

Serome

2001 한국방송공학회 디지털방송기술 Workshop

무선 멀티미디어 스트리밍 기술

2001. 11

정 재원 (jwchung2k@serome.co.kr)

Multimedia Platform Team

㈜새롬기술

Contents

- Introduction
- 3GPP (3rd Generation Partnership Project)
- 3GPP2 (3rd Generation Partnership Project 2)
- WMF (Wireless Multimedia Forum)
- ISMA (Internet Streaming Media Alliance)
- Video Compression Technologies : MPEG-4, H.263

Serome

Introduction – Standardization Bodies

- MPEG: Moving Picture Experts Group, mpeg.telecomitalia.com
- 3GPP: 3rd Generation Partnership Project, www.3gpp.org
- 3GPP2: 3rd Generation Partnership Project 2, www.3gpp2.org
- WMF: Wireless Multimedia Forum, www.wmmforum.com
- ISMA: Internet Streaming Media Alliance, www.isma.tv
- M4IF: MPEG-4 Industry Forum, www.m4if.org
- IETF: Internet Engineering Task Force, www.ietf.org
- ITU-T: International Telecommunication Union – Telecommunication Standardization Sector, www.itu.int/ITU-T
- MPEG Korea Forum: www.mpeg.or.kr
- TTA: Telecommunications Technology Association, www.tta.or.kr
- KWIS Forum: Korea Wireless Internet Standardization Forum, www.kwisforum.org

Serome

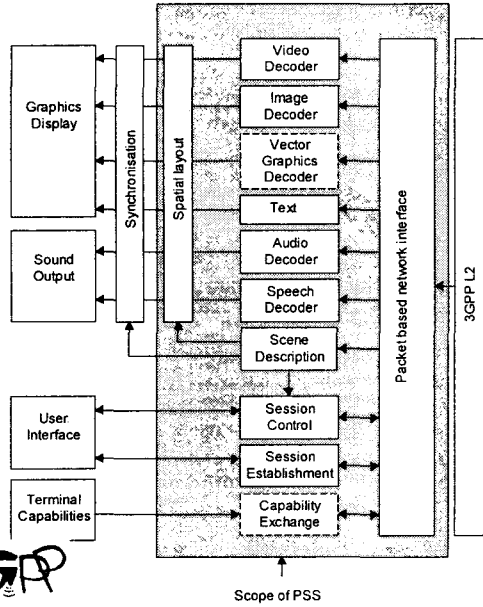
3GPP Packet-switched Multimedia Streaming (1)

- 3GPP: 3rd Generation Partnership Project
 - www.3gpp.org
 - Circuit-switched Multimedia Telephony: 3G-324M
 - Packet-switched Multimedia Streaming
 - Packet-switched Multimedia Telephony
- Packet-switched Multimedia Streaming (PSS)
 - Rel. 4: Simple Streaming (Rel. 4)
 - Service Optimization
 - Enhanced Transport
 - New Media Types
 - Commercial Factors (Security, DRM)
- PSS Documents: TS 26.234, TS 26.235



Serome

3GPP Packet-switched Multimedia Streaming (2)



- Functional Component of PSS Client (TS 26.234)

3GPP Packet-switched Multimedia Streaming (3)

- Overview of the Protocol Stack (TS 26.234)

Video Audio Speech	Scene description Presentation description Still images Bitmap graphics Vector graphics Text	Presentation description
Payload formats	HTTP	RTSP
RTP		
UDP	TCP	UDP
IP		

3GPP

Serome

3GPP Packet-switched Multimedia Streaming (4)

- **Session Set-up and Control**
 - RTSP (RFC 2326): Minimal Implementation in Appendix D
 - SDP (RFC 2327): RFC 2326 Appendix C
- **Codecs**
 - Speech: GSM-AMR NB
 - Audio: MPEG-4 AAC L/C (Optional)
 - Video: H.263 Baseline (Mandatory)
 - Video: H.263 Profile 3 Level 10 (Optional)
 - Video: MPEG-4 Video Simple Profile @ L0 (Optional)
- **File Format**
 - For interworking with MMS server
 - MP4 File Format



Serome

3GPP Packet-switched Multimedia Streaming (5)

