North America RCS Common Implementation Guidelines

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1 Introduction

1.1 Overview

This document provides guidance to Original Equipment Manufacturers (OEM) and Application Developers on the implementation of the RCS 5.1 release. The document provides optimal User to Network Interface (UNI) and NNI implementation guidelines for RCS 5.1 features that aim to reach a consistent experience for the base RCS features. This allows a common framework of RCS services to be robustly defined so it can be further used by Mobile Network Operators (MNO) as the foundation for adding future services and own differentiators.

It is strongly recommended that the implementation of RCS is closely integrated within the devices' core native communication services. Utilizing RCS natively on devices greatly improves the adoption and recognition of RCS as the foundation of the next generation of telecommunication services.

1.2 Scope

The document covers end to end implementation guidelines for native and downloadable implementations of [RCC.07 RCS5.1 UNI] (also common with [RCC.07 RCS5.2 UNI]) and harmonizing some of the new experience and configuration parameters defined in [RCC.61 SDD], targeting a consistent implementation by OEMs of the RCS services in a common framework over UNI (User to Network Interface) and NNI (Network to Network Interface). Although based on North American requirements, this document is open to be used by any OEMs and operators who decided to deploy the technical realization of the GSMA RCS 5.1 specification described herein. As requirements change and new RCS versions are available, this document is expected to evolve with them.

> NOTE: The realizations detailed in this document are common to both RCS 5.1 and RCS 5.2 releases. A rebase of the document to [RCC.07 RCS5.2 UNI] specification and beyond is planned in a future version.

1.2.1 Purpose of the document

The purpose of this document is to detail how the RCS features included within [RCC.07 RCS5.1 UNI] release should be implemented and how RCS can work with the various types of devices and their levels of integration of the RCS client with the existing native communication services. Some features and device configuration parameter updates documented in [RCC.61 SDD] are also considered.

1.2.2 Structure of the document

The document details how the features are to be implemented in regards to the UNI and NNI. Some basic aspects of Experience (UX) are included when a basic consistent behaviour of an RCS service is needed to be specified.

This document includes technical specification references and details that may influence how certain functions behave, creating an overall guide for OEMs and application developers.

1.2.3   RCS client scope

RCS services can be implemented in two ways:

1. RCS application can be implemented natively within the device by the OEM.
2. RCS can be implemented as a standalone application downloadable on a device from Application stores hence accessible as a separate application on the user's device.

In most cases, implementation of features is identical for both native and downloadable clients in which case this document will not differentiate between the two. In those cases where implementation of a feature in a downloadable client differs from the native experience, or where additional handling is needed for the interactions between different RCS features and/or services, this shall be described separately within the relevant section.

1.2.3.1   Native RCS client

A native RC client tightly integrates the RCS capabilities and services within the address book, existing legacy messaging services, voice services and many other native touch points across the device.

The seamless messaging experience shall be provided that a user only needs to select the recipient(s) and type the message without the need to select messaging delivery mechanism (such SMS/MMS/IP).

Of special importance is the RCS client native integration with a VoLTE client, that allows them to share the same IMS registration, authentication, user and device addressing, as well as the same IMS APN (in home network and/or roaming scenarios). Implementing the RCS clients natively on devices will facilitate handling of RCS services in the network, and support an optimized UNI flow for RCS services described in [RCC.07 RCS5.1 UNI].

1.2.3.2   Downloadable RCS client

The integration of the RCS client with existing services on the device, including legacy communication services as well as the native VoLTE client, is a lose integration, that has the disadvantages of requiring additional solutions in the network to alleviate the consequences of services running their separate ways (e.g. additional handling in the network of the separate IMS registrations for RCS and VoLTE, and of the different authentication methods for the same user as an RCS downloadable client loosely integrated may not have access to the device/SIM credentials hence the need to use Digest authentication methods, whereas a VoLTE native client would be able to use GBA/GAA and IMS AKA, for example).

1.3   Definitions and Abbreviations

Term	Description
3G	Third generation mobile cellular technology for networks based on the GSM standard.
3rd party communication applications	Communication services provided by parties other than the MNO. Third party services might be offered by the device manufacturer or over-the-top as a web-based service.
A-Party	Calling party/sender.
Available	A capable RCS user, connected to the data network, registered and connected to RCS services, but not necessarily active
Blacklist	List of contacts or manually entered telephone numbers that are

	excluded from RCS communication by the user.
B-Party	Called party/receiver.
Called Party	The party who receives a call.
Calling Party	The party who initiates a call.
Capability Discovery	The process that enables a user to understand the services available to access and/or communicate with his/her contacts at a certain point in time. The capability discovery is the RCS-e service backbone.
Capability Exchange	Background process to exchange service capabilities via telecommunications signalling.
Chat	Instant Message Service - a form of real-time direct text and multimedia -based Chatting communication in push mode between two or more people over a network.
Chat conversation	A thread of instant messages exchanged with one contact or a group of contacts.
Chat Thread	An Instant Message conversation history. The Chat thread usually contains all messages, notifications and events exchanged between two or more people listed in chronological order.
Communication history	Summary of all communication events (voice calls, VoIP, Video over IP, SMS, IM, file transfers). The communication history might be presented as a complete summary of all own communication events or filtered by communication partners (person centric view).
Connected	Synonym for available (see above)
CS	Circuit-switched call
Device Configuration	The device configuration provides a joyn device or client with the necessary parameters over-the-air to operate within a specific Joyn network.
Device Platform	Categorisation of mobile operating systems (mobile OS); the system that controls a smartphone, tablet, PDA, or other mobile device.
Dialler	Initial user interface (UI) when entering the call application directly. Allows dialling a phone number manually or access to phone book, communication history or favourites.
File Transfer	Transfer a file from sender to receiver and store the file in the receiver's file folder.
File Transfer Acceptance Dialogue	Before the File Transfer is initiated the receiver is requested to accept the file.
Group Chat	A Chat session with multiple participants.
IMS	IP multimedia subsystem
IMSI	International mobile subscriber identity
IP	Internet protocol
KB	Kilobyte
LTE	Long Term Evolution
Mbps	Megabytes per second
MMS	Multimedia message service

MNO	Mobile network operator
MO	Managed object
ms	milliseconds
MPEG	Moving pictures experts group
MSISDN	Mobile subscriber integrated services digital network number
MSRP	Message session relay protocol
Native address book	The address book that is integrated into the device operating system.
NNI	Network-to-Network Interface
Notification	Delivery of a message to a receiver with the intention to get the user's attention.
OEM	Original Equipment Manufacturer
OMA	Open Mobile Alliance
Operating System	An operating system (OS) is a set of programs that manages a device's resources and provide common services for application software. The operating system is the most important type of system software in a computerised device. A user cannot run an application program on the device without an operating system.
Primary Device	The device containing the SIM which is used as the primary identity
Primary Identity	This is the identity a joyn blackbird user uses to access joyn across primary and secondary devices. It is typically their MSISDN.
Provisioned Users	A user who is allowed to use the service. The business support system provides the appropriate permission.
PS	Packet Switched
QoS	Quality of Service
SBC	Session Border Controller
S&F	Store & Forward
Secondary Device	Any additional device used to access RCS with the primary identity.
SIP	Session Initiation Protocol
SMS	Short Message Service
The network	All system elements involved in the end-to-end transaction between sender and receiver which do not belong to the user's device.
UAC	User Agent Client
UI	User Interface – see below
Use Case	Describes the situation where specific elements and participants (users, systems) act to achieve an intended result.
UE	User Equipment
User Interface (UI)	The user interface (UI) is the space where interaction between humans and devices occurs. The goal is to achieve effective operation and control of the device, and collect feedback from the device to help the user in making operational decisions. The UI can be implemented as any combination of graphical, acoustic, or haptic elements.

Video and Image Share	Sending a video or an image to the communication partner during a call. The video/image sent will be presented on the sender's as well as on the receiver's display.
Video Call	Bi-directional video communication with lip synchronous audio
xMS	Generic term covering all messaging services i.e. SMS and MMS.

