*ISO/IEC*
*JTC1/SC29/WG11*
*MPEG93/.....*
*JULY 1993*

Telecommunication Standardization Sector
Study Group 15
Experts Group for ATM Video Coding
(Rapporteur's Group on part of Q.2/15)

Document AVC-516
Version 1
June 28, 1993

SOURCE : JAPAN
TITLE : CONSIDERATIONS ON THE NEXT PROFILE
Purpose : Discussion
*Relevant sub-groups: Requirements, Video*

---

## 1. Introduction

We have been particularly concerned with the following features in the MPEG-2/H.26X generic video coding [1];

- low delay,
- H.261 compatibility,
- cell loss resilience,
- low bit rate operation.

The low delay and low bit rate features have been sufficiently studied and incorporated in the Main Profile, and moderate level of cell loss resilience has also been included in it. However, H.261 backward compatibility as well as stronger cell loss resilience features are left to the Next Profile.

This contribution lists some possibilities for the Next Profile and minimum requirements from the audiovisual communication applications.

## 2. Elements for the Next Profile

There are two categories for extending the Main Profile to the Next Profile; adding new syntactic elements and removing restrictions imposed on the Main Profile elements.

The first category includes the following elements as we see in the Video Working Draft[2] and the TM5 document[3];

1) Spatial scalability Extension
2) Data partitioning Extension
3) Spatial scalability Extension
4) FF/FR Extension
5) 4:2:2 Extension
6) AC-leaky prediction
7) 8x1 DCT

The second category includes such existing elements which have the following limitations in the Main Profile at Main Level specifications;

| | MP@ML |
|---|---|
| • **forward/backward_horizontal/vertical_f_code** | 1-9 |
| • **intra_dc_precision** | 8-10 |
| • dual prime prediction | M=1 only |
| • 16x8 MC for frame structure | none |

## 3. Possible structures of the Next Profile

Assuming that the Next Profile adds some syntactic elements to the Main Profile, its possible structures are illustrated in Figure 1.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| Frequency Scalable Extension | Data Partitioning Extension | Spatial Scalable Extension | FF/FR Extension | 4:2:2 Extension | AC-leaky Extension | 8x1 DCT Extension |
| MAIN Profile | | | | | | |

Figure 1 Possible structures of the Next Profile

Some or all of the second category elements may be combined as necessary. At maximum, seven different sub-profiles can be defined as NEXT-1, NEXT-2, ..., NEXT-7. Some of them may be dropped; e.g. 4:2:2 if it is implemented as part of Spatial Scalable Extension, FF/FR if it is implemented using Data Partitioning, Frequency Scalable if it is integrated with Spatial Scalable (as attempted in Appendix J.9/TM5).

Figure 1 suggests that there are four alternatives to define the Next Profile.

Solution A: to define a single Next Profile by specifying that all listed elements are mandatory

- Maximum interoperability among different applications
- Decoders may probably be expensive?
- Is it implementable in the near future?

Solution B: to define multiple sub-profiles; Next Profile is a mere collection of them

- Optimized with respect to respective applications
- Lack of *intraworking*; e.g. sscalable decoder does not accept fscalable bitstreams

Solution C: to define a single Next Profile with selected mandatory elements

- Intermediate solution between A and B covering major future applications
- How to handle unselected elements? Drop them from the standard? Define them as tools not covered by any profile but designated by an application standard?

Solution D: not to define the Next Profile

- Only tools are defined. Their use is defined in application standards.

Obviously Solution D is not what we are seeking. Solution A looks unlikely to be commercially implemented. We prefer Solution C as a compromise between interoperability and practicality. Unselected elements can be dropped from the standard for the sake of simplicity.

## 4. Requirements from audiovisual communication applications

From audiovisual communication point of view, H.261 backward compatibility is the function which is not supported by the Main Profile. This function is deemed useful particularly in multipoint environments where both of H.26X and H.261 are connected through the MCU (Multipoint Control Unit). Spatial Scalable Extension is the only way to achieve this functionality in video coding (Note).

*Note* - As another system solution for such multipoint videoconferencing, a combination of H.26X/H.261 switchable terminals and a transcoding MCU should also be evaluated in the context of total audiovisual communication configuration[5].

For error resilience against $10^{-3}$ or higher CLR, some form of layered coding is required. One or more of Frequency Scalable, Spatial Scalable or Data Partitioning should be included in the Next Profile.

Use of Virtual Channels with different QoS is one of the B-ISDN opportunities. Spatial Scalable is in any case required for H.261 compatibility. It is appropriate for error resilience as well, e.g. by allocating the low priority channel to the upper layer in resolution or SNR scalable schemes. The next choice is Data Partitioning if its implementation simplicity is considered.

AC-leaky prediction is another element which may enhance error resilience. However, we are of the opinion that alternative solutions using existing elements can provide similar effects. See a companion contribution AVC-515 from Japan[4].

## 5. Conclusion

Syntactic elements have been listed which may be included in the Next Profile and four possible solutions have been shown. We conclude that Solution C is preferable for the definition of Next Profile.

The Next Profile has been considered in the light of audiovisual communication requirements. A minimum requirement is that it should include Spatial Scalable Extension for H.261 backward compatibility and error resilience. For enhanced error resilience, Data Partitioning will be the next choice.

END

## References


| | | | |
|---|---|---|---|
| [1] | §2.2.6/AVC-206R | Report of the Singapore Meeting (Chairman) | Jan 1992 |
| [2] | AVC-497 | Video Working Draft (WD Editing Committee) | Mar 1993 |
| [3] | AVC-491b | Test Model 5 (Test Model Editing Committee) | Mar 1993 |
| [4] | AVC-515 | Considerations on AC-leaky prediction (Japan) | Jun 1993 |
| [5] | AVC-419 | Use of compatibility/spatial scalability in multipoint audiovisual communication systems (Japan) | Jan 1993 |