STI Requirements

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Open Mobile Alliance

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Contents

1. Scope (Informative)

This document defines the requirements and boundaries of the first STI (Standard Transcoding Interface) specification within OMA. This first release is referred to as "STI 1.0".

STI is the interface between the Transcoding Platform and the Multimedia Application Platforms; it is primarily used to request transcoding of media Content files based on Application specified transcoding parameters and constraints and/or User Equipment capabilities, and to return the corresponding transcoded media files. STI is not intended to be used directly by end-users.

The notion of "Content adaptation" or "transcoding" in this document refers to the transformation and manipulation of Content (images, audio, video, text, presentation…etc.) to meet the desired targets (defined by the terminal capabilities and/or the application needs). Those adaptations include: media format transcoding, scaling, re-sampling, file size compression…etc.

The document describes a number of use cases and the list of derived requirements for STI 1.0.

2. References

2.1 Normative References

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[3GPP] TS 26.233: Transparent end-to-end packet switched streaming service; General description

TS 26.234: Transparent end-to-end packet switched streaming service; Protocols and codecs

TS 26.244: Transparent end-to-end packet switched streaming service; 3GPP file format (3GP)

TS 26.246: Transparent end-to-end Packet-switched Streaming Service (PSS); 3GPP SMIL language profileTS 26.140: Multimedia Messaging Service (MMS); Media formats and codecs

TS 23.140: Multimedia Messaging Service (MMS); Functional description; Stage 2

http://www.3gpp.org/ftp/Specs/html-info/26-series.htm

The specifications will be relative to 3GPP Rel. 6.

TR 21.905: Vocabulary for 3GPP Specifications; 3GPP System Aspects; Rel. 5

[3GPP2] C.S0050-0: File Formats for Multimedia Services Stage 3, URL: http://www.3gpp2.org/Public_html/specs/tsgc.cfm

[SMIL] "Synchronized Multimedia Integration Language (SMIL 2.0)", W3C Recommendation 07 August 2001, URL: http://www.w3.org/TR/smil20/

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[MMS 1.2] "OMA MMS Conformance Document", Version 1.2, Open Mobile Alliance™, OMA-MMS-CONF-v1_2, URL:http://www.openmobilealliance.org/

[Download] "OMA Generic Content Download Over The Air", Version 1.0, Open Mobile Alliance™, OMA-Download-OTA-V1_0, URL: http://www.openmobilealliance.org/

[Push] "OMA Push Enabler", Version 1.0, Open Mobile Alliance™, URL: http://www.openmobilealliance.org/ftp/mag/PUSH/gen_info/specs.shtml

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[Privacy] "OMA Privacy Requirements for Mobile Services", Version 1.0, Open Mobile Alliance™, OMA-RD-Privacy-V1_0, URL: http://www.openmobilealliance.org

2.2 Informative References

[MAG-2003-0020] "3GPP2 Default MMS Speech Codecs ", OMA MAG Input Contribution, Open Mobile Alliance™, OMA-MAG-2003-0020-3GPP2-MMS-Speech-Codecs, URL:http://www.openmobilealliance.org/

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[DRM 1.0] "OMA Digital Rights Management", Version 1.0, Open Mobile Alliance™, OMA-Download-DRM-v1_0, URL: http://www.openmobilealliance.org/

[OMA] http://www.openmobilealliance.org/

3. Terminology and Conventions

3.1 Conventions

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in [RFC2119].

All sections and appendixes, except “Scope” and “Introduction”, are normative, unless they are explicitly indicated to be informative.

3.2 Definitions

Application Platform	Combination of hardware and software that provide the functionality of an application. Note that rather than implementing all components to provide the functionality of an application the implementation can integrate the necessary components from other platforms.
Application Service	System that provides an Application to the end user. Note that such systems can also include functionality beside the one of the application itself such as billing, encryption and so on.
Terminal Equipment	Equipment that provides the functions necessary for the operation of the access protocols by the user. A functional group on the user side of a user-network interface.
User Equipment	A device allowing a user access to network services. For the purpose of OMA specifications the interface between the UE and the network is the radio interface
Content	Subject matter or information that is processed, stored, or transmitted electronically. It includes such things as text, presentation, audio, images, video, etc. Content may have properties such as media type, mime type, etc.
Constraint	A description of limitation(s) which shall not be exceeded by the transcoding; e.g. maximum size for a video clip, …etc. Such limitations are typically provided by the Application Service Provider by taking into account limiting factors such as User Equipment Capabilities.
Preference	A list of rules or recommended limits that should be applied by the transcoding platform. Such rules would typically be given by End-Users or Content Providers.
Policy	A list of rules or recommended limits that should be applied by the transcoding platform. Such rules would typically be given by the Application Service Provider.
Parameters	A list of attributes used for the definition of Preferences, Constraints or Policies.
Transcoding Platform	Combination of hardware and software that provide transcoding functionality.
Transcoding Service	System that provides transcoding of Content as a service to the end user. Note that such systems can also include functionality beside the transcoding such as billing, encryption and so on.
MMBox	Network storage associated with a user into which MMs, along with MM State and MM Flags, may be stored, retrieved, and deleted
MM1_Forwarding	Describes the mechanism by which a forwarding MMS User Agent can request from the corresponding MMS Relay/Server, that an MM for which the MMS User Agent is the intended recipient (and has been notified of the MM) be forwarded to other specified recipient(s) MMS User Agent(s) whose address(es) shall be specified by the forwarding MMS User Agent, without having to first retrieve the MM. If the MMBox is supported, the MM being forwarded may also be requested to be stored in to the originator’s MMBox.

3.3 Abbreviations

13k	or QCELP or Q13: QualComm Code Excited Linear Predictive Coding at 13k
AAC	Advanced Audio Coding
AMR	Adaptive Multi Rate
DRM	Digital Rights Management
EVRC	
GIF	Graphics Interchange Format
GIF 87a/89a	GIF with animations
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
JPEG	Joint Photographic Experts Group
MIDI	Musical Instrument Digital Interface
MIME	Multipurpose Internet Mail Extension
MM	Multimedia Message
MMS	Multimedia Messaging Service
MMSC	Multimedia Messaging Service Center
MPEG	Moving Picture Experts Group
MP3	MPEG-1 Audio Layer 3
OMA	Open Mobile Alliance
PC	Personal Computer
PDA	Personal Digital Assistant
Q13	or 13k or QCELP: QualComm Code Excited Linear Predictive Coding at 13k
QCELP	or 13k or Q13: QualComm Code Excited Linear Predictive Coding at 13k
RFC	Request For Comments
SMIL	Synchronized Multimedia Integration Language
SMV	Selectable Mode Vocoders
UAProf	User Agent Profile
UTF	Unicode Translation Format
WAP	Wireless Application Protocol

3.4 Actors

For the use cases described in this document, the following actors will be used.

Network Provider: The entity providing network connectivity for a User Equipment.

Application Service Provider: The entity providing the application/service to an End User.

Application Platform Provider: The entity responsible for implementing the application/service and providing the application platform to the service provider.

Content Provider: The entity responsible for developing and/or publish Content to be consumed on a User Equipment.

Transcoding Service Provider: The entity responsible for transcoding Content to make it suitable for the target User Equipment and providing their service to end-users.

Transcoding Platform Provider: The entity responsible for transcoding Content to make it suitable for the target User Equipment and providing their service to application platform providers.

End User: The entity that consumes the Content.

4. Introduction (Informative)

The deployment of multimedia applications (MMS, WAP (2), e-mail, web browsing… etc.) may require some Content adaptations, due to the diversity of the phone specifications (memory, screen size, resolution, colour depth…etc. and supported media formats) and the diversity of the media formats as distributed by the Content industry (JPEG, GIF, all AMR modes, 13K vocoder, EVRC, SMV, MPEG-1, MPEG-4, H.263…etc.).

Content Adaptation is largely independent on the type of service that delivers the data to the end-users.

STI 1.0 is the first specification of a standard interface between the Multimedia Application Platforms and the Transcoding Platform and is meant to resolve some of the integration and testing problems when deploying multimedia services towards mobile devices.