1.4   References

Reference	Title
[3GPP TS 24.229]	3GPP TS 24.229 Release 12, 3rd Generation Partnership Project; IP multimedia call control protocol based on Session Initiation Protocol (SIP) and Session Description Protocol (SDP) http://www.3gpp.org
[CPM CONV TS]	CPM Conversation Functions v2.0, Open Mobile Alliance Ltd. http://member.openmobilealliance.org
[PRD-IR.64]	GSMA PRD IR.64 - "IMS Service Centralization and Continuity Guidelines" Version 8.0 http://www.gsma.com
[PRD-IR.65]	GSMA PRD IR.65 - "IMS Roaming and Interworking Guidelines" Version 14.0 http://www.gsma.com
[PRD-IR.67]	GSMA PRD IR.67 - "DNS/ENUM Guidelines for Service Providers & GRX/IPX Providers" Version 10.0 http://www.gsma.com
[PRD-IR.74]	GSMA PRD IR.74 - "Video Share Interoperability Specification" version 1.4 http://www.gsma.com
[PRD-IR.79]	GSMA PRD IR.79 - "Image Share Interoperability Specification" version 1.4 http://www.gsma.com
[PRD-IR.84]	GSMA PRD IR.84 - "Video Share Phase 2 Interoperability Specification" 2.2 http://www.gsma.com
[PRD-IR.88]	GSMA PRD IR.88 - "LTE Roaming Guidelines" 12.0 http://www.gsma.com
[PRD-IR.90]	GSMA PRD IR.90 - "RCS Interworking Guidelines" v9.0 http://www.gsma.com
[PRD-IR.92]	GSMA PRD IR.92 - "IMS Profile for Voice and SMS" 8.0 http://www.gsma.com
[PRD-IR.94]	GSMA PRD IR.94 - "IMS Profile for Conversational Video Service" Version 6.0 http://www.gsma.com
[OMA PDE DDS]	Presence SIMPLE Data Specification version 2.2.1, Open Mobile Alliance Ltd. http://member.openmobilealliance.org
[RCC.07 RCSRCC.07 RCS5.1 UNI5.1 UNI]	RCC.07 Rich Communication Suite 5.1 Advanced Communications Services and Client Specification v4.0
[RCC.07 RCS5.2 UNI]	RCC.07 Rich Communication Suite 5.2 Advanced Communications Services and Client Specification v5.0
[RCC.09 RCS 5.1 CMS]	RCC.09 RCS 5.1 Endorsement of OMA CPM 2.0 Message, Version 3.0

[RCC.10 RCS 5.1 IW]	RCC.10 RCS 5.1 Endorsement of OMA CPM 2.0 Interworking, Version 2.0
[RCC.11 RCS 5.1 Conv]	RCC.11 RCS 5.1 Endorsement of OMA CPM 2.0 Conversation Functions, Version 2.0
[RCC.52PRS Best Practices]	RCS Presence Best Practice Optimization Guidelines v1.0 (part of RCS 5.1 v4.0 release package)
[RCCTF.54 Interconnect]	RCS Interconnection Guidelines v1.0 (part of RCS 5.1 v4.0 release package)
[RCC.61 SDD]	RCC.61 Common Core Service Description Document, version 1.0
[RCC.60 v3.0]	Joyn Blackbird Product Definition Document v3.0 http://www.gsma.com
[RFC 2119]	"Key words for use in RFCs to Indicate Requirement Levels", S. Bradner, March 1997. Available at http://www.ietf.org/rfc/rfc2119.txt
[RFC 3326]	"The Reason Header Field for the Session Initiation Protocol (SIP)", H. Schulzrinne, D. Oran, G. Camarillo, December 2002. Available at http://www.ietf.org/rfc/rfc3326.txt
[RFC 3840]	"Indicating User Agent Capabilities in the Session Initiation Protocol (SIP)", J. Rosenberg, H. Schulzrinne, P. Kyzivat, August 2004. http://www.ietf.org/rfc/rfc3840.txt
[RFC 3862]	"Common Presence and Instant Messaging (CPIM): Message Format", G. Klyne, Nine by Nine, D. Atkins IHTFP Consulting, August 2004. https://tools.ietf.org/html/rfc3862
[RFC 4575]	A Session Initiation Protocol (SIP) Event Package for Conference State, IETF RFC http://tools.ietf.org/html/rfc4575
[RFC 4975]	The Message Session Relay Protocol, IETF RFC http://tools.ietf.org/html/rfc4975
[VoLTE-SD-IG]	VoLTE Service Description and Implementation Guidelines, version 1.1, March 2014

1.5   Conventions

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" and their lower case equivalent in this document are to be interpreted as described in [RFC2119].

2   Generic RCS client aspects

2.1   IMS registration

The RCS client follows section 2.4 in the [RCC.07 RCS5.1 UNI] with the following additions described in this section.

2.1.1 Use of the RCS VOLTE SINGLE REGISTRATION configuration parameter

The RCS configuration parameter "RCS VOLTE SINGLE REGISTRATION" defined in [RCC.61 SDD] indicates if the RCS client uses one IMS registration with the VoLTE client (co-located on same device) when in LTE coverage.

As a clarification to [RCC.61 SDD], the parameter also applies for access over EPC-integrated Wi-Fi.

As a general clarification:

- The IMPI is associated with the client instance,
- The sip.instance is associated with the device (i.e. a RCS client co-located with a VoLTE client on the same device shall use the same sip.instance value whenever possible).

The registration behaviour of the RCS client that coexists on the same device with a VoLTE client is summarized in the table below:

ACCESS	RCS VOLTE SINGLE REGISTRATION Value = 0 (dual registration) [Note1, Note2]	RCS VOLTE SINGLE REGISTRATION Value = 1
LTE with VoLTE	RCS client has its own registration (uses different IMPI than the VoLTE client, provided as part of the RCS client configuration)	Single RCS & VoLTE registration covering joint capabilities in SIP REGISTER (one IMPI, one sip.instance)
	RCS client mode: RCS-CS	*RCS client mode: RCS-VoLTE*
EPC integrated Wi-Fi	RCS client has its own registration (uses different IMPI than the VoLTE client, provided as part of the RCS client configuration)	Single RCS & VoLTE registration covering joint capabilities in SIP REGISTER (one IMPI, one sip.instance)
	RCS client mode: RCS-CS	*RCS client mode: RCS-VoLTE*
Wi-Fi non- integrated with cellular	RCS client has its own registration (uses different IMPI than the VoLTE client, provided as part of the RCS client configuration)	RCS client registers on Wi-Fi all applicable RCS services (uses different IMPI than the VoLTE client, same sip.instance as VoLTE client). NOTE: RCS registration on Wi-Fi is NOT allowed according to [RCC.07 RCS5.1 UNI] when the device has LTE with VoLTE coverage. It is allowed depending on operator policy when device has 3G coverage or LTE without VoLTE coverage.
	RCS client mode: RCS-AA or RCS-CS if client supports CS	*RCS client mode: RCS-AA or RCS-CS if client supports CS*
3G or LTE without VoLTE	RCS client has its own registration (uses different IMPI than the VoLTE client, provided as part of the RCS	Single RCS registration (using one IMPI, one sip.instance with VoLTE)

	client configuration)	
	RCS client mode: RCS-CS	*RCS client mode: RCS-CS*

Table 1: RCS client registration cases

NOTE1: In the cases where the RCS client does not have access to the IMEI of the device (i.e. downloadable RCS client), the RCS client shall derive the sip.instance based on other mechanisms as described in section 2.4.2 of [RCC.07 RCS5.1 UNI]. This will result in two different sip.instance values being used on the same device (one by RCS client and another by VoLTE client).

NOTE2: When the RCS client has a separate IMS registration than the VoLTE client, it should use an APN different than the IMS APN, following [PRD-IR.88] (e.g. the APN for Home Operator Services).

2.2   Addressing and identities

An RCS enabled terminal's address book should have the capability to store tel URIs and/or alphanumeric SIP URIs as part of a contact's details. If both a MSISDN based SIP URI (i.e., a SIP URI containing the string "user=phone") and a tel URI are available to the RCS client, the SIP URI should be used when generating an outgoing request for RCS services (Standalone Messaging, 1-to-1 Chat, Group Chat, File Transfer, Geo-location Push, Audio Messaging, RCS IP Voice, and RCS IP Video) even if a MSISDN or TEL URI is also present for the contact.

The RCS Client can store the received SIP URI e.g. in the <contact> tuple of the presence SIP NOTIFY or in P-Asserted-Identity header field in either SIP requests or responses.

When requests using SIP URI fail with a SIP 404 error response, the RCS Client may fall-back to using the MSISDN.

A RCS enabled terminal should follow section 4.1.2 for capability discovery via presence when retrieving and storing the SIP URI of a contact from a SIP NOTIFY for presence event package.

