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**3RD GENERATION
PARTNERSHIP
PROJECT 2
"3GPP2"**

Multimedia Streaming Services – Stage 1

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**Wireless Features Description:
Multimedia Streaming Services Functional Characteristics and
Requirements
For use within Telecommunications wireless networks**

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2 Scope

The objective is to define and to standardize the functionality of Multimedia Services that can be incorporated into the operations of wireless telecommunications networks. Audio-only or video only streaming are a special case of multimedia streaming. This document defines the functional characteristics and requirements of the multimedia streaming services. The areas that must be defined are service features and system requirements, necessary for multimedia streaming services to be provided in wireless telecommunications networks.

3 References

3.1 Normative Reference

- S.R0001 – 3GPP2 Specifications List
- S.R0002 – 3G Capability Descriptions
- C.0017-0-2 – Data Service Options for Spread Spectrum Systems: cdma2000 High Speed Packet Data 2 Service Option 33

3.2 Informative References

- ITU-T Recommendation H.263: "Video Coding for Low Bitrate Communication".
- ISO/IEC 14496-1~6: "Information Technology — Generic Coding of Audio-Visual Object".
- ITU-T Recommendation H.323: "Visual Telephone Systems and Equipment for Local Area Networks which Provide a Non-Guaranteed Quality of Service".
- ITU-T Recommendation H.324: "Terminal for Low Bitrate Multimedia Communication".
- TIA/EIA Recommendation IS-707-A: "Data Services Options for Spread Spectrum Digital Cellular Systems".

4 Abbreviations

For the purpose of this document, the following abbreviations apply:

3G	Third Generation system
3GPP2	Third Generation Partnership Project 2
ASF	Advanced Streaming Format
BER	Bit Error Rate
CIF	ITU-T Common Intermediate Format (352 pixels x 288 lines)
FER	Frame Error Rate
ISDN	Integrated Services Data Network
ISO	International Standards Organization

ITU-T	International Telecommunication Union - Telecommunication Sector
PSTN	Public Switched Telephone Network
QCIF	ITU-T Quarter Common Intermediate Format (176 pixels x 144 lines)
QoS	Quality of Service
RLP	Radio Link Protocol
SMIL	Synchronized Multimedia Integration Language
TIA	Telecommunications Industry Association

5 General

The potential benefits of including visual media, in addition to audio, have long been recognized. Full multimedia communications, including voice, video, and data, can greatly enhance the potential for end users to communicate and to convey information.

Transmitting multimedia streams has proven to be a very challenging goal to attain. In most cases, transmission of multimedia streams requires significant resources, and can put a heavy burden on the system. Because multimedia streams contain much more information than voice alone, they demand much higher throughput. In order to respond to the need for reducing the throughput requirement, many video codecs are optimized for compression alone; and, thus, are very sensitive to any transmission errors.

With the development of 3G wireless communications systems, the throughput available to each end user will be greatly increased. With this newly available throughput, many long-awaited capabilities and services can be provided to end users. For multimedia services, the available throughput has reached the threshold where reasonable quality multimedia services can be realized.

6 Multimedia Streaming Services

6.1 Multimedia Streaming Service Characteristics

Multimedia streaming services are services in which continuous video, audio and multimedia data is delivered to an end user. Multimedia streaming enables users to view videos within system-dependent playout delay after the end user begins receiving the data. This is in contrast to other schemes that require the user to wait for the entire media to download before it can be viewed. Since it can often take several minutes and longer to download whole multimedia files, multimedia streaming offers the advantage of being able to view the multimedia soon after it begins downloading.

This service option is generally used in multimedia information and message retrieval, video-on-demand, Pay-TV, interactive news retrieval and search, and other multimedia information broadcasting. Longer playout delay is allowed for Multimedia Streaming Services because of its one-way transmission nature and buffering at the terminal. Consequently, transmission errors can be dealt with by utilizing retransmission. Terminal buffering is used to minimize the influence of delay jitter and retransmission delays, and to achieve seamless playback.