This document describes the use cases, requirements and requirements for STI 1.0.

5. Use Cases (Informative)

To meet the objective of a generic Standard Trancoder Interface that accommodates a multitude of multimedia applications (MMSC, web download, Push…etc.) and in order to clearly define the list of requirements, a list of significant use cases must be developed. The use cases in this section cover a range of applications, each having a unique need for STI. The current list of use cases defines the scope of STI 1.0 (.i.e some use cases have been postponed to future versions of STI).

5.1 Use Case – Person-to-person MMS (1)

This use case is a typical scenario of person-to-person MMS where one user sends a second user a message containing digital Content. This use case falls into the MMS Conformance document [MMS 1.2] and should therefore be consistent with the work in OMA-MAG-MMSG. The STI is used between the Application Platform (MMSC) and the Transcoding Platform and enables Content transcoding.

5.1.1 Short Description

Eva, an End User, sends an MM to Rob, another End User. This message contains a video Eva just created with her camera-phone and a text describing the situation she just shot. The MMS Provider ensures that the Content is appropriate for Rob's User Equipment before delivering the message.

5.1.2 Actors

Eva owns a camera-phone that is able to display videos. She is able to author her own audio/video clips and send them to her friends.

Rob, another end-user, owns an image-enabled phone, which can display GIF, animated GIF and JPEG and can play AMR files.

The Network Provider, here the mobile operators.

The Application Platform Provider here the MMSC provider.

The Transcoding Platform Provider.

5.1.2.1 Actor Specific Issues

Eva wants to share her videos with her friend Rob.

Rob does not have a high-end phone but wants to be able to receive Eva's videos.

The mobile operator wants his MMS service to be seamless and simple to use. That is, Eva should not be concerned with the capabilities of Rob's phone. Eva wants her messages to reach Rob and to carry as much of the original experience as possible. The mobile operator also wants the MMS service to reach most of his subscribers (not only the ones with video-enabled User Equipments).

5.1.2.2 Actor Specific Benefits

Eva can send her videos to Rob and Rob is able to play them (in a format his phone understands). Both users find the MMS authoring and receiving easy and functional. They tend to use it more and more.

The mobile operator's MMS service can reach more users and even users with lower-end phones can get a taste of video messaging. The traffic on the networks is increased. Users are satisfied with the MMS experience and tend to use /subscribe to the service more.

The service grows faster and the providers (MMSC and Transcoding Platform Provider) benefit from the expansion of the service.

5.1.3 Pre-conditions

- The application is aware of both device capabilities
- Both users are subscribed to MMS
- Eva's camera phone is capable of shooting video clips
- Rob has means to publish his preferences

5.1.4 Post-conditions

- In case of failure/success both End Users should be able to receive indicative information
- Rob's phone should handle unsupported media in a graceful manner

5.1.5 Normal Flow

- Eva prepares a message using her camera-phone: she shoots a little video, then she creates a text describing the situation and includes both text and video clip in a MM.
- Eva sends the MM (a 100kB file) to Rob.
- Rob's phone is MMS enabled but can only display animated GIF, GIF and JPEG. Besides his phone can only receive MM smaller than 30kB.
- The MMSC receives the MM intended for Rob.
- The MMSC knows Rob's preferences and Rob's phone's capabilities and constraints and decides whether transcoding is needed and what are the "best media types" the Transcoding Platform should create, to address Rob's phone. Stripping out the video, the MMSC requests (from the Transcoding Platform) transcoding of Eva's video into animated GIF with a size less than 25kB, and a resolution and colors that are consistent with Rob's User Equipment capabilities.

  Note: If no transcoding is required, the MMSC will either request transcoding and the Transcoding Platform will return the original Content, with a note that no transcoding happened, or will detect that no transcoding is needed and will not go through the Transcoding Platform.
- The Transcoding Platform creates the animated GIF 25kB file (selecting the images in the video…etc.).
- The MMSC attaches the GIF to the text and delivers the MM to Rob's phone.
- (The MMSC should optionally make the original MM available to the end-user through other MMS transactions, e.g. using the MMBox or MM1_forward [3GPP], or by other means as described in [MMS 1.2])

5.1.6 Alternative Flow

- Eva prepares a message using her camera-phone: she shoots a little video, then she creates a text describing the situation and includes both text and video clip in a MM.
- Eva sends the MM (a 100kB file) to Rob.
- Rob's phone is MMS enabled but can only display animated GIF, GIF and JPEG. Besides his phone can only receive message smaller than 30kB.

- The MMSC receives the MM intended for Rob.
- The MMSC extracts the SMIL media file and requests (from the Transcoding Platform) transcoding of Eva's SMIL presentation for Rob's User Equipment. It sends the SMIL file, with the referenced Content to the Transcoding Platform, Rob's User Equipment identification and the MMS specific policies (for the MMSC to be inline with the MMS conformance).

Note: If no transcoding is required, the MMSC will either request transcoding and the Transcoding Platform will return the original Content, with a note that no transcoding happened, or will detect that no transcoding is needed and will not go through the Transcoding Platform.

- The Transcoding Platform knows Rob's phone's capabilities and constraints, Rob's preferences and it received the MMS specific policies. Based on the information, it determines "the best transcoding option": in this case animated GIF with size less than 25kB. The Transcoding Platform returns a complete and converted SMIL file, including an animated GIF image and the text.
- The MMSC creates the MM based on the adapted SMIL file and other media elements and sends it to Rob's phone.
- (The MMSC should optionally make the original MM available to the end-user through other MMS transactions, e.g. using the MMBox or MM1_forward [3GPP], or by other means as described in [MMS 1.2])

5.1.7 Operational and Quality of Experience Requirements

The images received by Rob as a result of the transcoding should be as close as possible to the video Eva sent in terms of both content and quality.

5.2 Use Case – Person-to-person MMS (2)

This use case is another typical scenario of Person-to-person MMS where one user sends a second user a message containing digital Content. The STI is used between the Application Platform (MMSC) and the Trancoding Platform and enables Content transcoding. This case differs from the first one by the "simplicity" of the transcoding to be performed.

5.2.1 Short Description

Eva, an End User, sends an MM to Rob, another End User. This message contains an image Eva just created with her camera-phone and a text describing the situation she just shot. The MMS Provider ensures that the Content is appropriate for Rob's User Equipment before delivering the message.

5.2.2 Actors

Eva owns a camera-phone that is able to take snap shots in JPEG format. Eva's phone is not limited in terms of memory and can therefore create "big" images.

Rob, another end-user, owns an image-enabled phone, which can display JPEG, but is limited to 30kB size (due to memory constraint).

The Network Provider, here the mobile operators.

The Application Service Provider here the MMSC provider.

The Transcoding Platform Provider.

5.2.2.1 Actor Specific Issues

Eva wants to share her images with her friend Rob.

Rob does not have a high-end phone but wants to be able to receive Eva's images.

The mobile operator wants his MMS service to be seamless and simple to use. That is, Eva should not be concerned with the capabilities of Rob's phone. Eva wants her messages to reach Rob and to carry as much of the original experience as possible. The mobile operator also wants the MMS service to reach most of his subscribers (not only the users with high-end User Equipments).

5.2.2.2 Actor Specific Benefits

Eva can send her images to Rob and Rob is able to play them on his phone (even though it's limited in memory). Both users find the MMS authoring and receiving easy and functional. They tend to use it more and more.

The mobile operator's MMS service can reach more users and even users with lower-end phones. The traffic on the networks is increased. Users are satisfied with the MMS experience and tend to use /subscribe to the service more.

The service grows faster and the providers (MMSC and Transcoding Platform Provider) benefit from the expansion of the service.

5.2.3 Pre-conditions

- Both phones are MMS capable.
- Both users are subscribed to MMS
- The MMS is aware of both device capabilities

5.2.4 Post-conditions

- In case of failure/success both End Users should be able to receive indicative information

5.2.5 Normal Flow

- Eva prepares a message using her camera-phone: she shoots a picture and creates an MM (a 100kB file) with the picture and some text.
- Eva sends the MM (a 100kB file) to Rob.
- Rob's phone is MMS enabled but can only handle 30kB message and 160*120 pixels images.
- The MMSC receives the MM intended for Rob.
- The MMSC knows Rob's preferences and Rob's phone's capabilities and constraints. Stripping out the image, the MMSC requests (from the Transcoding Platform) transcoding of Eva's JPEG image into another JPEG image with a size below 25kB and a resolution below 160 x 120.