2.2.1   Non-International MSISDNs in resource-list

In addition to, and as a clarification to, section "2.2 Addressing and Identities", when there are no number normalization capabilities in the client, the client shall use the same logic to populate the URIs within a resource-list as defined in section 5.1.2A.1.3 of 3GPP 24.229.

```xml
<?xml version="1.0" encoding="UTF-8"?>
<resource-list xmlns="urn:ietf:params:xml:ns:resource-lists">
 <list>
  <entry uri="tel:2065551212;phone-context=operator.com"/>
  <entry uri="tel:5551212;phone-context=thislocality.operator.com"/>
  <entry uri="sip:2065551212;phone-
            context=operator.com@operator.com;user=phone"/>
 </list>
</resource-list>
```

Table 2: Resource list example with different URIs

2.3   RCS and Access Technologies

2.3.1   Data Off

To control RCS client behaviour for the RCS services when connected over cellular networks, the RCS client shall implement the support of the new configuration parameters defined in the requirement 15.5.21 of [RCC.61 SDD] that dictates the impact on the RCS services availability when Data is turned Off on the device. The RCS client shall not use the following parameters, so if they are provided as part of configuration from the network the RCS Client shall ignore them:

- CONTENT SHARE DATA OFF; and
- EXTENSIONS DATA OFF.

Notes:

1. In the future [PRD-IR.92], or [PRD-IR.94], or other PRDs may include parameters providing similar behaviour. In that case in case of conflict that parameter which would be applicable beyond the scope of devices implementing RCS shall get priority over this one when conflicting values are configured.
2. These parameters only affect behaviour on cellular networks. Services that can be offered over non-cellular networks remain available over such networks irrespective of the setting of the cellular data switch.
3. These parameters are provided in a dedicated Data-Off subtree provided in the Services tree defined in [RCC.07 RCS5.1 UNI].

Note: This section will align with the final decision coming out from IREG/NG on Data OFF handling.

2.4   APN considerations

No difference with [RCC.07 RCS5.1 UNI], the APNs used by the RCS client shall follow [PRD-IR.88] recommendations.

NOTE: The configuration of the APN is still FFS in [IR.88] and later versions of RCC.07.

2.5   Multi-device guidelines

No difference with [RCC.07 RCS5.1 UNI].

2.6   Security and privacy

No difference with [RCC.07 RCS5.1 UNI].

2.7   Configuration

No difference with [RCC.07 RCS5.1 UNI] and the new configuration parameters relevant to RCS 5.1 defined in [RCC.61 SDD].

2.7.1   Multiple RCS clients on the same device

When another RCS client is downloaded by the user on a device that already has a native RCS client, the implementations should ensure that only one RCS client is active at a time.

In order to prevent negative consequences in the user experience, when there are two RCS clients on the same device, it should be handled as defined in joyn Blackbird [RCC.60 v3.0]

section 2.6.3 and as specified in [RCC.61 SDD] section 2.3.1, requirements: R2-11-5, R2-11-6 and R2-11-7. This shall be implemented by both embedded and downloaded RCS clients.

3   Common aspects for RCS messaging

3.1   SIP User-Agent and Server header fields

RCS version specific SIP User-Agent header field sent by the client/device for SIP INVITE, MESSAGE and conference event SUBSCRIBE shall comply with Appendix D in [RCC.11 RCS 5.1 CONV] in addition to the following additions and clarifications: User-Agent: CPM-client/OMA2.0 [terminal_vendor]/[terminal_model-terminal_SW_version] [RCS_version/client_vendor-client_version]

The parameters terminal_vendor, terminal_model, terminal_SW_version, client_vendor, client_version shall be the same as used in the http configuration as defined in RCS5.1 specification.

Example OEM native clients:

```
User-Agent: CPM-client/OMA2.0 Samsung/SGH-T999-1.0
RCS5.1v4.0/Samsung-1.0
```

Server header field is set by the RCS entities in the User Agent Server (UAS) role. An example is given below:

Server: CPM-serv/OMA2.0

3.2   MSRP Bearer Support

As a clarification to section 2.9.1.3 Bearer aspects in [RCC.07 RCS5.1 UNI], for a device that can use LTE access for RCS traffic: at a minimum LTE QCI (QoS class identifier) 6, 8 or 9 via a dedicated bearer shall be supported so that any one may be used for MSRP traffic.

3.3   MSRP Chunk Size

While the RCS specification states that the MSRP chunk is configurable, this document provides an example of how to determine the optimal MSRP chunk size for devices that are using LTE for data access:

- assuming a client supporting an MSRP chunk size of 250kb, the table below shows how the maximum bitrate can be calculated by the client, also considering the latency of the TCP ACK response for each chunk.

MSRP chunk Size (byte)	Latency* (sec)	Maximum Mbps
20000	0.05	3.05
40000	0.05	6.10
60000	0.05	9.16
80000	0.05	12.21
100000	0.05	15.26
150000	0.05	22.89
200000	0.05	30.52
250000	0.05	38.15

Table 3: MSRP chunk size guide for the RCS client

*Latency = assumes worst case scenario for client to receive TCP ACK after SEND request. Most LTE networks will have between 20-50ms.

GSMA IR.90 recommends that the value of MSRP chunk size used over the NNI interconnection should be a maximum of 500kB. With the high throughput in LTE environment this recommendation does not make the best use of the resources and should not be followed. The recommended maximum MSRP chunk size over NNI interconnection shall be a maximum of 5MB. No MSRP re-chunking shall be done before NNI. The receiving network may need to re-chunk the received MSRP chunk to deliver to the recipient.

> NOTE: The reason to select 5MB as the maximum MSRP chunk size is to cover most of the MSRP transfer in one MSRP chunk to minimize the signalling overhead.

3.4 Messaging During CS Fallback

As a clarification to section 3.8.4.2 Devices using CS domain for voice calls in [RCC.07 RCS5.1 UNI], the RCS client *may* provide RCS functionality via 3G during a voice call.

3.5 Preconditions

For a device in RCS-VoLTE mode, support for preconditions is not required for RCS messaging thus precondition support should be omitted in SIP headers and SDP attributes.

3.6 Conversation Management

For a RCS client, a conversation thread is identified by a globally unique Conversation-ID value. The conversation window and its corresponding Conversation-ID are generated based on the selected participants including the initiating participant itself and the subject if available, no matter if the remote participants are RCS clients or not. Once created, the Conversation-ID value for a certain conversation window remains the same even if some participants leave or new participants join. The conversation window shall keep an up-to-date participant list. The subject for the conversation window cannot be changed after the conversation was created. A participant is represented by a phone number in the participant's list, when the participant is presented to the user in the conversation window, the client can display:

1. The phone number if no additional information in the user's address book and no RCS Alias name is available; or
2. A name associated with the phone number from the user's address book; or
3. Both of the above.

NOTE: For the use of RCS Alias name the RCS Client shall refer to [RCC.61 SDD].

When the user opts to create a new conversation window with certain participants including the initiating party itself and a subject (if available), the client shall check if an old conversation window exists, whose up-to-date participant list and subject are the same as the newly requested one by the user. If such conversation window already exists, it shall be used instead of creating a new one.

