CCITT SGXV
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Experts Group for ATM Video Coding

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Source: SWEDEN
Title: ASPECTS ON PICTURE FORMAT FOR HIGH QUALITY APPLICATIONS
Purpose: INFORMATION

In Sweden we think the definition of a new picture format for high quality applications is a very important topic, which needs careful consideration by everybody involved. In order to achieve an effective standard it is essential that a decision on a new picture format has widest possible support. Ideally, a decision should be taken jointly by CCITT, CCIR and ISO, although we can see problems with the practical procedure.

There are several aspects to take into account. Some of them are contradicting, so their importance must be weighted carefully against each other. Some of those aspects are

Application	1. Communication.	
	2. Distribution.	
	3. Storage/retrieval.	
Compatibility	4. CIF.	
	5. CCIR 601.	
	6. Future HDTV.	
	7. Computer graphics.	
Parameters	8. Picture aspect ratio.	4:3 or 16:9 ?
	9. Pixel aspect ratio.	Square or not ?
	10. Frame rate.	50, 60 or other ?
Equipment	11. Usefulness of existing equipment.	
	12. Commercial feasibility of new potential products.	
	13. Location of picture format standard converters.	

Swedish opinion.

As much compatibility as possible shall exist among different applications.
"Distribution" and "Future HDTV" aspects shall be given heavy weight in definition of a new picture format decision.

Further comments, related to compatibility, are given in the annex.

ANNEX.

This annex describes one possible strategy to acheive compatibility between various applications, ranging from video phone to HDTV. A decoder as in Figure A1 would need to be standardised with this strategy.

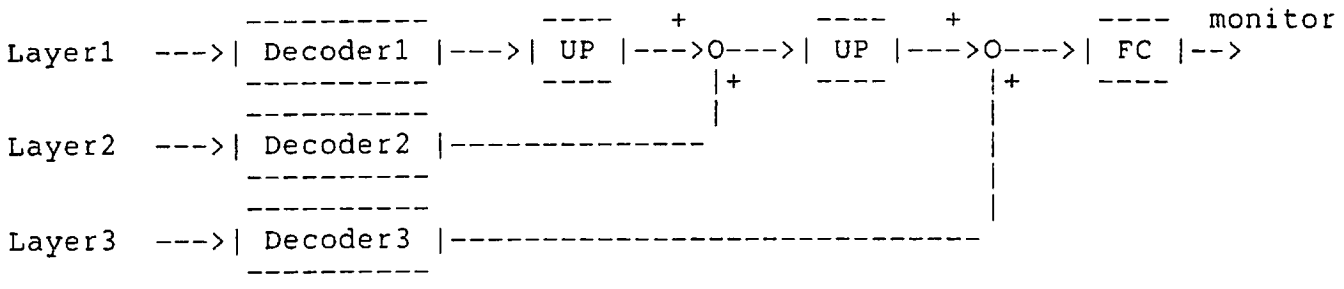


Figure A1. Layered Decoding.

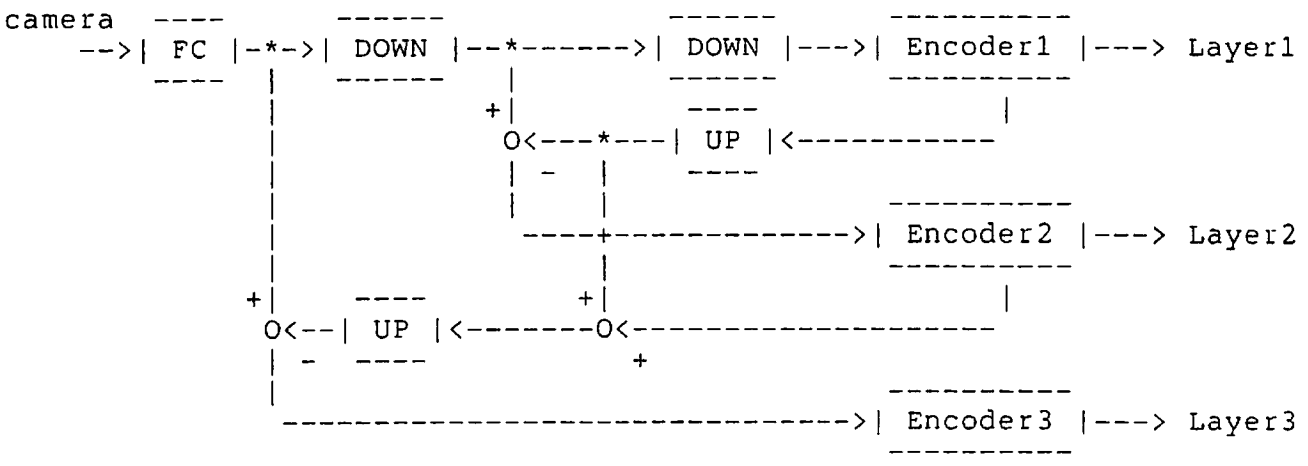


Figure A2. Example of possible Layered Encoding.