6.2 Multimedia Streaming Services' Scope and Charter

The streaming services are asymmetric between the sender and the receiver(s), since the video stream only flows in one direction, from a server to one or more clients.

On the sender side, the multimedia streaming services will include content creation and transmission. The video stream is encoded from the video and audio signals with corresponding codecs if the content is encoded in real time, or if it is retrieved in pre-coded format from storage devices. The encoded information may be sent in packet or circuit mode. The receiving terminal decodes the data with the corresponding video and audio decoders. The output is then sent, to be played back at local video and audio devices.

The multimedia streaming services will also include system control protocols for setting up connections between parties involved with the streaming services, negotiating various options and capabilities, and communicating with and controlling the various source codecs that the multimedia streaming services use.

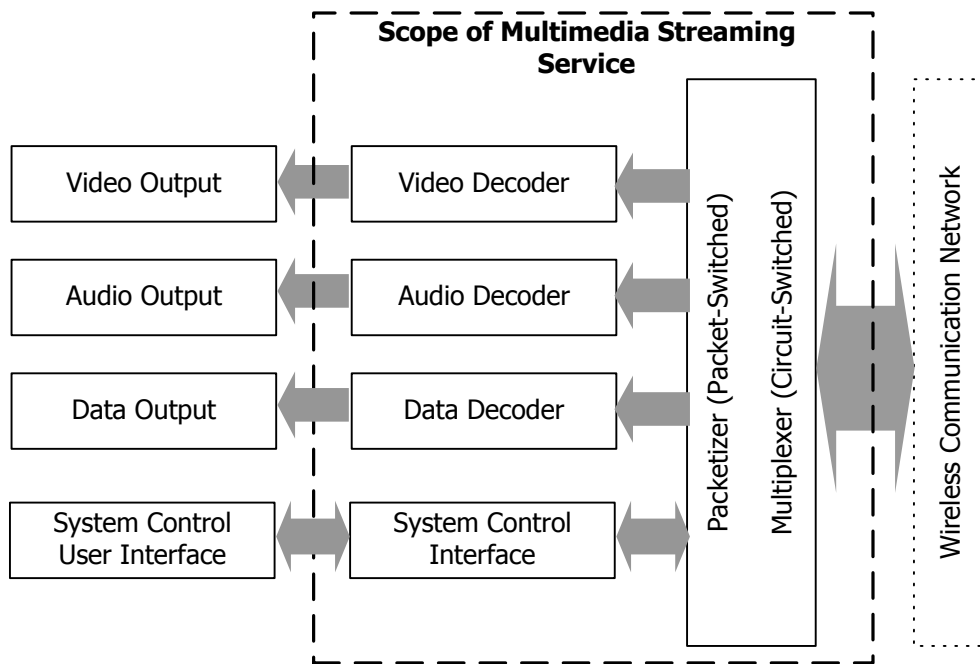


Figure 1: Scope and structure of Multimedia Streaming Services

6.3 Relationship between Multimedia Streaming Services and Other Data Services

The Multimedia Streaming Services can be built over other data service options, e.g., Packet Data Service Option and Circuit Data Service Option. Although it is possible that

the Multimedia Streaming Services could utilize the "Multimedia Call Model" (i.e., calls with multiple simultaneous connections of the same or different traffic types including voice, circuit switched data, and packet data), it is recommended that the practice of the common international standards to transmit all the contents through one single connection be followed. This practice ensures compatibility with other systems, and avoids the extra requirements of synchronizing the data sent through separate connections. When the Packet Data Service Option is used, the Multimedia Streaming Service shall packetize all of the data streams before the data is transferred to the Packet Data Service. When the Circuit Data Service Option is used, the Multimedia Streaming Services needs to multiplex all the data streams before the data is transferred to the Circuit Data Service.

Multimedia Streaming Services over the Packet Data Service Option and the Circuit Data Service Option will have different QoS parameters; hence, the features and requirements that are unique to either service will be discussed separately in the following sections.