Note: If no transcoding is required, the MMSC will either request transcoding and the Transcoding Platform will return the original Content, with a note that no transcoding happened, or will detect that no transcoding is needed and will not go through the Transcoding Platform.

- The transcoding engine returns the transcoded JPEG.
- The MMSC attaches the transcoded JPEG to the text and delivers the MMS to Rob's phone.

5.2.6 Alternative Flow

- Eva prepares a message using her camera-phone: she shoots a picture and creates an MM (a 100kB file) with the picture and some text.
- Eva sends the MM (a 100kB file) to Rob.
- Rob's phone is MMS enabled but can only handle 30kB message and 160*120 pixels images.
- The MMSC receives the MM intended for Rob.
- The MMSC extracts the SMIL file and requests (from the Transcoding Platform) transcoding of Eva's SMIL presentation for Rob's User Equipment. It sends the SMIL file, with the referenced Content to the Transcoding Platform, Rob's User Equipment identification and the MMS specific policies (for the MMSC to be inline with the MMS conformance).

Note: If no transcoding is required, the MMSC will either request transcoding and the Transcoding Platform Provider will return the original Content, with a note that no transcoding happened, or will detect that no transcoding is needed and will not go through the Transcoding Platform.

- The Transcoding Platform knows Rob's phone's capabilities and constraints and it received the MMS specific policies. Based on the information, it determines the "best transcoding option": in this case, the picture is transcoded to fit the resolution 160 x 120 and the 25kB limit. The Transcoding Platform returns a complete and converted SMIL file and the resized image and text.
- The MMSC creates the MM based on the adapted SMIL file and other media elements and sends it to Rob's phone.

5.2.7 Operational and Quality of Experience Requirements

The image received by Rob as a result of the transcoding should be as close as possible to the image Eva sent in terms of quality.

5.3 Use Case – Person-to-person MMS (3)

3GPP and 3GPP2 have in some cases adopted different default and optional media codecs and file formats for MMS. Transcoding is therefore essential to ensure that GSM/UMTS and CDMA subscribers can exchange MM that contains digital Content. This use case describes a scenario in which a GSM subscriber exchanges MM containing speech Content with a CDMA subscriber. The STI is employed to transcode between AMR (the default speech codec for GSM and UMTS networks) and 13K (one of the default speech codecs in CDMA networks).

5.3.1 Short Description

Paulo, an End User, sends an MM to Ashley, another End User. This message contains speech Content that Paulo just created with his GSM phone. The MMS Provider ensures that the speech Content is appropriate for Ashley's CDMA phone before delivering the message. When Ashley sends a reply MM with speech Content to Paulo, the MMS Provider similarly ensures that the Content is appropriate for Paulo's GSM phone.

5.3.2 Actors

Paulo owns a GSM phone that is able to record speech in AMR format. He is able to play and record his own speech clips and send them to his friends.

Ashley, another end-user, owns a CDMA phone that can record and play 13K audio files.

Paulo's Network Provider, here a GSM operator.

Ashley's Network Provider, here a CDMA operator.

Paulo's Application Service Provider, here Paulo's MMSC provider.

Ashley's Application Service Provider, here Ashley's MMSC provider.

The Transcoding Platform Providers.

5.3.2.1 Actor Specific Issues

Paulo and Ashley want to share Content with all their friends, who include subscribers of GSM, CDMA and UMTS networks.

Paulo and Ashley do not want to have to know the network type of a friend's Network Provider when deciding what types of Content to send them.

CDMA, GSM and UMTS mobile operators all want their MMS service to reach the widest range of subscribers possible, and they want to minimize the occurrence of unsuccessful message exchanges due to Content incompatibility issues.

5.3.2.2 Actor Specific Benefits

Paulo and Ashley can send each other speech clips and feel confident that the recipient phones will be able to play them, even though neither person knows whether the other's Network Provider is (GSM, CDMA or UMTS).

The mobile operators' MMS services can enable Content exchange between more subscribers. This results in a "network effect" that increases MMS traffic on the operators' networks.

The service grows faster and the providers (MMSC and Transcoding Platform Provider) benefit from the expansion of the service.

5.3.3 Pre-conditions

- Both phones are MMS capable.
- Both users are subscribed to MMS
- The MMS is aware of both device capabilities

5.3.4 Post-conditions

- In case of failure/success both End Users should be able to receive indicative information

5.3.5 Normal Flow

- Paulo prepares a message using his GSM phone: he records a speech clip that is encoded in AMR, and then creates a MM that includes the speech clip.
- Paulo sends the MM to Ashley.
- Ashley's phone is MMS enabled but cannot play back AMR speech files (her CDMA phone can only play speech encoded with the 13K codec, which is one of the default speech codecs in CDMA networks).
- Paulo's MMSC receives the message intended for Ashley and forwards it to Ashley's MMSC.
- Ashley's MMSC knows Ashley's preferences and her phone's capabilities and constraints and determines the "best media type" the Transcoding Platform should create. The MMSC requests (from the Transcoding Platform) transcoding of Paulo's speech file from AMR to 13K.

- The Transcoding Platform takes the AMR created on Paulo's phone as input, transcodes it to 13K, and returns the 13K file to the MMSC (since the Transcoding Platform is designed to handle all the default and optional codecs and file formats specified in 3GPP (for GSM and UMTS networks) and 3GPP2 (for CDMA networks), it is capable of transcoding AMR into 13K).

  Note: If no transcoding is required, the MMSC will either request transcoding and the Transcoding Platform will return the original media, with a note that no transcoding happened, or will detect that no transcoding is needed and will not go through the Transcoding Platform.

- Ashley's MMSC attaches the 13K file to the body of the MM and deliver it to Ashley's phone.
- Ashley then prepares a reply to Paulo's message using her CDMA phone: she records a speech clip that is encoded in 13K, and then creates an MM that includes the speech clip.
- Ashley sends the MM to Paulo.
- Paulo's phone is MMS enabled but cannot play back 13K speech files (his GSM phone can only play speech encoded with the AMR codec, which is the default speech codec in GSM networks).
- Ashley's MMSC receives the MM intended for Paulo and forwards it to Paulo's MMSC.
- Paulo's MMSC knows Paulo's preferences and his phone's capabilities and constraints and determines the "best media type" the Transcoding Platform should create. The MMSC requests (from the Transcoding Platform) transcoding of Ashley's speech file from 13K to AMR.
- The Transcoding Platform takes the 13K speech clip created on Ashley's phone as input, transcodes it to AMR, and returns the AMR file to the MMSC (since the Transcoding Platform is designed to handle all the default and optional codecs and file formats specified in 3GPP (for GSM and UMTS networks) and 3GPP2 (for CDMA networks), it is capable of transcoding 13K into AMR).
- Paulo's MMSC attaches the AMR file to the body of the MM and delivers it to Paulo's phone.

5.3.6 Alternative Flow

- Paulo prepares a message using his GSM phone: he records a speech clip that is encoded in AMR, and then creates an MM that includes the speech clip.
- Paulo sends the MM to Ashley.
- Ashley's phone is MMS enabled but cannot play back AMR speech files (her CDMA phone can only play speech encoded with the 13K codec, which is one of the default speech codecs in CDMA networks).
- Paulo's MMSC receives the message intended for Ashley and forwards it to Ashley's MMSC.
- Ashley's MMSC extracts the SMIL file and other media elements and requests (from the Transcoding Platform) transcoding of Paulo's SMIL presentation for Ashley's User Equipment. It sends the SMIL file, with the referenced Content to the Transcoding Platform, Ashley's User Equipment identification and the MMS specific policies (for the MMSC to be inline with the MMS conformance).

Note: If no transcoding is required, the MMSC will either request transcoding and the Transcoding Platform will return the original Content, with a note that no transcoding happened, or will detect that no transcoding is needed and will not go through the Transcoding Platform.

