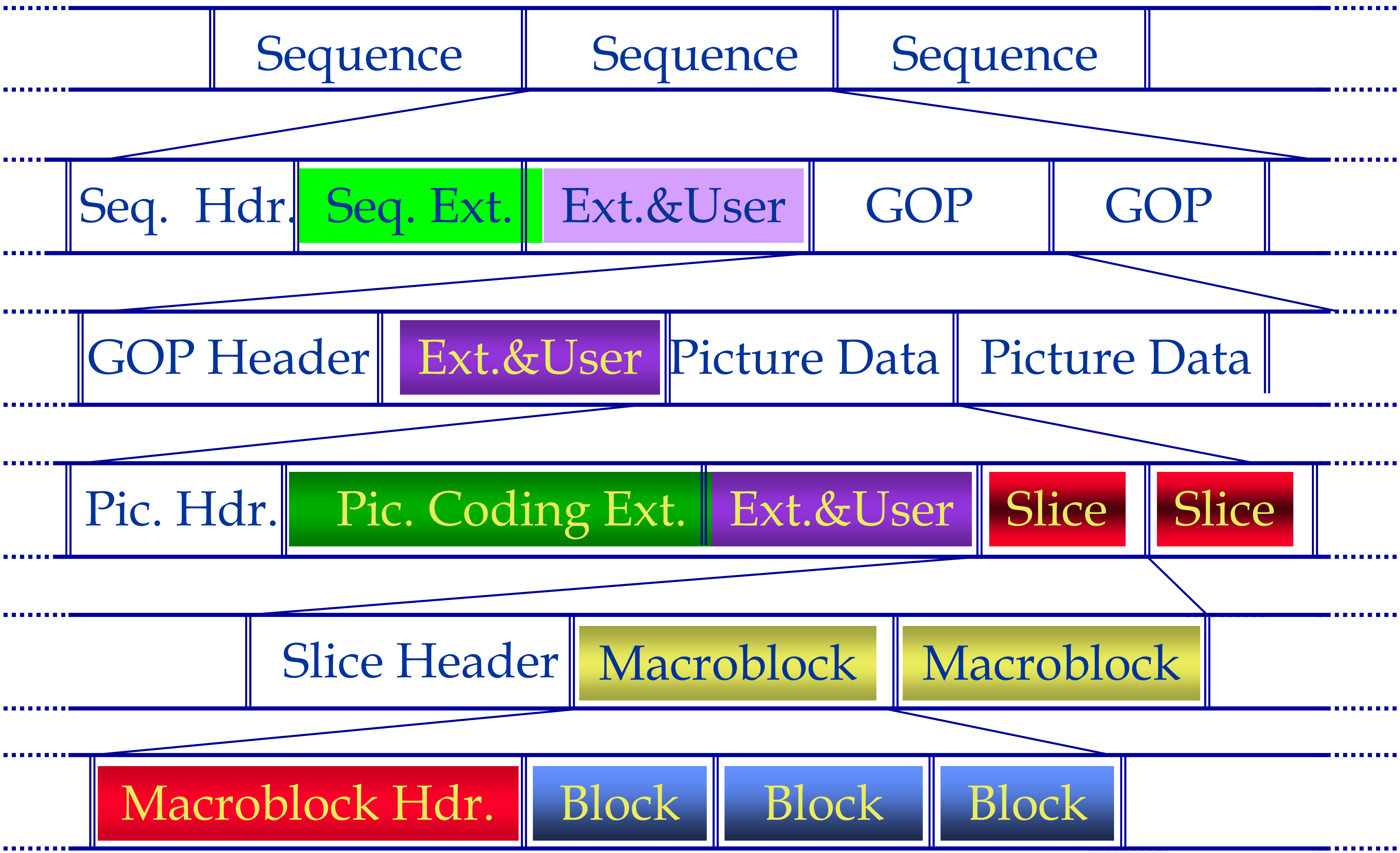
Profiles and Levels

			Profile						
			Simple (I, P) (4:2:0)	Main (I, P, B) (4:2:0)	SNR (I, P, B) (4:2:0)	Spatial (I, P, B) (4:2:0)	High (I, P, B) (4:2:0; 4:2:2)	Multiview (I, P, B) (4:2:0)	4:2:2 (I, P, B) (4:2:0; 4:2:2)
Level	Low	Pels/line			352	352		352	
		Lines/frame			288	288		288	
		fps			30	30		30	
		mbps			4	4		8	
	Main	Pels/line	720	720	720		720	720	720
		Lines/frame	576	576	576		576	576	512/608
		fps	30	30	30		30	30	30
		mbps	15	15	15		20	25	50
	High-1440	Pels/line	1440		1440	1440	1440		
		Lines/frame	1152		1152	1152	1152		
		fps	60		60	60	60		
		mbps	60		60	80	100		
	High	Pels/line	1920			1920	1920	1920	
		Lines/frame	1152			1152	1152	1152	
		fps	60			60	60	60	
		mbps	80			100	130	300	

I, P, B: allowable picture types. Maximum bit rates include all layers in case of scalable bit streams.

