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Final Report

ITU-T Workshop on Video and Image Coding and Application(VICA)

(ITU Headquarters, Geneva, 22-23 July 2005)

Table of Contents

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Executive Summary

In between the meetings of two lead technical groups working on image and video compression, ISO/IEC's JPEG and ITU-T's Study Group 16, ITU-TSB organized a workshop on Video and Image Coding and Applications (VICA) at the ITU headquarters, Geneva, Switzerland on 22-23 July 2005.

Key experts joined users to review the development, assessment and application of video and image coding and to discuss and start work on an action plan and a roadmap for VICA standardization. Presentations instigated discussion on how standards work in the field, including how next generation networks (NGN) can support the development of so-called ubiquitous services - any device, anytime, anywhere. Current work on home network environments was also taken into account.

A major conclusion from this workshop is that new generation video coding should be standardized in a few years time, but not now. Backward compatibility should be reconsidered where appropriate. At this moment, VICA standardization needs more careful requirement analysis and strategic architecting before heading into next standardization action.

There were 68 participants attended this two-day workshop. Also at the event was a demonstration showing various products using related standards. Workshop program, all presentations and conclusions of this workshop together with an audio-archive of this event are available on the web: http://www.itu.int/ITU-T/worksem/vica/index.html.

Highlights of Technical Sessions

Session 1: Network platforms

In this session five presentations overviewed the existing platforms in home-, access- and core networks and their evolution towards NGN. Speakers noted that convergence of telephone including multimedia communications, digital audiovisual including broadcasting, Internet access and tele-control (Home Networking) as well as higher bandwidth and controlled QoS provided by NGN technologies necessitates and brings more opportunities for the transport of video and image, whereas the need for cable to accommodate more channels using MPEG-2, the mobile terminal factors(price, size, complexity, packet erasure) and the shared nature of Internet limit the transport of video and image. Therefore more compression is yet to be sought; adaptation to mobile networks as well as its terminals and the Internet is to be further explored.

Session 2: Applications

In this session four presentations reviewed the evolution of Multimedia applications, their impact on the requirements to VICA schemes and on the development of standards. Speakers saw a new generation of video coding based on H.264/AVC sweeping the world and emphasized the importance of standards' stability especially for long-term archival storage. Video applications need platform flexibility, error robustness and high compression. Tamper resistance and selectable region of interest (ROI) were seen as very useful in surveillance applications.

Session 3: Digital video

In this session, the status of video coding and discussion of future developments towards the harmonization of video coding solutions for future applications (including inter-working and compatibility aspects) were presented. Presentations and discussions in this session consented that:

- The new generation of advanced video coding designs (e.g., H.264/AVC, VC-1, AVS) could provide very substantial improvements in capability relative to the prior generations (e.g., H.262/MPEG-2, H.263, MPEG-4pt2).
- Various trade-offs of compression capability, loss resilience, computational complexity, licensing terms, time-to-market, etc. can be found in recent video coding design efforts.
- H.264/MPEG-4 AVC has been extended to enhance professional and high-quality/high-resolution uses. Future work will extend H.264/AVC to add "scalability" (with strong efforts to be more successful than past such work). H.264/AVC illustrates an open collaborative design approach conducted in major standards bodies
- New approaches to IPR handling are being tried in AVS for design and intra-China licensing approaches, while "RAND" with post-design patent pooling is the usual approach. IPR issues affect deployment adoption decisions by industry (and motivations of design participants)

Session 4: Image coding

Presentations of this session discussed on future developments towards the harmonization of image coding schemes for future applications (including the inter-working and compatibility aspects). Speakers in this session agreed that:

- JPEG/JBIG is an excellent example of ISO/IEC and ITU-T cooperation
- Standards all have complex IPR, effective handling of IPR is key to success (or failure)

They recommended that:

- Take the IPR Policies and their implementation very seriously, introduce ITU-T/ISO "external" efforts for supporting this (e.g. patent searching by Members and communication

results to the committee, better links and information exchange between standardization and licensors, users). Generally, the still image work should be independent from communication protocol work, although there might be exceptions

- It is for further study when those exceptions are justified
- Improved interaction, exchange of information and cooperation between codec standardization and protocol/application standardization is needed (for instance between JPEG and 3GPP)

Session 5: Performance measurements and assessments

This session examined the state of the art on existing methodologies and tools used for the assessment and measurement of the quality of digital video (problems and experiences made so far). Speakers in this session emphasized:

- Measurement of user experience is essential to the industry
- Subjective methods are mature for television and fairly well along for multimedia
- Objective methods are needed and effective products have recently become available — primarily for standard definition television
- More work needs to be done for multimedia, HDTV, and to improve accuracy of Objective models — especially for error conditions
- Closer interaction with the coding experts in SG16 and ISO/IEC is recommended.