- The Transcoding Platform knows Ashley's phone's capabilities and constraints and it received the MMS specific policies. Based on the information, it determines the "best transcoding option": in this case, the AMR file is transcoded to 13K format. The Transcoding Platform returns a complete and converted SMIL file with the converted audio file.
- The MMSC creates the MM based on the adapted SMIL file and other media elements and sends it to Ashley's phone.

- Ashley then prepares a reply to Paulo's message using her CDMA phone: she records a speech clip that is encoded in 13K, and then creates an MM that includes the speech clip.
- Ashley sends the MM to Paulo.
- Paulo's phone is MMS enabled but cannot play back 13K speech files (his GSM phone can only play speech encoded with the AMR codec, which is the default speech codec in GSM networks).
- Ashley's MMSC receives the message intended for Paulo and forwards it to Paulo's MMSC.
- Paulo's MMSC extracts the SMIL file and other media elements and requests (from the Transcoding Platform) transcoding of Ashley's SMIL presentation for Paulo's User Equipment. It sends the SMIL file, with the referenced Content to the Transcoding Platform, Paulo's User Equipment identification and the MMS specific policies (for the MMSC to be inline with the MMS conformance).

Note: If no transcoding is required, the MMSC will either request transcoding and the Transcoding Platform will return the original Content, with a note that no transcoding happened, or will detect that no transcoding is needed and will not go through the Transcoding Platform.

- The Transcoding Platform knows Paulo's phone's capabilities and constraints and it received the MMS specific policies. Based on the information, it determines the "best transcoding option": in this case, the 13K file is transcoded to AMR format. The Transcoding Platform returns a complete and converted SMIL file with the converted audio file.
- Paulo's MMSC creates the MM based on the adapted SMIL file and other media elements and sends it to Paulo's phone.

5.3.7 Operational and Quality of Experience Requirements

The result of the transcoding should best preserve the original speech quality

5.4 Use Case – Application to Person Messaging

5.4.1 Short Description

Eva and Rob are both subscribed to the weather news service provided by their operators. Everyday, they receive one e-mail with the day weather forecast and a link to the weekly forecast. The e-mail contains little videos or images describing the weather.

5.4.2 Actors

Eva owns a camera-phone that is able to display videos.

Rob, another end-user, owns an image-enabled phone, which can display GIF, animated GIF and JPEG and can play AMR files.

The Network Provider, here the mobile operator.

The Content Provider, here the Weather channel.

The Application Service Provider, here the weather web service provider.

The Transcoding Platform Provider.

5.4.2.1 Actor Specific Issues

Eva and Rob both expect to receive the weather news.

The Application Service Provider receives one video clip from the Content Provider (in MPEG-4+AMR 3GPP format) but wants his service to reach most subscribers.

The mobile operator wants his service to reach most subscribers.

5.4.2.2 Actor Specific Benefits

Eva and Rob receive the weather news in a format their User Equipment can understand.

The mobile operator's weather service can reach more users and even users with lower-end phones. The traffic on the networks is increased.

The service grows faster and the providers (MMSC and Transcoding Platform Provider) benefit from the expansion of the service.

5.4.3 Pre-conditions

- Eva and Rob are both subscribed to the weather news service
- The application is aware of both device capabilities
- Both have phones that supports e-mail and browsing
- Eva's phone is capable of playing video clips
- Rob's phone is capable of displaying images

5.4.4 Post-conditions

- In case of failure/success both End Users should be able to receive indicative information

5.4.5 Normal Flow

- The Content provider creates one video clip in MPEG-4+AMR 3GPP format, presenting the day forecast.
- The Application Service requests the Transcoding Platform for a "bulk transcoding": to adapt the initial clip for all subscribed users, including Eva and Rob, so that the clip can be seen with their User Equipment.
- Based on the User Equipment capabilities and constraints, the Transcoding Platform adapts the MPEG-4+AMR 3GPP clip to Eva's phone (compressing the stream to reach the 100kB limit) and to Rob's phone (converting the video into a short animated GIF, with a size of 30kB)…etc. and returns the list of converted Content to the Application Service.
- The Application Service packages the e-mail for each user and sends them out.

5.4.6 Alternative Flow

None

5.4.7 Operational and Quality of Experience Requirements

- The images received by Rob as a result of the transcoding should be as close as possible to the original video in terms of both content and quality.

- The video received by Eva as a result of the transcoding should be as close as possible to the original video in terms of both content and quality.

5.5 Use Case – MMS to email transcoding

This use case describes a transcoding scenario when sending an MM from a mobile terminal to a standard email client. The specificity of this use case is to describe transcoding of presentation layer (SMIL to HTML) and text. The STI is used between the Application Platform (MMSC) and the Trancoding Platform and enables Content transcoding.

5.5.1 Short Description

Eva, an End User, sends an MMS to Rob's email address. This message contains a SMIL presentation with multiple slides containing images, audio and text. The MMSC expects Rob to access his e-mail through his PC. For Rob to be able to play the e-mail on his PC, some transcoding has to be performed (transcoding from SMIL to HTML and transcodings of the media elements and text).

5.5.2 Actors

Eva owns an MMS capable phone and is able to compose MMS messages with multiple slides.

Rob, another end-user, has a standard email account.

The Network Provider, here the mobile operator.

The Application Service Providers, here the MMSC provider and the e-mail server provider.

The Transcoding Platform Provider.

5.5.2.1 Actor Specific Issues

Eva wants to share her MMS messages with her friend Rob. Eva wants her messages to reach Rob and to carry as much of the original experience as possible.

Rob does not have an MMS capable phone, just an email account but he wants to be able to receive Eva's MMS messages.

The mobile operator wants his MMS service to be seamless and simple to use. That is, Eva should not be concerned with the fact that Rob is receiving the message through his e-mail account. The mobile operator also wants the MMS service to reach the email users in addition to the MMS users.

5.5.2.2 Actor Specific Benefits

Eva can send her MMS messages to Rob and Rob is able to play them. Both users find the MMS authoring and receiving easy and functional. They tend to use it more and more.

The mobile operator's MMS service can reach more users and even users with an email account. The traffic on the networks is increased. Users are satisfied with the MMS experience and tend to use /subscribe to the service more.

The service grows faster and the providers (MMSC provider and Transcoding Platform Provider) benefit from the expansion of the service.

5.5.3 Pre-conditions

- Eva is subscribed to MMS

- Rob is subscribed to email service

5.5.4 Post-conditions

- In case of failure/success both End Users should be able to receive indicative information

5.5.5 Normal Flow

- Eva prepares a message using her MMS capable phone : she composes several slides each with a different image and text.
- Eva sends the MMS (a 100kB file) to Rob's email address.
- The MMSC receives the message intended for Rob.
- The MMSC specific rule when dealing with e-mail is to consider that the user equipment is a PC. The MMSC decomposes the SMIL presentation stripping out the text and images,
    - The MMSC requests (from the Transcoding Platform) transcoding of each image to a resolution and colors that are consistent with the PC default characteristics.
    - The MMSC requests (from the Transcoding Platform) transcoding of the text file from one character set (e.g.UTF-16) to a character set consistent with a PC (e.g. US-ASCII). This is possible if the input and output character set information is available.
- The Transcoding Platform receives the individual media and the characteristics and performs the required transcoding. It returns the transcoded individual media to the MMSC.
- The MMSC re-packages the transcoded images and text objects into one HTML page containing the different slides arranged one below the other, within a multipart MIME.
- The MMSC sends the HTML page (and related objects) using SMTP to Rob's server for delivery to Rob's e-mail account.

5.5.6 Alternative Flow

- Eva prepares a message using her MMS capable phone : she composes several slides each with a different image and text.
- Eva sends the MMS (a 100kB file) to Rob's email address.
- The MMSC receives the message intended for Rob.
- The MMSC sends a multipart MIME file (containing the SMIL presentation and the related objects) to the Transcoding Platform together with the characteristics of a generic e-mail client (characteristics chosen by the MMSC as part of his e-mail policy).
- The Transcoding Platform receives the e-mail client characteristics and determines "the best transcoding option": in this case an HTML page, containing the different slides arranged one below the other, within a multipart MIME. The Transcoding Platform returns a complete and converted multipart MIME containing the HTML presentation that includes the different image and text objects. If the input and output character set information is available, the Transcoding Platform will also perform character set conversion on the text file.