MPEG-1 Compatible

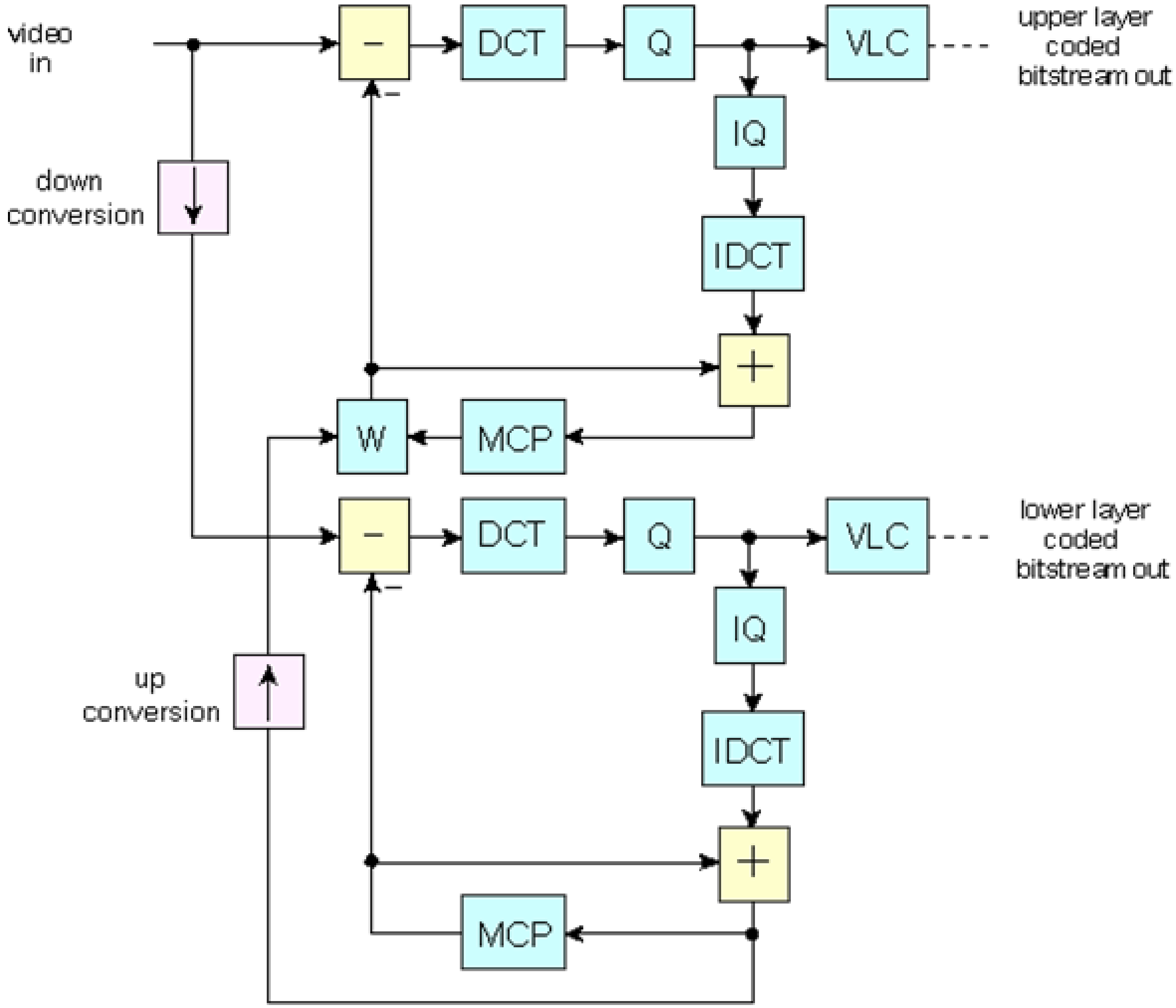
MPEG-2 Btstream structure



Scalability Modes

- SPATIAL SCALABILITY
- TEMPORAL SCALABILITY
- SNR SCALABILITY
- DATA PARTITIONING