3.7   Handling of MSRP Error Responses at RCS client

As a clarification of handling MSRP error responses as defined in [RFC 4975], the RCS client shall handle MSRP error responses as below:

MSRP Response	File Transfer	Chat and Large Message Mode Standalone Message
400	Correct the error and Resume from last chunk where client did not receive 200 OK.	Correct the error and re-send last chunk where client did not receive 200OK
403	Attempted action is not allowed, No Resume No Retry. Client sends BYE to close FT session.	Attempted action is not allowed. Client sends SIP BYE to close chat. When received for a request to restart a long-lived group Chat, the RCS client may retry to submit the Group Chat request as a new Group Chat (e.g. using own Controlling function).
408	Resume from last chunk where client did not receive 200 OK, if it fails then fallback.	RCS Client may re-send last chunk where client did not receive 200OK.
413	Indicates desire to interrupt the current MSRP message. The receiving client must behave as per [RFC 4975] and [CPM CONV TS]. NOTE: resumption is possible as described in section 4.5.1. If resumption is not supported, fallback as per section 4.5.2.	Indicates desire to interrupt the current MSRP message being transmitted. The receiving client must behave as per [RFC4975] and interrupt any further MSRP chunks with the same Message-ID as the chunk being interrupted. RCS Client may expect to receive the next MSRP message (with a different Message-ID), or to receive termination of the session.
415	Media Type Not understood, No Resume No Retry. Display error that selected media is not allowed. Fallback as per section 4.5.2.	Media Type Not understood, No Resume No Retry. Display error that selected media is not allowed. Client triggers fallback as described in section 4.3.1.1.
423	Fallback	

481	As per [RFC 4975] if the session doesn't exist, the client should terminate the session. An error is displayed to the user together with indication of the on-going attempt to re-try. RCS client may choose to resume the FT as described in section 4.5.1. If resume is not supported, then retry as new file transfer request.	As per [RFC 4975] if the session doesn't exist, the client should terminate the session. A new request for a Chat session may be submitted by the RCS Client.
501	Recipient does not understand the request method. Fallback	
506	Error code is defined in section 2.8.2 of [RCS.07 RCS5.1 UNI]. The Originating client should stop sending further MSRP chunks (if any) and close the MSRP session as another session is already established, according to [RFC 4975].	
Other	Fallback	

Table 4: RCS Client handling of MSRP error codes

RCS client shall handle MSRP error responses as defined in [RFC 4975], with the following clarifications:

1. If the MSRP session is a file transfer session, and any of the chunks receives an MSRP error response or an MSRP failure REPORT, the file transfer session shall be terminated by the sender with appropriate Reason code in the SIP BYE. Further, if the MSRP error code response recommended handling in [RFC 4975] involves a retry, a new MSRP based CPM file transfer shall be tried.
2. If the MSRP session is a 1-1 chat session, and if the recommended MSRP error handling involves:

   a) a retry, the chat session shall NOT be terminated and the chat message can be retried;
   b) a retry using a new 1-1 chat session, the existing chat session shall be terminated first, followed by new session setup.

3. If the MSRP session is a group chat session, and if the recommended MSRP error handling involves:

   c) a retry, the group chat session shall NOT be terminated and the chat message can be retried.
   d) a retry using a new session, the existing SIP session shall be terminated first with an appropriate Reason header with a non-200 cause code in the SIP BYE, followed by new session setup.

3.8   Handling of SIP INVITE Error Responses at RCS client

In addition to the error responses and handling in section "3.2.4.6.3 Interworking with MMS" and "3.3.4.1.6 Interworking towards SMS/MMS" of the [RCC.07 RCS.51 UNI], the following tables contain recommended SIP error responses and their handling by the RCS client on the originating leg of the SIP INVITE.

The response handling below for group chat assumes Closed Group Chat implementation within the default messaging application provided by an OEM.

SIP RESPONSE	Chat, File Transfer and Standalone Messaging
300 Multiple Choices	Retry based on first value in contact header field
301 Moved Permanently	
302 Moved Temporarily	
305 Use Proxy	
380 Alternative Service	Fallback
400 Bad Request	
403 Forbidden	"105 isfocus already assigned": Retry as new Chat as per section 3.4.4.1.7 in [RCC.07 RCS 5.2]
	"119 Anonymity not allowed": Display Error (e.g. "Operator does not support anonymous requests. Please adjust your client settings.")
	"122 Function not allowed": Error message (e.g. "You are forbidden from sending messages")
	"127 Service not authorised": Fallback
	"129 No destinations": Display Error (e.g. "Please select one or more recipients.")
	"132 Version not supported": Fallback
	"133 Size Exceeded": Display Error (e.g. "Message sent is too big, resize and try again."
	Other Human readable error or code not defined above: Display Error in "Warning" header

	No Reason Code in Warning Header: Re-REGISTER as per section 2.4.8 in [RCC.07 RCS 5.2]
404 Not Found	For a rejoin of chat session (Re-INVITE) regardless of Warning text, retry as new Chat as per section 3.4.4.1.7 in [RCC.07 RCS 5.2]
	For start of a new chat with new INVITE, Fallback
	Note: If "Retry-After" value is present and less than or equal to 5s then retry the above operations with the requested time.
405 Method Not Allowed	Fallback
406 Not Acceptable	
408 Request Timeout	Fallback
410 Gone	When it applies to re-INVITE for an existing group Chat, RCS client shall initiate it as a new GC request.
	When it applies to a new Chat request: fallback.
413 Request Entity Too Large	Fallback
414 Request-URI Too Large	
415 Unsupported Media Type	
416 Unsupported URI Scheme	Retry with other URI format. If current URI is SIP, retry with TEL & vice-versa.
420 Bad Extension	Fallback
421 Extension Required	
423 Interval Too Brief	
480 Temporarily not available	Retry if "Retry-After" value is less than or equal to 5s otherwise retry immediately. If fail again, then fallback.
481 Call/Transaction Does Not Exist	"123 Session does not exist": When it applies to re-INVITE for a an existing Chat, retry as new Chat as per section 3.4.4.1.7 in [RCC.07 RCS 5.2]

	When it applies to a new Chat request: retry once then fallback.
482 Loop Detected	Retry once then fallback
483 Too Many Hops	
484 Address Incomplete	Fallback
485 Ambiguous	
486 Busy Here	No Retry. Store and Forward was applied to the Message as per RCS 5.1 Table 53.
487 Request Terminated	Fallback
488 Not Acceptable Here	
491 Request Pending	Retry as per Section 14.1 in RFC 3261. If Retry fails again with 491, then Fallback
493 Undecipherable	Fallback
494 Security Agreement Required	
500 Internal Server Error	Retry if "Retry-After" value is less than or equal to 5s otherwise fallback if "Retry-After" is not returned or greater than 5s.
501 Not Implemented	Fallback
502 Bad Gateway	Retry once then fallback
503 Service Unavailable	Retry if "Retry-After" value is less than or equal to 5s otherwise fallback if "Retry-After" is not returned or greater than 5s.
504 Server Time-out	Fallback

	If response contains a P-Asserted-Identity URI matching a URI received during registration in Service-Route or Path header field and containing a 3GPP IM CN subsystem XML body with the <alternative-service> child element with the <type> child element set to "restoration" and the <action> child element set to "initial-registration" then Re-REGISTER.
505 SIP Version not supported	Fallback
513 Message Too Large	
580 Precondition Failure	Not Applicable
600 Busy Everywhere	Retry if "Retry-After" value is less than or equal to 5s otherwise fallback if "Retry-After" is not returned or greater than 5s.
603 Decline	Display rejection.
604 Does not exist anywhere	Fallback
606 Not Acceptable	
Other	

Table 5: RCS Client handling of SIP error codes

3.9 Handling of Messaging Service Selection when Client has no connectivity

The device is considered to have "no connectivity" when all transmission and reception functions have been turned off, meaning that neither cellular access nor Wi-Fi are available to the RCS client in that device.

If the RCS user opts to send messages when the device has "no connectivity", the following behaviour is expected from the RCS client:

- the message(s) should be queued/cached in the RCS client and should be sent out automatically when the client next gets connectivity. The selection of the RCS service and technology to be used for sending the queued message(s) shall follow Section 4.2.2 of [RCC.61 SDD].

3.10 CPIM Body Clarifications

As a clarification to [RFC 5438], and [RFC 3862] section 2 a complete message has two parts: a message metadata and the second part is the message content. For File Transfer, there is no CPIM wrapper present in the request, unless a delivery report is requested. In this case, the CPIM wrapper is found in the SIP INVITE body but an MSRP File Transfer has no MIME content within a message body as defined in section "3.5.4.7.1 File transfer invitation" of [RCC.07 RCS 5.2].

The body shall maintain a "Content-Type" header since it's required as per section 2.4 in RFC 3862. The semantics for filling in the CPIM Content-Type MIME header shall be same

as the file type of file-selector attribute in the SDP. Since there is also no MIME media content, as a best practice the "Content-length" field with value of 0 is recommended but not required.