The MMSC sends the multipart MIME using SMTP to Rob's email server for delivery to Rob's e-mail account.

5.5.7 Operational and Quality of Experience Requirements

The result of the transcoding from SMIL to HTML should preserve, in a consistent manner, the logic of the original SMIL presentation.

5.6 Use Case - Browsing

This use case is a classical example of browsing to a web page, and purchasing Content.

5.6.1 Short Description

Tyler, an end user, browses on a website to view MP3 music clips that he can purchase. The Application Service uses the Transcoding Platform to adapt the Content for Tyler, before he downloads it and completes his transaction.

5.6.2 Actors

Tyler is an end user who browses web pages. His phone only supports AAC.

The Network Provider, here the mobile operator

The Content Provider , here the Music Content owner.

The Application Service Provider, here a Music clip service provider

The Transcoding Platform Provider

5.6.2.1 Actor Specific Issues

Tyler wants to download the music clips on his phone and be able to play them.

The mobile operator wants his Music service to reach more users.

5.6.2.2 Actor Specific Benefits

Tyler is ensured that the Content listed on the web pages will be playable on his User Equipment.

The mobile operator's music service can reach more users (not only the users with MP3 enabled phones). The traffic on the networks is increased.

The service grows faster and the providers (Music service provider and Transcoding Platform Provider) benefit from the expansion of the service.

The Content provider gets more promotion of his Content, as more users access the web site.

5.6.3 Pre-conditions

- Tyler's phone supports browsing
- The application is aware of the device capabilities

5.6.4 Post-conditions

- In case of failure/success the End- User should be able to receive indicative information

5.6.5 Normal Flow

- Tyler browses on a website that lists MP3 music clips available for purchase.
- Tyler selects one clip.
- The Application Service determines that Tyler's User Equipment does not support MP3.
- It requests the Transcoding Platform to transcode the MP3 file to a format suitable for Tyler's phone (i.e. AAC).
- The Application Service transfers the AAC clip to Tyler and collects payment for the transaction.

5.6.6 Alternative Flow

None

5.6.7 Operational and Quality of Experience Requirements

The result of the transcoding from MP3 to AAC should best preserve the original audio quality

5.7 Use Case – Peer Content Distribution

This use case shows an example of an end user accessing a transcoding service directly. In turn, STI is used between the Application Service (Transcoding Service) and the Trancoding Platform and enables Content transcoding.

5.7.1 Short Description

Tyler, an end user, runs into his best friend Matt, another end user. Tyler creates an ad-hoc network with Matt, for example using a Bluetooth or infrared connection, and sends Matt a ring tone. The ring tone is not suitable for Matt's User Equipment. Matt utilizes the Transcoding Service to convert the ring tone to a suitable format.

5.7.2 Actors

Tyler is an end user, who downloads ring tones from the Internet for his phone.

Matt is a second end user, who wants to get Tyler's ring tones.

The Application Service Provider, here the Transcoding Service Provider

The Transcoding Platform Provider

5.7.2.1 Actor Specific Issues

Tyler wants to share his Content with Matt.

Matt wants to be able to play Tyler's Content.

5.7.2.2 Actor Specific Benefits

Matt can access a transcoding service and ensure he will be able to play the ring tones he receives from his friend on his User Equipment.

5.7.3 Pre-conditions

- Tyler's phone supports browsing
- Matt is subscribed to a transcoding support application, which is aware of Matt's device capabilities

5.7.4 Post-conditions

- In case of failure/success the End- User should be able to receive indicative information

5.7.5 Normal Flow

- Tyler downloaded some ring tones for his User Equipment and wants to share them with Matt.
- Tyler establishes an ad-hoc network with Matt
- Tyler sends the ring tones to Matt. Matt's User Equipment determines that the Content is not suitable (cannot be rendered).
- Matt's User Equipment offers to change the Content to a suitable format.
- Matt accepts and the User Equipment sends the Content and transcoding instructions (capabilities and preferences info) to the Transcoding Service Provider.
- The Transcoding Service requests transcoding of the Content from the Transcoding Platform.
- The Transcoding Platform transcodes the Content to a suitable format and sends it back to the Transcoding Service.
- The Transcoding Service returns the converted Content to Matt's User Equipment.
- Matt can now play the ring tones

5.7.6 Alternative Flow

- Tyler downloaded some ring tones for his User Equipment and wants to share them with Matt.
- Tyler establishes an ad-hoc network with Matt
- Tyler sends the ring tones to Matt. Matt's User Equipment determines that the Content is not suitable (cannot be rendered).
- Matt's User Equipment sends a ring tone identifier to the Transcoding Service Provider, rather than the Content itself, to reduce over-the-air traffic.
- The Transcoding Service Provider uses the ring tone identifier to retrieve the ring tone from the Content Provider.
- The Transcoding Service Provider requests transcoding of the Content from the Transcoding Platform.
- The Transcoding Platform transcodes the Content to a suitable format and sends it back to the Transcoding Service.
- The Transcoding Service returns the converted Content to Matt's User Equipment.

- Matt can now play the ring tones

5.7.7 Operational and Quality of Experience Requirements

The result of the transcoding should best preserve the original audio quality

5.8 Use Case – Transcoding Preferences and Policies

This use case highlights how an Application Platform can convey to the Transcoding Platform preferences and/or policies.

5.8.1 Short Description

An application might have specific constraints / policies that the Transcoding Platform has to comply with.

Likewise the network operator or the Content provider might have preferences.

Likewise a user might have preferences.

When the Application Platform requests the Content transcoding, the specific preferences and policies are sent to the Transcoding Platform, as part of the transcoding request.

When the Transcoding Platform transcodes, it can take into account preferences from the user, the network provider, the service/application and the Content provider.

5.8.2 Actors

Tyler, an end user.

The Application Service Provider

The Network Provider, here the mobile operator

The Content Provider

The Transcoding Platform Provider

5.8.2.1 Actor Specific Issues

The Application Service Provider wants to implement a certain policy: When a message needs to be transcoded to a certain target size in bytes, it would like to specify the order in which the media can be deleted, i.e. first audio then images, then video.

5.8.2.2 Actor Specific Benefits

The Application Service Provider controls the policy by which messages will be transcoded and thus controls the end-user experience

5.8.3 Pre-conditions

- There are means for the Application Service Provider to define policies

5.8.4 Post-conditions

- In case of failure/success the End- User should be able to receive indicative information

5.8.5 Normal Flow

- When the Application Service Provider requests Content adaptation, it sends the policies, within the transcoding request. The policy determines the order of object deletion from the message in case the target size that the terminal can handle requires suppression of some media elements. In particular it determines that, if needed, audio will be deleted first, then images, then video.
- Transcoding Platform utilizes the business policy when transcoding the Content. The resulting transcoded message meets the target size as specified and the objects were deleted according to the policy.

5.8.6 Alternate Flow

- The Application Service Provider determines the transcoding parameters per each media object based on the policy.
- The Application Platform then sends the transcoding request for each of the individual elements.
- Transcoding Platform tries to comply with the preferences when transcoding the Content.

5.8.7 Operational and Quality of Experience Requirements

The result of the transcoding should best reflect the policy, preferences and constraints requested by the Application Service Provider while resolving conflicts according to the precedence rules.

5.9 Use Case – Operator with Multiple Services

5.9.1 Short Description

An operator deploys several multimedia services: image browsing, audio download and Video clip distribution over MMS. The operator wants to support 4 multimedia handsets (2 video enabled, 3 audio enabled, 1 image-only). The STI allows the operator to pick the transcoding provider most suited for the handsets, which he wants to deploy and independent of the application platform providers.

The STI also allows for several multimedia services to share the same transcoding. This may reduce the amount of required resources (e.g. number of CPUs, storage), and allows several multimedia services to share the transcoding configurations (e.g. user preferences).