Spatial Scalability Diagram



(a)

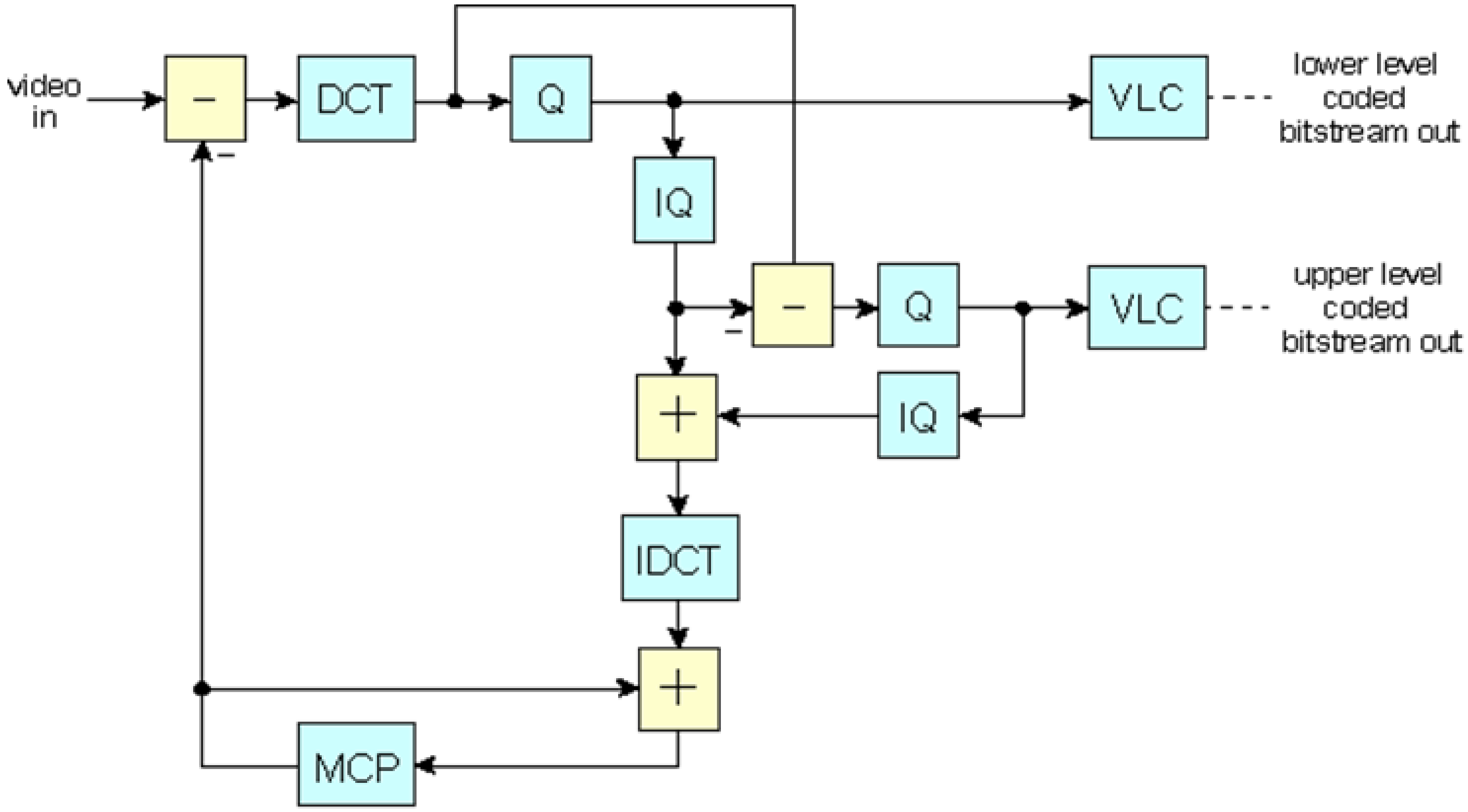
SNR Scalability

- Refinement of the DCT coefficients encoded in base layer by the enhancement layer coefficients