An example of a CPIM message body containing an IMDN request is below:

```
m: Content-type: Message/CPIM
s:
h: From: MR Piglet SANDERS <tel:+151455511212>
h: To: Depressed Donkey <sip:eeyore@100operator.com>
h: DateTime: 2014-12-13T13:40:00-08:00
h: Subject: nice pic
h: NS: imdn <urn:ietf:params:imdn>
h: imdn.Message-ID: d834jied93rf
h: imdn.Disposition-Notification: positive-delivery
s:
e: Content-type: image/jpeg;
e: Content-length: 0
```

An example of a CPIM message body containing an IMDN response is provided below:

```
m: Content-type: Message/CPIM
s:
h: From: Depressed Donkey <sip:eeyore@100operator.com>
h: To: MR Piglet SANDERS <tel:+151455511212>
h: DateTime: 2014-12-13T13:40:40-08:00
h: Subject: nice pic
h: NS: imdn <urn:ietf:params:imdn>
h: imdn.Message-ID: 34jk324j
h: Content-Disposition: notification
s:
e: Content-type: message/imdn+xml; charset=utf-8
e: Content-length: …

<?xml version="1.0" encoding="UTF-8"?>
<imdn xmlns="urn:ietf:params:xml:ns:imdn">
    <message-id>d834jied93rf</message-id>
    <datetime>2014-12-13T13:40:40-08:00</datetime>
    <recipient-uri>sip:eeyore@100operator.com</recipient-uri>
    <delivery-notification>
    <status>
       <delivered/>
    </status>
    </delivery-notification>
</imdn>
```

4 RCS services

The following RCS services are in scope of this document:

Candidate RCS Service	Alternative	Guiding Document	In Scope (UNI) RCS downloadable	In Scope (UNI) RCS native	In Scope (NNI)	Clarifications
Capability Exchange	SIP Options	GSMA RCS 5.1	Yes	Yes	Yes	
	SIMPLE Presence	GSMA RCS 5.1	Yes	Yes	Yes	Preferred Capability Discovery Mechanism (North America)
	Interworking between Capability Discovery (SIP Options and Presence)	GSMA RCS 5.1	Yes	Yes	Yes	
Social Presence	SIMPLE Presence	GSMA RCS 5.1	No	No	No	Social Presence Information
Standalone Messaging	CPM Pager Mode	GSMA RCS 5.1	Yes	Yes	Yes	Standalone Messaging, include Interworking with SMS
	CPM Large Message Mode	GSMA RCS 5.1	Yes	Yes	Yes	Standalone Messaging, include Interworking with SMS and MMS
Chat (1:1 and Group)	CPM	GSMA RCS 5.1	Yes	Yes	Yes	1:1 Chat (Session mode messaging) Group Chat (Session mode messaging) Messaging Technology
	SIMPLE IM	GSMA RCS 5.1	No	No	No	*(covered in joyn Blackbird [RCC.60 v3.0])*
	Interworking between CPM and SIMPLE IM	GSMA RCS 5.1	No	No	Yes	OMA IM to OMA CPM
File Transfer	CPM (MSRP)	GSMA RCS 5.1	Yes	Yes	Yes	File Transfer
	HTTP/S	GSMA RCS 5.1	No	No	No	*(covered in joyn*

Candidate RCS Service	Alternative	Guiding Document	In Scope (UNI) RCS downloadable	In Scope (UNI) RCS native	In Scope (NNI)	Clarifications
						Blackbird [RCC.60 v3.0]*)*
Video Share	During a Call	RCS 5.1 V1.0 Endorsement of GSMA IR.74	No	No	No	Video Call can be used instead (IR.94 based)
	Outside a Call	RCS 5.1 V1.0 Endorsement of GSMA IR.84	No	No	No	Video Call can be used instead (IR.94 based)
Image Share		GSMA IR.79	No	No	No	See File Transfer
Geo-Location	Geo-Location Push	GSMA RCS 5.1	No	No	No	
	Geo-Location Pull	GSMA RCS 5.1	No	No	No	
	Geo-Location File Transfer	GSMA RCS 5.1	No	No	No	See File Transfer
Voice Call	IP Voice Call over LTE	GSMA IR.92	No	Yes	Yes	IP Voice Call
	IP Voice Call over HSPA	GSMA IR.58	No	No	No	
	RCS IP Voice Call	GSMA RCS 5.1	No (primary) Yes (secondary)	No (primary) Yes (secondary)	No	
Video Call	IP Video Call over LTE	GSMA IR.94	No	Yes	Yes	IP Video Call
	IP Video Call over HSPA	GSMA IR.94	No	No	No	
	RCS IP Video Call	GSMA RCS 5.1	No (primary) Yes (secondary)	No (primary) Yes (secondary)	No	

Table 6: RCS Services Supported in this document

For the RCS services listed above:
- The specific services to be supported across an interconnection between two Service Providers are specified in the GSMA RCS Interconnect **Error! Reference source not found.**.
- The details of RCS services supported over UNI are described in [RCC.07 RCS5.1 UNI].

4.1   Capability and new user discovery mechanisms

4.1.1   Overview

The RCS 5.1 specification provides two alternative mechanisms to perform the service capability discovery.

The desired mechanism is configured in the RCS client via setting the parameter CAPABILITY DISCOVERY MECHANISM (see Annex **Error! Reference source not found.** of [RCC.07 RCS5.1 UNI]).

4.1.2   Presence based service discovery

This mechanism is recommended in RCS deployments where a presence server executing OMA SIMPLE Presence procedures exists. However, a presence relationship between users is not required in order to exchange service capabilities.

4.1.2.1   System requirements

In order to make use of the XDM Lists defined in [RCC.07 RCS5.1 UNI] an XDM Server supporting Presence and List application usages is required in the network. If social presence is deployed then the service capability information is retrieved via the same SUBSCRIBE requests together with social presence.

A minimum capability exchange implementation may either:

1. not utilize list SUBSCRIBE, or
2. end all list SUBSCRIBEs according to [RFC 5367].

In both cases, only the Presence XDMS is required.
When social presence is not deployed, basic capability exchange functionality may be implemented without XCAP access from UE to XDMS.

4.1.2.2   Multi-device

As the capabilities are queried against a presence server using the standard OMA SIMPLE Presence procedures, the aggregated capabilities from all user's devices are provided by the presence server without always requiring an end-to-end flow between the requestor and the publisher presentity. OMA SIMPLE Presence standard presence composition rules apply for same services published by different devices of the same user.

Presence composition rules for aggregating service tuples shall follow [OMA PDE DDS] as defined in section 7.4.2, 6.1.2 and 6.1.3.

4.1.2.3   RCS capability

To avoid corner cases where RCS users are deemed as "non-RCS contact", it is highly recommended that at least the RCS service capability discovery via presence is provisioned in the RCS user's permanent presence. This can be done at the same time as the RCS service is provisioned for the user.

> NOTE: additional RCS services that are persisted in permanent presence data are subject to operator choices.

Depending on the response received to the SIP SUBSCRIBE for presence information of a contact, the contact is considered to be:

- A non RCS contact, if :

    - a SIP 404 "Not found" error response is received when the contact is not an IMS user.An RCS contact if:

    - a SIP 200 "OK" response was received, followed by a SIP NOTIFY that included at least one RCS Service-ID element or that contact, as described in section 2.6.2.2 of [RCC.07 RCS.51 UNI].

- Inconclusive, if:

    - other non-2xx responses are received to the SIP SUBSCRIBE, or
    - a SIP 200 "OK" was received and the SIP NOTIFY did not include any of the RCS Service-IDs for that user (in single subscriptions, or in the RLMI body).

In inconclusive cases, further SUBSCRIBE requests or client interworking to SIP OPTIONS will be initiated and any existing RCS capabilities for the contact will be kept until a conclusive response above is received or the cached RCS capabilities expired.

A summary is captured in the tables below.

Response	Interpretation	Action
404	Conclusive (Non-RCS User)	Remove Capabilities
Capabilities Tuple in PIDF (status = "closed")	Conclusive (RCS User)	Keep Capabilities
Capabilities tuple in PIDF (status = "open")	Conclusive (RCS User)	Keep Capabilities
No tuples	Conclusive (Non-RCS User)	Remove Capabilities
non-2xx	Inconclusive	Keep Capabilities
malformed/corrupt document	Inconclusive	Keep Capabilities

Table 7: Individual subscribe

Response	Interpretation	Action
No tuples	Conclusive (Non-RCS User)	Remove Capabilities
No Capabilities in PIDF (status = "closed")	Conclusive (RCS User)	Keep Capabilities
Capabilities in PIDF (status = "open")	Conclusive (RCS User)	Keep Capabilities
No PIDF and fullState = true	Inconclusive	Keep Capabilities
No PIDF and fullState = false	Inconclusive	Keep Capabilities
non-2xx	Inconclusive	Keep Capabilities

Table 8: List Subscribe

4.1.2.4   Authorization policies

The authorization policies in the network are applied by the Presence server to control at user level the content of the data provided to other RCS users, or to anonymous requests.