5.9.2 Actors

The Network Provider, here the mobile operator.

The Application Service Providers

The Transcoding Platform Provider

5.9.2.1 Actor Specific Issues

The Network Provider wants to minimize the testing hassle and wants to make sure the Application Services are available to most users on his network. He also wants the best user experience for the services deployed.

The Application Service Providers and Transcoding Platform Provider want to minimize the testing hassle and the cost of integrating their solutions together.

5.9.2.2 Actor Specific Benefits

The Network Provider can select the transcoding and application vendors independently and build a best-of-class solution.

The integration tests are reduced because the interface is public and implemented in the products.

The Content transcoding tests can be done independently and all Application Services benefit from the tests and can rely on the Transcoding Platform.

5.9.3 Pre-conditions

None

5.9.4 Post-conditions

- In case of failure/success the End- User should be able to receive indicative information

5.9.5 Normal Flow

- STI is published and vendors implement STI in their products
- The operator deploys several Application Services on platforms that support STI.
- The operator selects a Transcoding Platform Provider most suited to the available handsets or several Transcoding Platforms with different capabilities.
- The Transcoding Platforms are tested with the handsets.
- The operator configures each Application Platform to work with the appropriate Transcoding Platform(s). Similar Application Platforms may be linked to the same transcoding Platform.
- The operator deploys an additional Application Service based on a platform, which interfaces with an already deployed Transcoding Platform. All the transcoding configurations (e.g. user preferences…etc.) are already available for the new Application Service.
- In the case that there are several Transcoding Platforms, with different capabilities, the Application Platform queries the Transcoding Platforms with respect to their transcoding capabilities. (i.e. there may be a Transcoding Platform which can generate animated GIF from MPEG-4 and another which can transcode MP3 to AMR.)

5.9.6 Alternate Flow

None

5.9.7 Operational and Quality of Experience Requirements

None

5.10 Use Case – Photo Album - Application Generated Constraints

This use case highlights how an application can convey to the Transcoding Platform characteristics and constraints that are different from the UE constraints

5.10.1 Short Description

Eva, a user with a high-end handset, accesses her network-based personal photo-album to find the pictures of her last trip to exotic lands. She wants to choose a few of the pictures to show off to her friends, therefore she first chooses the option to see thumbnails of the pictures in the trip-folder. The photo-album application provider verifies that the picture format is appropriate for the terminal that Eva is using and in addition requests that the images be resized to thumbnail size for display.

5.10.2 Actors

Eva is an end user.

Application Service Provider

Network Provider

Transcoding Platform Provider

5.10.2.1 Actor Specific Issues

Eva wants to view thumbnails of her photos to have easy access to choose the ones that she wants to display in “full view’ mode.

The Network Provider wants to save bandwidth and therefore supports a “thumbnail” mode for downloading the images.

The Application provider wants to transcode the images using the constraints from the user option of choosing the size of display regardless of the terminal screen size.

5.10.2.2 Actor Specific Benefits

Eva can view several images at once on her terminal screen and choose the ones to display in full.

Application provider can provide a more friendly user environment for his application by offering the different viewing options on different terminals.

5.10.3 Pre-conditions

- Eva is subscribed to a Photo Album application
- The application is aware of the device capabilities
- There are means for the Application Service Provider to define constraints

5.10.4 Post-conditions

- In case of failure/success the End- User should be able to receive indicative information

5.10.5 Normal Flow

- Eva browses her personal photo-album and finds the folder containing all of the images from her last trip. She wants to choose a subset of these pictures to show her friends, therefore she chooses the "Thumbnail" option of display.
- Photo-Album Viewer application prepares each of the images for transcoding and, in addition to providing the user's terminal capabilities, provides information of the requested display size, for the "Thumbnail" option. This additional size information should override any information that may be associated with the terminal type for the UE.
- Transcoding Platform Provider utilizes the terminal capability information supplied to determine the image format to transcode the image to and the overriding size information to determine the proper transcoding to perform.
- Application determines the layout of the images to display on the screen after receiving the transcoded thumbnail images.

5.10.6 Alternate Flow

None

5.10.7 Operational and Quality of Experience Requirements

Apart from image size, transcoded "Thumbnails" should preserve a comparable quality to the original images

5.11 Use Case – Photo Album - Concatenation of Files

This use case highlights how an application may transfer a list of media files and request that the Transcoding Platform generate a multi-part media file from them.

5.11.1 Short Description

Eva, a user with a high-end handset, accesses her network-based personal photo-album to find the pictures of her last trip to exotic lands. After seeing the thumbnails, Eva chooses five or six images to display. She, further, requests that the application display them as a slide-show on her terminal.

5.11.2 Actors

Eva is an end user.

Application Service Provider

Network Provider

Transcoding Platform Provider

5.11.2.1 Actor Specific Issues

Eva wants to show her photos in "full view" mode in a slide-show mode.

The Network Provider wants to provide a friendly application-set and therefore supports a "slide-show" mode for downloading the images.

The Application Service Provider wants to provide a user-friendly interface and allows the user to display his photos in a slide-show mode.

5.11.2.2 Actor Specific Benefits

Eva can view several images on her terminal screen using a simple interface of choosing the next image.

Application Service Provider can provide a more friendly user environment for his application by offering the different viewing options on different terminals.

5.11.3 Pre-conditions

- Eva is subscribed to a Photo Album application
- The application is aware of the device capabilities

5.11.4 Post-conditions

- In case of failure/success the End- User should be able to receive indicative information

5.11.5 Normal Flow

- Eva has chosen a set of pictures from her personal photo-album that she wants displayed. She selects the option to have them displayed as an automatic slide-show on her Photo-Album Viewer.

The Application Service Platform (supporting requests from the Photo-Album Viewer) prepares the selected images for transcoding and provides the user's terminal capabilities.

- Transcoding Platform Provider utilizes the terminal capability information supplied to determine the image format to transcode the images.
- Application determines the layout of the images to display on the screen after receiving the transcoded images and creates the SMIL presentation layer according to the known user preferences.
- Eva shows off her pictures to her friends in continual slide show.

5.11.6 Alternate Flow

- Eva has chosen a set of pictures from her personal photo-album that she wants displayed. She selects the option to have them displayed as an automatic slide-show on her Photo-Album Viewer.
- The Application Service Platform (supporting requests from the Photo-Album Viewer) prepares the selected images for transcoding along with an appropriate SMIL presentation which it generated and provides the user's terminal capabilities.

- Transcoding Platform Provider utilizes the terminal information supplied to determine the image format to transcode the images. Then the Transcoding Platform modifies the SMIL as appropriate and returns the multipart presentation to the application.
- Application sends the full presentation to the user's terminal.
- Eva shows off her pictures to her friends in continual slide show.

5.11.7 Operational and Quality of Experience Requirements

None

5.12 Use Case – Applications with different time constraints

5.12.1 Short Description

Different applications can have different requirements on response times to serve its end-users. It is desired that the transcoding platforms can prioritise their incoming transcoding jobs according to these requirements.

5.12.2 Actors

Application Provider A.

Application Provider B.

Transcoding Platform Provider.

End-user Bo.

End-user Marie.

Actor Specific Issues

Application Provider A can accept relatively long response times for transcoding and give this information to the Transcoding Platform.

Application Provider B depends on very short response times for transcoding and wants the Transcoding Platform to know this.

Transcoding Platform Provider wants to please the applications in the best way.

Bo is subscribing for an application that can accept relatively long response times.

Marie is subscribing for an application that only can accept short response times.

Actor Specific Benefits

Application Provider A get content transcoded within a time frame that is acceptable for the end-users.

Application Provider B gets content transcoded within a time frame that is acceptable for the end-users.

Transcoding Platform Provider can prioritise all incoming requests and get satisfied Applications that tend to use their services more.

Bo is happy that his subscription works fine.

Marie is happy that her subscription works fine.

5.12.3 Pre-conditions

The Transcoding Platform can handle prioritised transcoding.

5.12.4 Post-conditions

The end-users get content within an acceptable time frame for the application they subscribe.

5.12.5 Normal Flow

Application A receives content addressed to Bo. The Application discovers that the content needs to be transcoded.