- Base layer contains coarser quantization then enhancement layer

- Enhancement layer contains coded refinement DCT coefficients and a small overhead

Scalable SNR Encoder Scheme

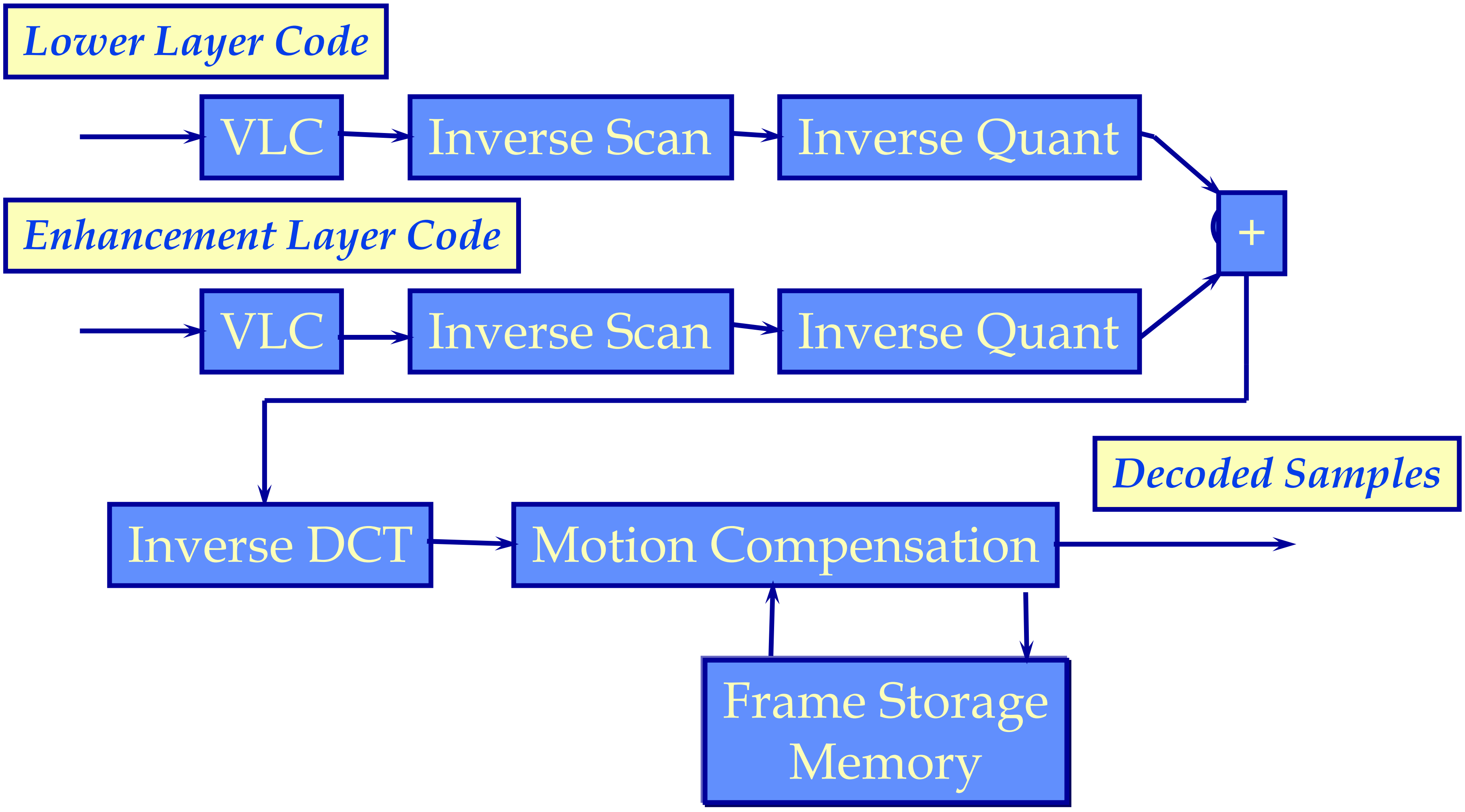


(a)