4.1.2.5   Headers

Anonymous SUBSCRIBE requests shall be created by anonymizing the From header field before sending the requests over the NNI (i.e. by IBCF). Following [OMA PRS TS] sect. 6.1.4., a Presence Server establishes that the user and the request must be considered anonymous based on:

1. Either the Privacy header field with a value set to "id" or "user" is present in the request; or
2. if the Privacy header field is not included in the request (or is included with a value different to the two above), nor is the P-Asserted-Id header field, but the From header field is set to "Anonymous" as specified in RFC 3261 [26].

4.1.2.6   Identifiers

Addresses of Record should be used in preference to identifiers that reference specific SIP User Agents (e.g., GRUUs). The RCS client SHALL populate the GRUU only as specified in [OMA PRS TS] and [OMA PDE DDS]. Specifically, the UE SHALL NOT:

1. populate a GRUU as one of its own identities in the R-URI of PUBLISH requests.
2. populate the From header of SUBSCRIBE or PUBLISH requests with GRUUs.
3. populate with a GRUU the entity attribute nor the <contact> element in a presence document.
4. For the aforementioned headers, elements and fields, tel URI shall be used if the device has received a tel URI in a P-Associated-URI header of a 200 OK response to a REGISTER request.

SUBSCRIBE requests routed to a Presence Server shall include a P-Asserted-Identity header with a SIP URI containing an FQDN. Otherwise it will be difficult to support the [PRD IR.90] requirement which states that "those service descriptions associated to specific [RCS] services where no interworking agreement exists between the Service Providers shall not be included in the NNI service descriptions".

4.1.2.7   IR.94-capable Contacts

A contact shall be regarded as IR.94-capable if and only if the RCS client receives a presence document containing an mmtel tuple (see IP video call service tuple) with media capabilities audio, video and duplex.

We cannot rule out the possibility that additional mmtel tuple(s) may be present, but not all the media capabilities are present to support video calls.

Reference: use the presence publication composition policy specified in Section 5.5.3.2.1 of [Presence2.0_TS] and [OMA PDE DDS] sections 7.4.2, 6.1.2 and 6.1.3.

4.1.2.8   Routing

Terminating iFCs shall be configured to route SUBSCRIBE requests to the correct Presence Server whenever the R-URI identifies an RCS user- regardless of the IMS registration status of the presentity.

This ensures that the sender of the SUBSCRIBE will receive a 200 OK response and a NOTIFY from the Presence Server, which is enough to conclusively identify the presentity as an RCS user. Thus, there is no ambiguity when the B party is not IMS registered. (This addresses the ambiguity described in scenario 2, Section 2.6.2.1 of [RCC.07 RCS5.1 UNI].)

4.1.2.9   Optimizations for Presence-Based Capability Exchange

Full Address Book Scans (Capability Polling)

4.1.2.9.1 Capability polling should be avoided unless the operator has a requirement for the first view of the address book to "clearly identify the RCS capable contacts with an icon or flag". Note that capability polling is optional according to Section 2.6.2.5 of [RCC.07 RCS5.1 UNI]. Operators who want to implement capability polling should consider the following challenges:

1. Capability polling traffic load is sensitive to address book size. Operators who want the first view of the address book to "clearly identify the RCS capable contacts with an icon or flag" should be aware of the potential cost.
2. List SUBSCRIBEs give rise to large NOTIFY message bodies and bursts of Back End SUBSCRIBEs, which may make it difficult to control peak transaction load in the network.

4.1.2.9.2   Individual SUBSCRIBEs

It is expensive (in terms of RAN and core network load) to send an individual SUBSCRIBE request every time a contact is selected. To reduce the load, RCS clients should refrain from sending an individual SUBSCRIBE in cases where it has recently been determined that the B party is not an RCS subscriber.

Accordingly, the RCS client should record time-stamped results of capability / user discovery queries, not only when a contact is identified as an RCS subscriber (as indicated in Section 2.6.2 of [RCC.07 RCS5.1 UNI]) but also when it is determined that a contact is not currently an RCS subscriber. [RCC.07 RCS5.1 UNI] does not make any explicit statement regarding the latter.

Regarding cases where it has "been determined that the B party is not an RCS subscriber", **4.1.2.9.3** it is up to the individual operator to decide how long since such a determination has been made before the information is considered stale.

Duration of SUBSCRIBEs

Long-lived SUBSCRIBEs have a major effect on scaling. For service capabilities (and when SPI is not enabled):

1. Individual SUBSCRIBEs should include an Expires header with value 0.
2. List SUBSCRIBEs: If list SUBSCRIBEs are utilized, they should include an Expires header with a small non-zero value (e.g., 30-60 seconds). This allows for latency

associated with Back End SUBSCRIBEs but limits the scaling impact on the Presence/Resource List Server.

General Optimizations

Recommended optimizations for the implementations on both UNI and NNI are summarized in [RCC.52PRS Best Practices].

4.1.2.9.4

4.1.3   SIP OPTIONS exchange

No difference with [RCC.07 RCS5.1 UNI].

4.1.4   Interworking of Presence and SIP OPTIONS mechanisms

Two interoperability and interworking solutions are described in [RCC.07 RCS5.1 UNI] and [PRD IR.90] specifications:

- Client based interworking, or
- Network based interworking.

To facilitate network based interworking,

1. Devices that utilize presence-based capability exchange shall include a "service discovery via presence" tuple in their published presence documents. When such a device receives a SIP OPTIONS request, it shall include a "service discovery via presence" feature tag in its response.
2. Constructing anonymous SUBSCRIBEs shall follow the section 4.1.2.5;
3. Short-lived anonymous SUBSCRIBEs shall be used minimal "Expires" header field value for Back End SUBSCRIBEs and Expires value 0 for individual SUBSCRIBEs. Note that Back End SUBSCRIBEs may inherit the Expires value from the causative list SUBSCRIBE.

4.1.5   UNI

4.1.5.1   Triggers

Service capability exchanges are triggered in various RCS services scenarios as described in [RCC.07 RCS5.1 UNI] and as recommended throughout this document.

4.1.5.2   Client Interworking of Presence and SIP OPTIONS mechanisms

Client based interworking is described in section **Error! Reference source not found.** of [RCC.07 RCS5.1 UNI]:

- when RCS client that is set to use Presence based service capabilities discovery mechanism has also the fallback mechanism enabled (CAPABILITY DISCOVERY VIA COMMON STACK parameter set to 1), then when a query for Presence service capability of a RCS contact fails with a user not found result (404), the RCS client falls back to using SIP OPTIONS.

4.1.5.3   Service Identification (Clarification)

The services supported by an RCS client shall be provided in the service capability exchanges via the configured service capability discovery mechanism(s) in the RCS client.

The service identifications of these RCS services will follow section 2.6.1.2.5 of [RCC.07 RCS5.1 UNI] and use the standard strings defined for each of the supported RCS services (per table 1).

4.1.5.4   Service usability aspects

As defined in joyn Blackbird [RCC.60 v3.0] section 3.1, with following clarifications and additions:

1. A contact is deemed RCS capable when at least one RCS messaging service is discovered for that contact.
2. The RCS capability of a contact is removed if the service discovery request for the contact returned a user not found result[1].
3. A "triggered removal" shall be applied, when all of the following conditions apply:

   a) a RCS contact is selected by the user (e.g. in a group chat picker) and,
   b) contact's RCS capabilities are older than an MNO set parameter (CAPABILITY INFO EXPIRY)[2] and the MNO does not request a periodic polling of the capabilities of contacts with obsolete capability information[3].

4. The RCS service capability updates for VIP and non-VIP contacts uses the optimization recommendations described in section 3 of [RCC.52PRS Best Practices].

4.1.5.5   Capability Discovery for Ad-Hoc Entry of Contacts

When composing a message or file transfer and a user enters ad-hoc contacts that are not in the local address book or they are in the address book and the capability has expired, the following rules for capability discovery shall apply:

1. The client shall perform an individual anonymous SUBSCRIBE to retrieve the capabilities for the user after the confirmation of entry of the mobile number (e.g."+", comma, semi colon, etc). See section 4.1.2.9.2.
2. If the response is received and RCS messaging capabilities are detected, the client shall then cache those capabilities for that ad-hoc contact so any subsequent messages to that contact do not trigger presence capability discovery.
3. The RCS client should record time-stamped results of capability / user discovery. See section 4.1.2.9.2.