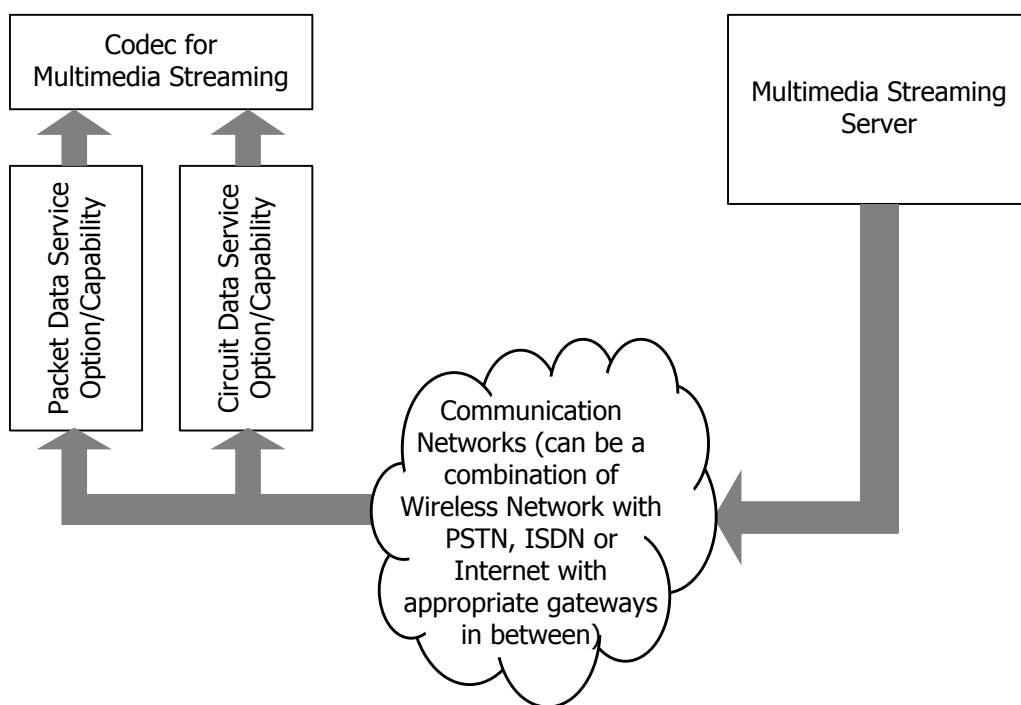


Figure 2: Relationship between Multimedia Streaming Services and other data services.

7 QoS Requirements and System Implications

In order to provide end users with multimedia streaming services that have acceptable quality, specific QoS requirements shall be imposed. Acceptable performance levels mandate specific minimum end-to-end QoS levels. To meet those end-to-end requirements, specific minimum QoS for the wireless communication link also need to be met. The transmission QoS provided by the wireless portion needs to be higher than required end-to-end QoS to provide extra room for application buffering, etc. These QoS requirements together will ensure multimedia streaming services to operate with acceptable quality on wireless networks. For the case where one end of the communication is outside the wireless communication network, the transmission QoS

requirements apply only to the portion that is within the wireless network.

7.1 QoS Attributes

7.1.1 Guaranteed Bitrate (kbps)

The guaranteed number of bits delivered divided by the duration of the period.

7.1.2 Maximum Transfer Delay (msec)

The maximum delay for 95th percentile of the distribution of delay for all delivered data frames during the duration of the session.

7.1.3 Acceptable Transfer Delay (msec)

The delay that is acceptable for the services. The network may make extra effort to improve error rate if the delay is below the delay threshold.

7.1.4 Maximum Transfer Delay Jitter (msec)

The maximum difference between 95th percentile of the distribution of delay and the average delay.

7.1.5 Frame Error Rate

The rate of lost and corrupted data frames (e.g., RLP frames) in the transmitted data.

7.1.6 Bit Error Rate

The rate of bit errors in the transmitted data.

7.2 System Implications

The wireless communication network shall satisfy the following requirements:

- The network data services shall provide Multimedia Streaming Services with the necessary QoS for successful execution of the Multimedia Streaming Services.
- Specifying QoS parameters shall be possible based on interactions between the Multimedia Streaming Services and the underlying network data service options. This enables the user to select the Multimedia Streaming Service quality that best fits user needs.
- The Multimedia Streaming Services shall be informed about the quality of the network data services if the provided QoS declines below the requested QoS. This enables the multimedia services to adaptively adjust to the available network data service qualities in the event that degradation happens.