SNR Scalability Decoding

- DCT coefficients in base layer are added to DCT coefficients in enhancement layer
- The combined layer decoding process is identical to decoding of a non-scalable bitstream
- Different rate control for the 2 layers

SNR Scalability Decoder Scheme



Data Partitioning

- The base layer contains the most ‘critical’ components, such as header information, motion vectors and (optionally) low-frequency DCT coefficients

- The enhancement layer contains all remaining coded data (usually less critical to successful decoding)

Data Partitioning (Cont’d)

- The bitsteam is split into 2 layers: partition0, partition1
- The Priority Breakpoint (in sequence header) indicates which syntax elements are placed in partition0 which is the base or high priority partition

Data Partitioning (Cont’d)

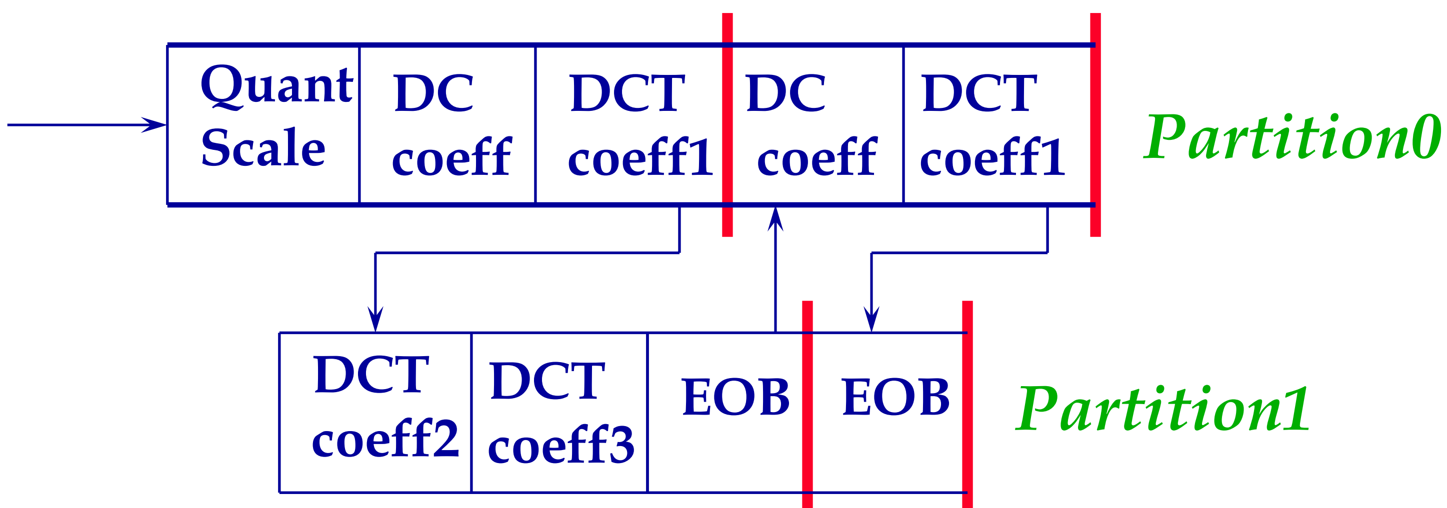
- The remainder of the bitstream is placed in partition1 which is the low priority partition
- Sequence, GOP, picture and slice headers are duplicated from partition0 to partition1
- VBV refers to the sum of the 2 partitions
- Partition0 contains sequence scalable extension

Data Partitioning (Cont'd)

- No Data Partitioning

Quant Scale	DC coeff	DCT coeff1	DCT coeff2	DCT coeff3	EOB	DC coeff	DCT coeff1	EOB

- Partitions for Priority Break Point 64:



Data Partitioning (Cont'd)

Possible Breakpoints:

- After slice header
- After macroblock address increment (macroblock header)
- Before coded block pattern (after Motion Vector)
- After any number of DCT coefficients (excluding one)