Layer1	used for pictures with low resolution.	SIF525 SIF625 CIF	352·240·30 352·288·25 352·288·30
Layer2	used for pictures or difference pictures with medium resolution.	CCIR 601 CCIR 601	720·240·30·2 720·288·25·2
Layer3	used for pictures or difference pictures with high resolution.	HDTV	?

FC (Format Conversion) must be done in the encoder, to adapt the camera format to the coding format, and in the decoder to adapt the coding format to the monitor format.
It is a great advantage if coding formats have simple relations to camera/monitor formats.

UP and DOWN are conversions between coding formats with different resolutions. Compatibilities are simplified if there are simple relations between coding formats.

New picture formats may or may not be defined with the purpose to
... simplify definition of UP-converters
(to be standardised).
... simplify design of DOWN-comverters
(not to be standardised).
... simplify design of FC (Format Converter) for camera/monitor
interface (not to be standardised).

Use of the layers depend on the encoder's knowledge about the decoder. The cases in Table 1 are the most interesting ones. Note that Encoder2 and Encoder3 are suitable for pictures as well as for difference pictures.

	Dec1	Dec2	Dec3	Enc1	Enc2	Enc3	Layer1	Layer2	Layer3
1.	yes	no	no	yes	-	-	yes	no	no
2.	yes	?	no	yes	no	no	yes	no	no
3.	yes	?	no	yes	yes	-	yes	maybe	no
4.	yes	yes	no	yes	no	no	yes	no	no
5.	yes	yes	no	yes	yes	-	no	yes	no
6.	yes	?	?	yes	no	no	yes	no	no
7.	yes	?	?	yes	yes	no	yes	maybe	no
8.	yes	?	?	yes	yes	yes	yes	maybe	?
9.	yes	yes	?	yes	no	no	yes	no	no
10.	yes	yes	?	yes	yes	no	no	yes	no
11.	yes	yes	?	yes	yes	yes	no	yes	maybe
12.	yes	yes	yes	yes	no	no	yes	no	no
13.	yes	yes	yes	yes	yes	no	no	yes	no
14.	yes	yes	yes	yes	yes	yes	no	no	yes

Table 1. Usage of layers for different decoder and encoder configurations.

Decoderx	Encoderx	Layerx
yes = Known to exist.	yes = Exists.	yes = Must be used.
no = Known to not exist.	no = Don't exist.	no = Must not be used
? = Do not know.	- = Don't care.	maybe = May or may not be used.

More than one layer is used in cases 3,7,8,11. Thus, these are the only cases where compatibility aspects need to be taken into account.

Cases 3,7,8: Compatibility between low and medium resolution.

It is an advantage for UP and DOWN converters if there is a simple relation between formats in Layer1 and Layer2.

a. Layer1 is MPEG1 Layer2 format should have a simply relation to SIF525 and SIF625 --> CCIR 601.

b. Layer1 is H.261 Layer2 format should have a simply relation to CIF, for example as in AVC-29.

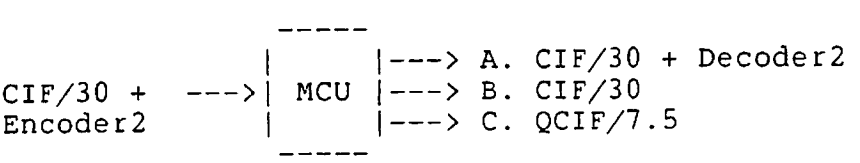
Case 11: Compatibility between medium and high resolution.

It is an advantage for UP and DOWN converters if there is a simple relation between formats in Layer2 and Layer3.

Further comments on Layer1-H.261.

In H.261 it is assumed that the decoder can inform the encoder about its decoding capability, which can range from QCIF/7.5 Hz to CIF/30 Hz. It must be assumed that the back-channel principle will be used also in H.26x. This implies that the encoder knows if Decoder2 is present or not, i.e. Cases 2,3,6,7,8 will not occur for Layer1-H.261.

Let us now study a multipoint situation:



We assume that the sender knows the receivers and their decoding capability.
If only A is connected, the sender will only use Encoder2 to reach maximum picture quality.
If B is also connected, it is necessary to use Layer1, in this case with CIF/30. Layer2 may be used to increase the quality for A, B would not notice.
If C is also connected, the sender will have to transmit with QCIF/7.5 in Layer1. Layer2 may be used?

It can be concluded that a simple relation between CIF and Layer2 format allows simpler UP- and DOWN-converters.
This can be utilised for multi-point applications.
If only one-to-one connections are considered, no advantage can be seen.

C O N C L U S I O N S

A principle for compatibility between various applications have been presented.

Aspects on coding format(s) for Layer2 can be summarised as follows:

Super CIF	Easy UP and DOWN for H.261 compatibility.
CCIR 601	Easy UP and DOWN for MPEG1 compatibility. Easy FC.
?	Easy UP and DOWN for HDTV compatibility.

Note:

In CCIR Sweden has proposed the following HDTV format(s) with square pixels

Interim solution (dual):	2048·1152·50 (interlaced)
	1920·1080·60 (interlaced)
Final solution (single):	2048·1152·72 (progressive)