- **Transport of Continuous Media**
 - GSM-AMR (currently Internet-Draft)
 - MPEG-4 AAC (RFC 3016)
 - MPEG-4 Video Simple Profile @ L0 (RFC 3016)
 - H.263+ (RFC 2429)
- **Transport Static Media**
 - HTTP for SMIL, JPEG, Text, etc.
- **Scene Presentation**
 - SMIL 2.0: SMIL Basic Profile + Some modules
- **Text**
 - XHTML Basic (UTF-8, UCS-2 Unicode)
 - XHTML is only for Text

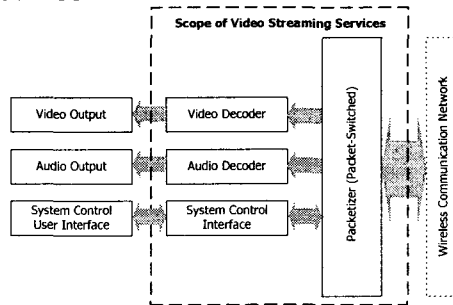


Serome

3GPP2 Video Streaming (1)

- 3GPP2: 3rd Generation Partnership Project
 - www.3gpp2.org
 - TSG-C WG1 SWG2
 - Video Streaming Service: IS-2000 Release B (waiting for ballot)
 - Video Conferencing Service

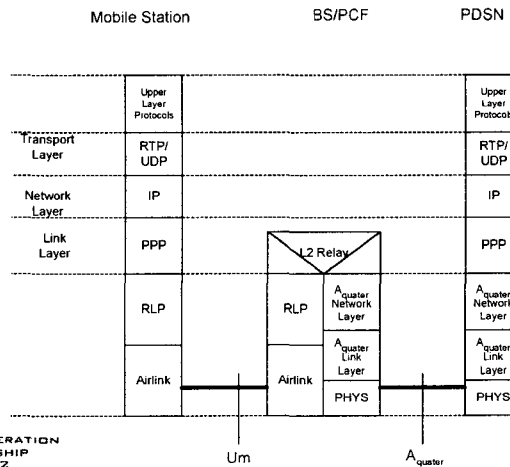
- Scope and Structure of Video Streaming Services (3GPP2 C.S0027)



Serome

3GPP2 Video Streaming (2)

- Protocol Stack for Transporting the Video Streaming Service (3GPP2 C.S0027)



Serome

3GPP2 Video Streaming (3)

- **Transport**
 - RTP (RFC 1889)
 - RTP Profile (RFC 1890)
- **Codec**
 - Video: MPEG-4 Visual Simple Profile @ L0 (Mandatory)
 - Video: H.263 Profile 3 (Annex I, J, K, T) and Profile 4 (Annex I, J, K, T, V, W)
 - Video: MPEG-4 Visual Simple Scalable Profile @ L0
 - Speech: EVRC (Optional) and 13 k PureVoice™ (Optional)
- **Control Protocol**
 - RTSP (RFC 2326) for Streaming
 - RTSP over TCP for reliable transport
 - SDP (RFC 2327)



Serome

Wireless Multimedia Forum (1)

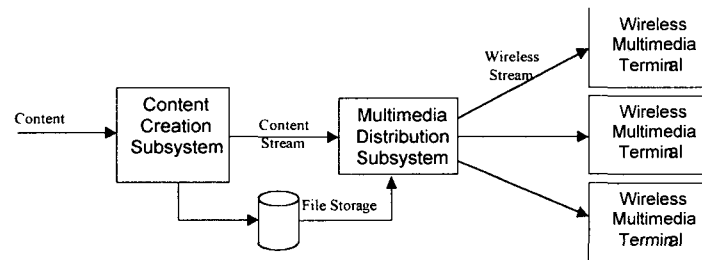
- **WMF: Wireless Multimedia Forum**
 - www.wmmforum.com
 - Participants: Device Manufacturer, Content Creator, Service Provider, Solution Provider
 - Application and Requirement Working Group
 - Technical Working Group
- **Recommended Technical Framework Document (RTFD)**
 - Version 1.0 in Dec. 2000 (Available at www.wmmforum.com)
 - Version 1.13 has been finalized (Internal Version)
- **Interoperability Test in Progress**
 - Based on RTFD Version 1.1



Serome

Wireless Multimedia Forum (2)

▪ End-to-End Streaming Multimedia System Model



Wireless Multimedia Forum (3)