7.3 QoS Properties of Multimedia Streaming Applications

The QoS properties of multimedia streaming applications are included in Section 8: "Features of Multimedia Streaming Services".

8 Features of Multimedia Streaming Services

The multimedia streaming services shall support one-way transmission of video/audio streams or audio-only streams in wireless packet-switched and circuit-switched transmission networks.

8.1 System

The multimedia streaming services system shall be compatible to commonly used multimedia streaming formats (e.g., Advanced Streaming Format, ASF, and Synchronized Multimedia Integration Language, SMIL, etc.) Mobile terminals should be equipped with appropriate browsers. A selected set of options for the streaming formats should be recommended to minimize the impact on both Base Stations and Mobile Stations.

8.2 Video Codec

Video codecs to be used for the streaming services shall be standard-compliant. Advanced coding options for coding efficiency and error robustness may be recommended for the decoders in the receivers or encoder in the server. Depending on the choice of video codec, the bitrate may vary considerably.

The advanced coding options should be interoperable in order to allow for minimal degradation of the video streams between different implementations of a single, standard compliant codec.

8.3 Audio Codec

Audio codecs to be used for the streaming services shall be standard-compliant. Audio codecs can be operating at low bitrates (near 8 kbps), FM-stereo quality bitrates (near 64 kbps) and high fidelity bitrates (near 128 kbps).

8.4 Synchronization

When transmitting streams with video, audio or media contents, the streaming service shall maintain synchronization between the video, audio and media components of the stream. The inter-media skew should be kept below 20ms.

If the available bandwidth drops below the minimum required bandwidth to deliver the video, audio or media streaming, the streaming may continue with blocking either the video, the audio or the media based on the user preferences.

8.5 Minimum Bandwidth

The service shall be able to work at the bandwidth of 14.4 kbps or higher for streams

with video and audio contents, and bandwidth of 9.6 kbps or higher for audio-only streams.

8.6 Playout Delay

The multimedia streaming service shall be able to provide service of reasonable end-to-end delay to accommodate data transfer from the source to the mobile terminal, plus shall support buffering at the terminal to accommodate transmission path degradations to a specific level. The recommended maximum playout delay is 30 seconds.

8.7 Delay Jitter

The system shall be able to operate under delay jitter of three times the RLP retransmission time in the network, with retransmission activated.

8.8 Error Rate

The service shall operate over channels with end-to-end BER of the order of 10^{-3} (for circuit-switched network services) and FER in the order of 10^{-2} (for packet-switched network services).

8.9 Picture Size

The service should be able to provide services for international standardized picture sizes, such as CIF and QCIF. It shall also support user-defined non-standard picture sizes.

8.10 Dynamic Adjustment of Streaming Parameters

The service should be capable of dynamically negotiating streaming parameters (e.g., bit rates of the video data stream, picture size, etc.) during the session, so as to adapt to the users' needs and/or channel conditions.

8.11 Hardware Resource Consumption

The system should be optimized to conserve the processing power and other resources for the mobile equipment, such as memory, power, etc.

9 Procedures for Multimedia Streaming Services

9.1 Normal Procedures With Successful Outcome

9.1.1 Authorization

The service may be generally available or may be provided after pre-arrangement with the service provider for all subscribers with properly equipped Mobile Stations.

9.1.2 De-Authorization

The service may be de-authorized at the subscriber's request or for administrative reasons.

9.1.3 Registration

Registration shall permit the provisioning of QoS parameters.

9.1.4 De-Registration

The service shall be de-registered upon de-authorization.

9.1.5 Activation

The service shall be activated upon authorization.

9.1.6 De-Activation

The service shall be de-activated upon de-authorization.

9.1.7 Invocation

This service may be invoked by subscriber locally with the phone number or with the address of the server using Mobile Station-specific procedures.