4.1.6   NNI

4.1.6.1   Services supported at NNI

Filtering of the service capability exchange between two MNOs may be done at NNI, subject to MNO service level agreements.

---

[1] 404 Not Found error code

[2] This means that for joyn Blackbird the CAPABILITY INFO EXPIRY can also be used if POLLING PERIOD is set to 0

[3] Controlled by POLLING PERIOD parameter setting

The filtering of service-ids exchanged via Presence discovery mechanisms is described in section 3.2 of [PRD IR.90], and the filtering of the feature tags/ICSI/IARI exchanged via SIP OPTIONS is described in section 3.1 of [PRD IR.90]. However, in case of presence based service discovery the service-ids are buried in the body of the SIP NOTIFY and therefore difficult for the IBCFs at NNI to filter them. It is recommended that such SLA based filtering is done in the Presence Server. On the originating side the Presence Server should apply appropriate filters in the SIP SUBSCRIBE to filter out the services not subjected to that NNI. On the terminating side, the Presence Server should filter out of the SIP NOTIFY the service not subject to SLA NNI. The information on the domain of the other party is derived from the requestor identity in P-Asserted-Identity header field.

4.2   Standalone messaging

4.2.1   Overview

The IMS-based Standalone Messaging service was introduced in [RCC.07 RCS5.1 UNI] and is based on OMA CPM 2.0 as endorsed in [RCC.09 RCS 5.1 CMS], [RCC.10 RCS 5.1 IW] and [RCC.11 RCS 5.1 CONV].

Standalone Messaging consolidates text and multimedia messaging mechanisms into a single and unified messaging solution. Consequently, it supports seamless interworking with existing SMS and MMS services. Standalone Messaging includes both CPM Pager Mode and Large Message Mode mechanisms based on the [RCC.11 RCS 5.1 CONV]. Depending on the size, messages are communicated in a transparent fashion for the user, without requiring the user to select a particular messaging mode. Hence, there is no distinction between text and multimedia messages for the user.

Basic Standalone messaging functionality to be supported by the RCS client, as defined in RCS 5.1 [RCC.07 RCS5.1 UNI], includes:

- delivery and display of notifications (IMDN) based on disposition state of messages,
- deferred messaging, and
- use of a repository for management of messages exchanged (i.e. Common Message Store) based on user subscription.

The Common Message Store is used for storage of messages as specified in [RCC.09 RCS 5.1-CMS]. The Common Message Store is used for the management of sent and received messages, and to allow devices to synchronize the exchange of messages when either offline or not involved in an active session. The Common Message Store is also used for long term backup of messages.

Standalone Messaging also supports interworking to SMS and MMS legacy messaging services involving mechanisms implemented in the CPM Interworking Selection Function (ISF) and the Interworking Function (IWF), and coordination with SMS and MMS Gateways for related breakout as defined in [RCC.07 RCS5.1 UNI] and [RCC.10 RCS5.1 IW]. These functional elements are responsible for the handling of outgoing RCS messages and incoming SMS or MMS messages.

4.2.2   Pager mode

In this mode, messages are delivered using the SIP MESSAGE method and are limited to a maximum size of 1300 bytes. Messages exceeding this limit are delivered in Large Message Mode.

Usage of Pager Mode standalone message and its fallback alternatives are described in section 4.2.4.3.

4.2.3   Large Message Mode

In this case, messages are carried out in SIP/MSRP sessions and are only subject to size limitations specified by Service Providers. Usage of Large Message Mode standalone message and its fallback alternatives are described in section 4.2.4.3.

4.2.4   UNI

4.2.4.1   Deferred Messaging

[RCC.07 RCS5.1 UNI] defines the device behaviour that the deferred messaging is to defer the delivery of standalone messages when none of the terminating RCS user's devices are registered and available to receive the messages.

The RCS Participating Function may do one of the following:

1. Trigger deferral of the message and keep it for later delivery to the recipient; or
2. Interwork the message based on the alternatives described in section 4.2.4.3; or
3. When the deferred messaging and the interworking services are not deployed and enabled by the service provider and in a 1-1 standalone message scenario, propagate the delivery error from the recipient that is not online all the way to the originating client which will trigger a fallback mechanism in the originating client. The possible error codes which trigger this fallback are included in the table under section 3.7 and section 3.8.

4.2.4.2   Delivery and Display Notifications

[RCC.07 RCS5.1 UNI] defines the client device should allow both the sending and receiving users to optionally enable/disable the display notifications request and response, respectively. If the sending user enables the display notification request, the delivery notification request should be enabled by default.

In the multi-device environment, the delivery and display notifications responses from a recipient shall be sent independently back to the sending user without aggregation.

4.2.4.3   Technology selection

The determination for the technology to be used by the client to send out text or multimedia messages is done as follows:

1. For text messages:

   a) If the standalone messaging service is enabled by the service provider via the configuration parameter STANDALONE MSG AUTH as defined in [RCC.07

RCS5.1 UNI] and the RCS client is registered in IMS, then Standalone Messaging as defined in section 3.2 of [RCC.07 RCS5.1 UNI] shall be used.

b) Otherwise, as supported by the device, the client shall:

   i. use the Short Messaging Service over IP as defined in [PRD-IR.92] if available, otherwise use Short Messaging Service as defined in [3GPP TS 23.040] or [3GPP2 SMS (C.S0015)], if there is only one recipient;

   ii. use the Multimedia Messaging Service as defined in 3GPP TS 22.140 and 3GPP TS 23.140, if there are more than one recipients.

2. For multimedia messages:

   a) if the standalone messaging service is enabled by the service provider via the configuration parameter STANDALONE MSG AUTH as defined in [RCC.07 RCS5.1 UNI] and the client is registered in IMS, then Standalone Messaging as defined in section 3.2 of [RCC.07 RCS5.1 UNI] shall be used.

   b) Otherwise, as supported by the device, the client shall use the Multimedia Messaging Service as defined in 3GPP TS 22.140 and 3GPP TS 23.140.

4.2.5   NNI

Standalone Messaging defines different possible NNI options, i.e. to another Standalone Messaging (OMA CPM) services, to SMS or to MMS.

The NNI to another Standalone Messaging service follows interworking guidelines defined in [PRD IR.90] and consists of MSRP requests and responses carried over the functions implemented in interworking Messaging Servers and SIP messages between peering IMS core systems.

Interworking between Standalone Message service and legacy messaging services such as SMS and MMS depends on the message characteristics as indicated in [RCC.07 RCS5.1 UNI].

4.3   1-to-1 Chat

The RCS 5.1 specification provides two alternative mechanisms to perform Chat Services, OMA SIMPLE IM and OMA CPM. The desired mechanism is configured in the RCS client via setting the configuration parameter CHAT MESSAGING TECHNOLOGY (see Table 80 in Annex A [RCC.07 RCS5.1 UNI]). This section will only cover OMA CPM implementation.

4.3.1   UNI

4.3.1.1   Setting up 1-to-1 Chat

The default RCS messaging application shall support 1-to-1 session based messaging and may be triggered in the following ways:

- If the selected contact has had capabilities exchanged, and the contact has RCS capabilities (like support for 1-1 chat), then RCS chat shall be used with the contact. In case of receiving an error, the originating client shall fallback. The determination for the fallback mechanism to be applied by the client is done following the procedures in section 4.2.4.3 "Technology selection".

Entry points:

1. **Contacts Picker**:

   - If the selected contact has no RCS capabilities, and there is no network based interworking implemented as set in IM CAP NON RCS = 0 configuration parameter, then the RCS application will fall back to Standalone messaging and follow the section 4.2.4.3 "Technology selection".

2. **History/Call Log:**

   - If the selected contact was in the address book and had capabilities exchanged with no RCS capabilities, and there is no network based interworking implemented as set in IM CAP NON RCS = 0 configuration parameter then the fall back messaging application will default to standalone based messaging or legacy technology. If the contact was not in the address book and the user enters the contact's MSISDN, then the client shall proceed as for an Ad-Hoc Entry and shall trigger an anonymous poll of the users capabilities.

3. **Contacts View:**

   - If the selected contact has had capabilities exchanged, and the contact has no RCS capabilities, and there is no network based interworking implemented as set in IM CAP NON RCS = 0 configuration parameter then the fall back messaging application will default to standalone based messaging or legacy technology.

4. **Ad-Hoc Entry:**

   - After the A party user has entered the B party MSISDN the device shall trigger capability exchange as per the rules in sections 4.1.2.3 and 4.1.3.