▪ Applications

- Streaming Multimedia (live/on demand/scheduled)
 - Included RTFD Version 1.0
- Downloading Multimedia
- Uploading Multimedia
- Multimedia Messaging
- Wireless Video Surveillance
- Real-time Multimedia Communications
- Interactive Multimedia Game

▪ Codec

- Speech: GSM-AMR, EVRC
- Video: MPEG-4 Visual Simple Profile @ L0 (Mandatory)
- Video: H.263 Profile 3 Level 10 (Optional)

Wireless Multimedia Forum (4)

- **Control**
 - Capability Exchange (Not supported in Version 1.0)
 - Session Initiation, Setup and Media Control
 - SDP: Some attributes have been specified
 - RTSP: Minimal Implementation in Appendix D, Use DESCRIBE
- **Transport**
 - RTP/RTCP over UDP
 - Video: MPEG-4 Visual Simple Profile @ L0 (RFC 3016)
 - Video: H.263 (RFC 2429)
 - Speech: GSM-AMR (Currently Internet-Draft)
- **File Storage Format**
 - MPEG-4 File Format with some restrictions



Serome

Wireless Multimedia Forum (5)

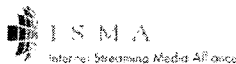
- **System Attributes beyond RTFD Version 1.0**
 - Audio: MPEG-4 AAC, MP3
 - Video: Scalable Coding
 - Still Natural Image: JPEG
 - Text
 - Bitmap Graphics: GIF
 - Scene Description and Multimedia Synchronization
 - Quality of Service Attributes
 - DRM (Digital Rights Management)
 - Usage Tracking, Reporting and Provisioning for Recording Purposes
 - Personalization



Serome

Internet Streaming Media Alliance (1)

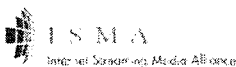
- **ISMA: Internet Streaming Media Alliance**
 - www.isma.tv
 - non-profit corporation founded by Apple, Cisco, IBM, Kasenna, Inc., Philips, and Sun Microsystems
 - to accelerate the market adoption of an international ubiquitous open standard for streaming rich media over the Internet Protocol (IP)
- **ISMA Plug Fest**
 - explore their understanding and implementation of the ISMA specification, refine products so they can inter-operate, and establish/demonstrate conformance to draft or published ISMA documents
- **ISMA Technical Specification 1.0.1 TD002**



Serome

Internet Streaming Media Alliance (2)

- **Technology Selection Criteria**
 - the technology must be an open standard.
 - the technology should enable interoperable products to be brought to market quickly.
 - the technology be forward-looking, and provide for new network media technologies and emerging video-enabled information appliances.
- **Functions**
 - Media Transmission
 - Media Control
 - Media Announcement



Serome

Internet Streaming Media Alliance (3)

- **Transport**
 - RTP (RFC 1889)
 - RTP Profile for Audio and Video Conferences with Minimal Control (RFC 1890)
 - User Datagram Protocol (RFC 768)
 - Interleaved RTSP & RTP/AVP over TCP transport
 - The media may be transmitted in unicast, multicast or in a broadcast manner.
 - It is further RECOMMENDED that a multicast implementation be conformant to IGMP v3.
- **RTP Payload**
 - RFC 3016 RTP Payload Format for MPEG-4 Audio/Visual Streams
 - Video decoder specific configuration information **MUST** be present in the SDP description of the media stream.



Serome

Internet Streaming Media Alliance (4)

- **Content Distribution**
 - MPEG-4 MP4 Format - ISO/IEC 14496-1:2000(E)
 - ISMA compliant content, when stored in files, will contain the minimal BIFS and OD streams. The BIFS and OD streams **MUST** be stored in their own tracks.
- **Media Control**
 - The minimal RTSP implementation described in Appendix D of RFC2326
 - DESCRIBED
- **Media Announcement**
 - The SDP data should be formatted according to SDP specification [RFC2327] and Appendix C of RFC2326.