Application A sends transcoding parameters, the content and priority normal of the transcoding job, to the Transcoding Platform.

Application B receives a content addressed to Marie. The Application discovers that the content needs to be transcoded.

Application B sends transcoding parameters, the content and priority high of the transcoding job to the Transcoding Platform.

The Transcoding Platform transcodes Application B's content first according to the priority and returns the content to Application B.

Application B sends the transcoded content to Marie.

The Transcoding Platform then transcodes Application A's content and returns the content to Application A.

Application A sends the transcoded content to Bo.

5.12.6 Alternative Flow

None.

5.12.7 Operational and Quality of Experience Requirements

The end-users quality of experience should not be degraded by the given priority of the transcoding request.

5.13 Open Issues

<Anything that the author(s) want to mention and which needs further clarification. (optional)>

6. Requirements (Normative)

6.1 High-Level Functional Requirements

6.1.1 Security

- STI SHALL support secure transfer of information between the Application Platform and the Transcoding Platform.
- STI SHALL operate over a transport protocol offering authentication between the Application Platform and the Transcoding Platform.
- STI SHALL define the transport protocol(s) to be used. It SHOULD be based on a standard protocol specification.
- When dealing with Content that needs to be secured, the Transcoding Platform SHALL secure the Content while working on it.
- The Application Platform MAY provide secure storage of Content.
- To be compliant with STI, it SHALL NOT be allowed to transcode any DRM [DRM 1.0] protected Content element.

6.1.2 Charging

This sub-section will not specify any particular billing mechanism, merely enablers for billing. Indeed, the Transcoding Platform is not responsible for billing but SHALL provide reporting information on the transcoding performed, so that the billing entity (Transcoding Service Provider) is able to bill accordingly.

- It SHALL be possible for a Transcoding Service Provider to obtain payment from an Application Service Provider for bulk transcoding or single transcoding.
- It SHALL be possible for a Transcoding Service Provider to obtain payment from End-users for transcoding their media files.

6.1.3 Interoperability

- To be compliant with STI, the Application Platform SHALL support the syntax and semantics as defined in STI for requests and responses. The Application Platform is not required to support all STI-defined media types, formats and adaptations on and between them.
- To be compliant with STI, the Transcoding Platform SHALL support the syntax and semantics as defined in STI for requests and responses. The Transcoding Platform is not required to support all STI-defined media types, formats and adaptations on and between them.
- To use STI, the Application Platform SHALL support versioning of the STI.
- STI SHALL provide a mechanism for the Transcoding Platform to describe, on request, its exact capabilities (in terms of media types and formats support, transformation support…etc.).

6.1.4 Privacy

- Information exchanged between the Application Platform and the Transcoding Platform through STI SHALL comply with [Privacy].

6.2 Overall System Requirements

6.2.1 Requirement on an application agnostic interface

- STI SHALL provide an interface, which is generic with respect to different Applications.

Note: Use Case: 5.8

6.2.2 Consistency check with OMA Applications

- STI SHALL support MMS services as defined in [MMS 1.2].
- STI SHALL support Download services, as defined in OMA [Download]
- STI SHALL support Push services, as defined in OMA [Push]
- STI SHALL support Browsing services, as defined in OMA [Browsing] Note: Use Case: 5.6

6.2.3 Requirements on the technology used

- STI SHALL be based on a high performance and lightweight protocol incurring a minimum of overhead.
- STI SHALL be backward compatible.
- STI SHALL supports the definition of private extensions.
- STI SHALL use standard technology whenever possible (e.g. MIME Types, UAProf).

6.3 Requirements on transcoding Request

6.3.1 Requirement on transfer of input Content

- STI SHALL support transfer of the input Content within the transcoding request.
- STI SHALL support Content transcoding requests, where the input is only referenced.

Use Cases: 5.1, 5.2 and 5.3.

6.3.2 Requirement on transfer of constraints on the transcoded Content

- STI SHALL supports the application to indicate the terminal capabilities that may affect the transcoding.
- STI SHALL supports the application to indicate applicative constraints that may override the basic transcoding parameters or terminal capabilities.
- STI SHALL define (as part of the interface parameters or as a static rule) the precedence between different, possibly conflicting, sets of constraints.
- STI SHALL support transfer of multiple sets of constraints within a single request.
- STI SHALL support that transcoding request's can have different priorities to differentiate between applications with long respectively short acceptable response times.
- STI SHOULD specify a standard definition for the terminal capabilities.

Notes: The requirement does not necessarily imply that the constraints themselves are transmitted but that they may be referenced e.g. by an ID. The requirement does not imply a certain granularity of constraints. The constraints may apply to a single media element or multiple media elements of the same type, or may describe a set of rules for a set of media elements. Use Cases: All

6.3.3 Requirement on transfer of preferences and policies on the transcoded Content

- STI SHALL support the application transferring a set of preferences (user, content provider…) and policies (application) giving guidelines on how to perform the transcoding.
- STI SHALL support the application transferring, as part of the preferences and policies, priority ranking between media types of a multi-part content (e.g. which media should be preserved versus compressed or deleted).
- STI SHALL define (as part of the interface parameters or as a static rule) the precedence between different, possibly conflicting, sets of preferences and policies.

Note: the requirement does not necessarily imply that the preferences themselves are transmitted but that they may be referenced e.g. by an ID. Use Case: 5.8

6.3.4 Requirement on request for multiple transcoding

- STI SHALL support request of multiple transcodings of the same Content from the Application Platform to the Transcoding Platform, within one request.
- STI SHALL support request for transcoding content composed of multiple media components (e.g. multipart).

Note: Use Case: 5.4 and 5.9

6.3.5 Requirements on request types

- STI SHALL support transcoding of Content, where the output format and characteristics are completely defined by the Application Server.
- STI SHALL support transcoding of Content based on target User Equipment information.
- STI SHALL support transcoding of packaged Content (combination of audio, video, images…etc), where the output format and characteristics are completely defined by the Application Server.
- STI SHALL support transcoding of packaged Content (combination of audio, video, images…etc), based on target User Equipment information.

6.4 Requirements on transcoding Response

6.4.1 Requirement on reporting transcoding results

- STI SHALL provide a mechanism to report, from the Transcoding Platform to the Application Platform, which adaptations were applied to Content.

Note: In case preferences and policies were specified, the actual properties of the transcoded Content are returned to enable the application service provider to know “what has happened”.

- STI SHALL allow the Transcoding Platform to report the Application Platform of error situations or inability to perform the requested transcoding.

6.4.2 Requirement on delivery of transcoded Content

- STI SHALL provide a mechanism to deliver the results of transcoding, which have been applied to Content from the Transcoding Platform to the Application Platform.
- STISHALL support transmission of the output adapted Content in the transcoding response.
- STI SHALL support Content transcoding responses, where the output is referenced.

Note: In case the transcoding engine cannot fulfil a request an error is returned (see requirement on reporting transcoding results), otherwise the adapted Content or a reference to the Content is returned.

6.4.3 Requirement on response for multiple transcoding

- STI SHALL support transfer of multiple transcoded content within one response message.
- STI SHALL provide a mechanism to report, from the Transcoding Platform to the Application Platform, which adaptations were applied to each of the Content elements.

Note: Use Cases: 5.4 and 5.9

6.5 Requirements applicable to transcoding Request and Response

6.5.1 Requirement on supported Content types

- STI SHALL support the following Content types: text, images (image, animation, vector graphics), audio (speech, music and ring tone), and video.
- STI SHALL support requests for format transcoding between different Content types: audio/video to audio-only, audio/video to video…etc.
- The support of other Content types SHALL be implemented through the private extensions. Introduction of new Content types can be proposed for future versions of STI.

6.5.2 Requirement on supported Content formats

- STI SHALL support requests for format transcoding between Content formats recommended and mandatory in [OMA], [3GPP] and [3GPP2] specifications.
- STI SHOULD support requests for format transcoding to and from other Content formats (to facilitate PC - User Equipment transfer of Content).
- STI SHALL allow easy addition of new Content formats, within the scope of the supported Content types.
- STI SHALL specify how a Content format is identified and SHALL allow addition of new formats identification.
- STI SHOULD use a standard way of identifying Content formats (e.g. MIME types or file name extensions).