Session 6: Future trends in VICA

Based on the advanced research work on video and image applications, four speakers in this session reviewed the evolution of multimedia services and applications and its medium and long term impact on future VICA standards. This session foresaw that:

- New compression schemes are being investigated and would lead to next generation coding standards
- Next compression standards should bear in mind the characteristics and parameters of the future deployment environments, i.e. Network, Display, Capture, Complexity, …
- Need for compression in particular applications should be continuously reassessed
- The issue of perceptual quality metrics is fundamental in the improvement of current and future compression standards

Session 7: Panel on VICA Standardisation towards a Roadmap and Wrap-up

In the end of the workshop, a wrap-up panel session chaired by Pierre-André Probst and engaged all the session chairmen reviewed the outcome of the previous sessions and discussed on a standardization roadmap for VICA, in particular to identify key inter-working issues, their priorities, and means for coordinating and harmonization of the work between the different players.

Workshop Conclusions and Recommendations

This workshop came to the following major conclusions for VICA standardization:

- Standards should be interoperable and flexible rather than narrow, at the trade-off of less optimization. They should support many applications (convergence) and work in many hardware environments with minimized number of interoperability points. Their compression ratios should be high to lossless and able to degrade gracefully.
- Fewer, less often standards will lead to higher interoperability and stability but less market responsiveness. It allows time for adoption & deployment, have larger jumps in performance and allow archival storage for the long term.
- VICA standardization should look forward, not backward. Start from scratch ("clean-sheet") will avoid complications from legacy support. Architect should consider broader applicability: other similar problems, big picture. Design but don't just imitate, reconsider legacy features.
- The requirements process should be improved: focus on what industry will really adopt, keep things simple. Source & Channel coding need to be carefully balanced to land responsibility somewhere. Semantics should have priority to transport.
- Performance standards are needed for reference at least, maybe for requirements too. Encoder quality measurement standards and perceptual quality measurement standards are necessary. Perceptual models will be important and should avoid technology lock-in, specmanship, clarify applicability or the lack thereof.
- For Video Coding, coding efficiency is crucial. It's not clear that even H.264 is good enough. Effort to reduce computational complexity should be made. Enhanced tools for data integrity and tools to facilitate video event generation are needed.
- Standards should be designed for real network environment of use, at the trade-off of interoperability, trans-coding. Network transmission characteristics should be considered from start rather than retro-fitted later.
- To avoid redundant design, infrastructure services should be made use of.
- Complex patent licensing is sometimes a major barrier. Cost is an issue, Uncertainty is a bigger issue. Reducing uncertainty of IPR licensing would be very useful.
- NGN, 3G, 4G [WiFi?] networks are coming, where should the intelligence be? Service providers would like to have it in the network, whereas equipment manufactures would like it in the endpoints. Everybody wants to add value. Need is to focus on real user values: Cost, performance, robustness, innovation, flexibility, creativity…

For VICA standardization, the most important as seen by this workshop is, everything is a cost-benefit trade-off. Trade-offs between market responsiveness vs. fragmentation, backward compatibility vs. cost & performance, timeliness vs. reliability must be carefully assessed and choice must be made. VICA standardization needs more careful requirement analysis and strategic architecting at this moment before heading into next standardization action.

ANNEX

WORKSHOP EVALUATION

Of 68 participants, 16 returned the filled evaluation form. From the respondents, 50% indicated an overall ranking for the Workshop as “very satisfied”, 44% as “satisfied and 6% did not rate the workshop in overall.

1= very dissatisfied, 2= dissatisfied, 3= neutral, 4= satisfied, 5= very satisfied

The average overall ranking of the Workshop was: 4.5

56% of respondents would welcome another Workshop on the same subject in the next 1-2 years