Serome

Internet Streaming Media Alliance (5) – Profile 0

- **Profile 0**
 - To allow for video and audio at bitrates suitable that match capabilities of narrowband and mobile wireless infrastructures
- **Video**
 - MPEG-4 Simple Profile @ L1
 - QCIF, Max. Bit Rate = 64kbps
 - Limited to One Video Object Only
- **Audio**
 - MPEG-4 High Quality Audio Profile @ L2
 - Up to 2 Channels, Up to 48,000 kHz Sampling Rate
 - Both CELP and AAC L/C



Serome

Internet Streaming Media Alliance (6) – Profile 1

- **Profile 1**
 - to allow for a richer streaming experience over infrastructures with broadband bit rates
 - fully decode any streams generated by Profile 0 encoders
- **Video**
 - MPEG-4 Advanced Simple Profile @ L3
 - CIF, Max. Bit Rate = 1.5Mbps
 - Limited to One Video Object Only
- **Audio**
 - MPEG-4 High Quality Audio Profile @ L2
 - Up to 2 Channels, Up to 48,000 kHz Sampling Rate
 - Both CELP and AAC L/C
- **The combined audio and video bit-rates in a Profile 1 session is limited to 1.5 Mbps.**



Serome

Internet Streaming Media Alliance (7)

- **Future Work Areas**
 - **Digital Rights Management (MPEG-4 IPMP)**
 - **Additional MPEG-4 Profiles**
 - Scalable Encoding
 - Main Profile or ACE Profile
 - **Additional MPEG-4 Technologies**
 - MPEG-4 System
 - Synthetic Video/Audio
 - **Various Techniques for Firewall Traversal**
 - HTTP, RTSP Proxies
 - **RTSP Mechanism for Negotiating QoS**
 - No standard yet exists
 - **RTP/RTCP Retransmission and/or FEC Mechanism**
 - Early in Standardization Process within IETF
 - **Network Level of QoS**



Serome

Video Coding (1) – MPEG-4 Simple Profile @ L0

- **Due to very limited resources of mobile handsets / terminals**
- **The following restrictions apply to Simple Profile @ L1**
 - The maximum frame rate shall be 15 frames per second;
 - The maximum f_code shall be 1;
 - The intra_dc_vlc_threshold shall be 0;
 - The maximum horizontal luminance pixel resolution shall be 176 pels/line;
 - The maximum vertical luminance pixel resolution shall be 144 pels/VOP;
 - If AC prediction is used, the following restriction applies : QP value shall not be changed within a VOP (or within a video packet if video packets are used in a VOP). If AC prediction is not used, there are no restrictions to changing QP value.
- **Reference: MPEG Document m6439 (September 2000)**



Serome

Video Coding (2) – MPEG-4 Simple Scalable Profile @ L0

- The following restrictions apply to Simple Scalable Profile @ L1
 - The maximum number of objects shall be 1.
 - The maximum VOP width and height shall be limited to 176 and 144 pixels, respectively.
 - The base layer shall conform to MPEG-4 Simple Profile @ L0.
 - Both temporal and spatial scalability are supported. Spatial scalability shall be limited to a 1:1 scaling ratio.
 - Maximum FCODE shall be 1.
 - Intra_dc_vlc_threshold shall be 0.
 - When AC prediction is used, the QP value shall not be changed within a VOP, or within a video packet if video packets are used.
- Reference: MPEG Document m7484 (June 2001)



Serome

Video Coding (3) – H.263 Profile 3

- H.263 Baseline
- Annex I: Advanced Intra Coding
 - Improve the Coding Efficiency for INTRA MBs
- Annex J: De-blocking Filter
 - Filter within the Coding Loop
 - Improve the Coding Efficiency over the Subjective Quality
- Annex K: Slice Structured Mode (Annex K) with Arbitrary Slice Ordering (ASO) Submode
 - Enhance the Error Resilience
- Annex T: Modified Quantization
 - Extended DCT Coefficient Range, Modified DQUANT syntax → Decrease Encoder's Computational Load
 - Modified Step Size for Chrominance → Improve Chrominance Fidelity

Serome

Video Coding (4) – H.263 Profile 4 & Level 10

- H.263 Profile 3
- Annex V: Data Partitioned Slice Mode (Annex V) with Arbitrary Slice Ordering (ASO) Sub-mode
 - Enhance Error Resilience Performance
- Annex W: Previous Picture Header Repetition Supplemental Enhancement Information
 - Enhance Error Resilience Performance

Level 10

Support of QCIF and sub-QCIF resolution decoding, capable of operation with a bit rate up to 64 000 bits per second with a picture decoding rate up to (15 000) / 1001 pictures per second.

Serome

감사합니다

www.seromemobile.com

m.serome.net

www.serome.co.kr

www.serome.com

Serome