6.5.3 Requirement on supported transcoding operations

- STI SHALL define a collection of transcoding operations, including
  for *images*: format conversion, resolution scaling, file sizelimitation, colour depth adaptation, rotation,

for *audio*: format conversion, file size limitation, channel transcoding (stereo to mono),
for *video*: format conversion (including multipart output), file size limitation, bit rate limitation, downscaling of motion picture resolution, frame rate limitation,
for *presentation/layout*: conversion from SMIL to HTML (as defined in [HTML]) (Use case 5.6).

for *text*: character set transcoding.

- STI MAY define a collection transcoding transformations, including

for *images:* mirroring and level adjustment,

for *audio*: sample rate transcoding, reduction of bit rate, bits-per-sample transcoding, automatic gain control and noise reduction,
for *video*: noise reduction and colour depth adaptation,

for *text*: font/size adaptation, color adaptation.

- STI MAY support Content adaptations that can enhance the data quality.
- STI SHALL support the definition of new transformations. This will allow STI to support new Content formats (without changing the STI Syntax), even when they require new parameters or transformations to be defined.

6.5.4 Requirements on supported file formats

- STI SHALL support transcoding of multi-part file, containing the SMIL presentation and the media files (as defined in [SMIL]).
- STI SHALL support transcoding of .3gp and .3g2 files (as defined in [3GPP] and [3GPP2]).
- STI SHALL allow easy addition of new multi-part file formats, with or without presentation part, within the scope of the supported media types.
- STI SHALL specify how a multi-part file format is identified and SHALL allow addition of new file formats identification.
- STI SHOULD use a standard way of identifying multi-part file formats (e.g. MIME multi-part, 3GPP and 3GPP2 file formats).

6.6 System Elements

The only two system elements that are directly concerned with STI are the Application Platform and the Transcoding Platform. Therefore this section lists the requirements that the Application Platform and the Transcoding Platform are expected to fulfil.

6.6.1 Application Platform

- To be compliant with STI, the Application Platform SHALL support the syntax and semantics as defined in STI for requests and responses. The Application Platform is not required to support all STI-defined media types, formats and adaptations on and between them.
- The Application Platform SHALL support versioning of the STI.
- If secure transfer of information with the Transcoding Platform is required, the Application Platform SHALL support the secure transfer features of STI in order to be compliant with STI.
- If Authentication is required between the Application Platform and the Transcoding Platform, the Application Platform SHALL use authentication provided by the transport protocol used by STI.

- The Application Platform MAY provide secure storage of Content.
- Information exchanged between the Application Platform and the Transcoding Platform through STI SHALL comply with [Privacy].

6.6.2 Transcoding Platform

- To be compliant with STI, the Transcoding Platform SHALL support the syntax and semantics as defined in STI for requests and responses. The Transcoding Platform is not required to support all STI-defined media types, formats and adaptations on and between them..
- The Transcoding Platform SHALL support versioning of the STI.
- STI SHALL provide a mechanism for the Transcoding Platform to describe, on request, its exact capabilities (in terms of media types and formats support, transformation support…etc.).
- The Transcoding Platform SHALL support the secure transfer features of the STI transport mechanisms for the transfer of information, either explicit or referenced.

- The Transcoding Platform SHALL support authentication via the transport protocol(s) used by STI.
- Information exchanged between the Application Platform and the Transcoding Platform through STI SHALL comply with [Privacy].
- When dealing with Content that needs to be secured, the Transcoding Platform SHALL secures the Content while working on it.
- The Transcoding Platform SHALL NOT transcode encrypted Content elements, as specified in [DRM 1.0]: it SHALL return encrypted Content untouched and SHALL return a warning/error message.
- The Transcoding Platform SHALL NOT transcode "Forward Locked" and "Combined Delivery" Content elements, as specified in [DRM 1.0].

6.6.3 Network Interfaces

- The STI is the interface, the list of requirements of the interface can be found in the sections 6.1 to 6.5.

Appendix A. Change History (Informative)

A.1 Approved Version History

Reference	Date	Description
n/a	n/a	No prior version

A.2 Draft/Candidate Version 1.0 History

Version Name	Date	Section	Description
Draft Versions OMA-RD_STI-V1_0	2003-11-11	All	Remove all editor notes from the document Section 5: Implementing minor wording changes in use cases Section 6: Implementing wording changes requested by Requirement Group Section 6: Updating 6.3.4 "Requirement on request for multiple transcoding" Section 6: Updating 6.5.2 "Requirement on supported Content formats" Section 6: Updating 6.5.3 on mandatory and optional transcoding operations Section 6: Additional updates to incorporate further requirements suggested during London meeting 11-Nov-2003
	2003-10-25	6	Section 6: Adding Requirement on supported Content types, Content formats, transcoding transformations and on supported transcoding parameters
	2003-10-23	6	Section 6: Adding requirements on Application Platform and Transcoding Platform system elements
	2003-10-05	2, 3, 5, 6	Section 2: Adding Ref to OMA Section 3: Deleting CODECS that are not specifically mentioned in the RD text Section 5: Adding use case on applications with different time constraints Section 6: Updating 6.5.1 Requirement on supported Content transcoding Section 6: Deleting explicit format list from 6.5.1
	2003-09-16	2, 3, 5	Section 2: Adding references to Browsing, Push and Download Section 3: Adding definitions for constraints, policies, preferences, parameters Section 5: Adding Pre/Post conditions
	2003-09-09	All	Section 5: Adding "Application Generated Constraints" use case Section 5: Adding "Concatenation of Files" use case Section 5: Adding Text Conversions to 5.5 Section 5: Adding "Quality of Experience" information to use cases Section 6: Restructuring the section to better support "Transcoding Request" and "Transcoding Response" logic Section 6: Major updates to section 6.2 Section 6: Suppress 6.1.4 (Usability) Section 6: Updating "Privacy" requirements Section 6: Add automatic cross-references to use cases appears in section 6
	2003-08-29	All	Terminology changes, Consistency changes, New acronyms and references
	2003-08-17	5	Section 5: Adding MMS to email use case
	2003-08-11	5	Section 5: Revised 5.7 use case inserted

Version Name	Date	Section	Description
	2003-08-01	2, 3, 5	Document name aligned with OMA naming conventions Section 2: Reference to 3GPP TS 23.140 added Section 3: MMBox and MM1_Forwarding definitions added Section 5: Changing Noraml Flow and Alternate Flow for the MMS use cases Section 5: Additional wording updates Apendix B: Change History updated
Draft Versions OMA-STI-REQ-V1_0	2003-0716	1, 5, 6	Section 1: Minor wording updates. Section 5: Update of terminology (MM to be used for Multimedia Message) in the MMS use cases. Some wording updates. Section 6: Addition of security requirements. Change of reference for SMIL (going beyond MMS 1.2 to encompass W3G SMIL).
	2003-07-08	All	.Terminology update: Content in place of content and transcoding in place of conversions.
	2003-07-06	All	Terminology update: media is replaced by content
	2003-06-28	1, 2, 3, 4, 5, 6	Section 1: Creation based on input contributions. Section 2: Update and selection of which reference is normative / informative. Section 3: Update: change of terminology (user equiment instead of device and content instead of media). Creation of abbreviation list. Section 4: Creation based on input contributions. Section 5: Update of terminology (user equipment / device) Section 6: Update based on input contributions.
	2003-06-11	2, 3, 5, 6	Creation of the document, based on use case document (0013) and the STI contributions in Atlanta
	2004-02-01	5, 6.5.2	Minor changes based on comments from TP review.
Candidate Versions OMA-RD_STI-V1_0	09 Dec 2003	n/a	Status changed to Candidate by TP TP ref # OMA-TP-2003-0640-STI-Requirements-for-approval
	14 Jun 2004		Minor changes based on comments from TP review.
OMA-RD-STI-V1_0	17 May 2005	2	Changes are all related to Section 2 References. OMA-STI-2005-0054-CONR-Fixes-To-RD