9.1.8 Normal Operation with Successful Outcome

Data will be streamed down through the link, and will be temporarily stored in the buffer. Playback of the video stream will start soon after the download starts, when the appropriate buffering level has been achieved.

9.1.9 Call Detail Record

The system should record call detail information for the following:

- the duration of service usage,
- the amount of packet data successfully transmitted, or
- other relevant information.

9.2 Exception Procedures or Unsuccessful Outcome

9.2.1 Registration

None identified.

9.2.2 De-Registration

None identified.

9.2.3 Activation

None identified.

9.2.4 De-Activation

None identified.

9.2.5 Invocation

Failure of the invocation, due to its either not being authorized or whenever the called party doesn't support the multimedia service, should be resolved by appropriate call treatment.

9.2.6 Exceptions While Roaming

None identified.

9.2.7 Exceptions During Intersystem Handoff

None identified.

9.2.8 Service Failure

Failure to complete or continue the service due to failure in the network or the application server should be reported to the Accounting system for appropriate action(s).

9.3 Alternate Procedures

None identified.

9.4 Interactions With Other Cellular Services

9.4.1 Asynchronous Data Service (ADS)

None identified.

9.4.2 Call Delivery (CD)

None identified.

9.4.3 Call Forwarding—Busy (CFB)

None identified.

9.4.4 Call Forwarding—Default (CFD)

None identified.

9.4.5 Call Forwarding—No Answer (CFNA)

None identified.

9.4.6 Call Forwarding—Unconditional (CFU)

None identified.

9.4.7 Call Transfer (CT)

None identified.

9.4.8 Call Waiting (CW)

Interaction between the multimedia services and Call Waiting should allow for the user to pause the multimedia services, bookmark their place in the multimedia services so they can come back to it after the call, and then answer the phone. Once the call is finished, the user can return to their bookmarked position in the multimedia services.

9.4.9 Calling Name Presentation (CNAP)

None identified.

9.4.10 Calling Number Identification Presentation (CNIP)

None identified.

9.4.11 Calling Number Identification Restriction (CNIR)

None identified.

9.4.12 Conference Calling (CC)

Not applicable.

9.4.13 Data Privacy (DP)

None identified.

9.4.14 Do Not Disturb (DND)

None identified.

9.4.15 Emergency Services Callback (9-1-1CB)

None identified.

9.4.16 Emergency Services Reconnect (9-1-1RC)

None identified.

9.4.17 Flexible Alerting (FA)

None identified.

9.4.18 Global Emergency Call Origination (GECO)

None identified.

9.4.19 Group 3 Facsimile (G3 FAX)

Not supported.

9.4.20 Incoming Call Screening

None identified.

9.4.21 Message Waiting Notification (MWN)

None identified.

9.4.22 Mobile Access Hunting (MAH)

None identified.

9.4.23 Network Directed System Selection (NDSS)

None identified.

9.4.24 Non-Public Mode Service (NP)

None identified.

9.4.25 Over-the-Air Service Provisioning (OTASP)

None identified.

9.4.26 Over-the-Air Parameter Administration (OTAPA)

None identified.

9.4.27 Password Call Acceptance (PCA)

None identified.

9.4.28 Preferred Language (PL)

None identified.

9.4.29 Priority Access and Channel Assignment (PACA)

None identified.

9.4.30 Remote Feature Control (RFC)

None identified.

9.4.31 Selective Call Acceptance (SCA)

None identified.

9.4.32 Service Programming Lock (SPL)

None identified.

9.4.33 Speech Option Selection (SOS)

Not applicable.

9.4.34 Subscriber PIN Access (SPINA)

None identified.

9.4.35 Subscriber PIN Intercept (SPINI)

None identified.

9.4.36 Three-Way Calling (3WC)

Not applicable.

9.4.37 Tiered Services (TS)

None identified.

9.4.38 User Group ID (UGID)

None identified.

9.4.39 Voice Controlled Services (VCS)

None identified.

9.4.40 Voice Message Retrieval (VMR)

None identified.

9.4.41 Voice Privacy (VP)

None identified (include all media types).