4.3.1.2   Clarifications to [RCC.07 RCS5.1 UNI]

As a clarification to section "3.3.6.2 Entry points to the chat service" of [RCC.07 RCS5.1 UNI], OEM's may also implement entry to RCS service from the default "Messaging" application on the home screen of the device. Therefore, a dedicated chat application is not required.

As a clarification to section "3.3.6.3 Initiating a chat" and "3.3.6.4 Answering a chat" of [RCC.07 RCS5.1 UNI], when there is no Store and Forward realized in the network, it is recommended operators implement a default value of "1" for IM SESSION AUTO ACCEPT. This will give users an optimal experience and limit manual user intervention when attempting to chat.

As defined in section "3.3.4.1.8 Emoticons" with following clarifications and additions the client shall also support ID_1_2 Blushing Emotions in joyn Blackbird Implementation Guidelines and also support emoticons as defined in sect. 3.3.4.1.8 of [RCC.07 RCS5.1 UNI].

4.3.1.3   1-to-1 Chat Message Size

As a clarification to section "3.4.4.1.4 Chat message size limitations" of [RCC.07 RCS5.1 UNI], a client may also implement the max field size to the "MaxSize1To1" configuration value. Thus, a user will not be able to enter text larger than this limit.

The client and server shall also consider the "MaxSize1To1" as defined in ID_2_11 Max Message Size of joyn Blackbird Implementation Guidelines. Thus, the size of the SIP headers does not count towards the Max size values.

4.4   Group Chat

4.4.1   Group Chat Message Size

As a clarification to section "3.4.4.1.4 Chat message size limitations" of [RCC.07 RCS5.1 UNI], a client may also implement the max field size to the "MaxSize1ToM" configuration value. Thus, a user will not be able to enter text larger than this limit.

The client and server shall also consider the "MaxSize1ToM" as defined in ID_2_11 Max Message Size of joyn Blackbird Implementation Guidelines. Thus, the size of the SIP headers does not count towards the Max size values.

4.4.2   UNI

4.4.2.1   Setting up Group Chat

The default messaging application shall support Group session based messaging and may be triggered from the same entry points as 1-to-1 chat described in section 4.3.1.1, with the additional clarifications:

1. **Contacts Picker:**

   a) If all of the selected contacts have had capabilities exchanged and the contacts all have chat based capabilities detected, or IM CAP NON RCS GROUP CHAT configuration parameter is set to a value = 1, then the messaging application will default to a session based chat service

   b) If the IM CAP NON RCS GROUP CHAT configuration parameter is set to a value = 0 and at least one of the contacts does not have chat based capabilities, then the RCS client shall fallback to another messaging technology, selected as described in section 4.2.4.3.

2. **Ad-Hoc Entry:**

   a) The originating device shall also trigger capability exchange as per the rules in sections 4.1.5.5 and 4.1.5.2.

4.4.2.2   Add Participants to Closed Group Chat

When Closed Group Chat is used, [RCC.07 RCS5.1 UNI] defines that no one can add participants. However, the client device may still provide the possibility to add users which, when used, shall indicate that this is not possible in the current chat and offer to create a new Closed Group Chat session with the extended participant list. The new closed group chat shall have a new Conversation-ID and Contribution-ID.

4.4.2.3   Explicit Departure for Closed Group Chat

When Closed Group Chat is used, and if the service provider wants to maintain the similar user experience as SMS/MMS that users should always receive all messages, the client device should not allow the user to leave the group chat.

4.4.2.4   Sending Disposition Notification for Non-Active Group Chat

The RCS client shall follow the procedures described in sect. 3.4.4.1.5. of [RCS.07 RCS5.1 UNI].

4.4.2.5   Client Device Receives Group Chat Termination NOTIFY before SIP BYE

If client devices receive Group Chat SIP NOTIFY (state: terminated and reason: no-resource) before SIP BYE, the client device shall consider the Group Chat terminated on the conference focus, since the resources on the Controlling Function no longer exist and hence stop sending messages in the Group Chat. This may be realized by disabling the keyboard/text entry field in the chat UI. Any messages typed by the user just before NOTIFY (state: terminated and reason: no-resource) is received, shall be queued until a SIP BYE is received. Once the SIP BYE is received, the client shall attempt to rejoin the group chat and then send the queued outgoing messages in this session.

4.4.2.6   Local Blacklist Handling

In addition to section "3.3.4.1.1 Black List Handling" of [RCC.07 RCS5.1 UNI], from the UI point of view, the originating client shall also not be notified if the receiver has blacklisted the originator. Also, the receiving client shall only send a delivery receipt and not send a read receipt notification to a blacklisted originator.

4.4.2.7   Abnormal termination or IP-CAN loss

As a clarification to section "3.3.4.1.3 Chat abnormal interruption" of [RCC.07 RCS5.1 UNI], for a native RCS client, the client shall not disable the "Send" button rather the client should follow the error handling and fallback procedures in section 3.7 and 3.8.

4.5   File Transfer

4.5.1   UNI

4.5.1.1   Contact Header in CPM Based Group File Transfer

RCS supports file transfer to a group only within the context of a group chat. Thus the file transfer to a group of users requires that the RCS client first initiates a group chat request and then reuse the obtained focus URI for the group chat to send the file transfer request to that group.

To support this, the conference focus shall indicate in the Contact header field during the setup of the Group Chat whether File Transfer can be used in the Group Chat by including the IARI tags for the RCS File Transfer services it supports. The client shall include +g.3gpp.icsi-ref="urn%3Aurn-7%3A3gpp-service.ims.icsi.oma.cpm.session";+g.3gpp.iari-ref="urn%3Aurn-7%3A3gpp-application.ims.iari.rcse.ft " in the Contact header at the time when a client initiates, is invited to or joins a Group Chat (because the client may initiate File Transfer later in this Group Chat session) or Group File Transfer outside a Group Chat Session.

A RCS client that has successfully received the file transferred within a group chat, for which a delivery report was requested, returns the delivery notifications via SIP MESSAGE as described in [RCC.07 RCS5.1 UNI] section 3.5.4.7.6 "CPIM/IMDN delivery notifications" or within the existing Group Chat session in MSRP as described in [RCC.07 RCS5.1 UNI] section 3.5.4.2.

4.5.1.2   Reason code for 1-to-1 File Transfer resume based on MSRP

To provide a better user experience, when a file transfer gets interrupted it could be automatically resumed based on the service provider's requirement. The automatic resume shall be only attempted during scenarios which are not cancelled by the user intentionally. In order to support this, the device should be able to detect the reason for interruption.

Thus, the device or the network shall use a reason header in SIP BYE requests while terminating the file transfer session as described below.

The RCS client determines the file transfer interruption to be:

1. User triggered, as described in [CPM CONV TS] and [RFC 5547], in which case the RCS client does not need to perform an automatic resume. Instead, the user is given an option to resume the file transfer manually.

2. Network triggered, as described in [RCC.11 CPM Conv], when it receives a SIP BYE request with a Reason header field with protocol SIP and a cause code different than "200".

   a) The RCS client receiving this cause code value in the Reason header field can assume that file transfer has been interrupted because of a network condition and thus it might automatically resume a file transfer without user intervention based on a retry scheme.

   b) If the interruption is triggered by the recipient's device and Store and Forward is not available for the recipient, then the recipient's network sends a SIP BYE with Reason header field "SIP;cause=503;text="Service Unavailable"" to the sender's RCS client, which will understand that the file transfer was interrupted due to a network condition on the other side and thus it might automatically resume a file transfer without user intervention based on a retry scheme.

NOTE: In the case where the Reason header field is not passed on all the way to the recipient client, or it was stripped over NNI and then the messaging AS on terminating side has populated it with a configured value as described in NOTE 1 in section 3.4.4.1.3.2 of [RCC.07 RCS5.1 UNI], the recipient RCS client will act on the Reason cause value received as described above.
In the unlikely case where the RCS client does not receive a Reason header field in the SIP BYE, then it shall assume the behavior as if a cause=200 and protocol=sip was received.

4.5.1.3   Condition and action for File Transfer resume based on MSRP

File transfer could be interrupted due to different reasons such as user interaction, network condition changes, or service failures. In order to better define the user experience and avoid ambiguity, following device reactions to the file transfer interruption are recommended.

1-to-1 File Transfer without Store and Forward support

4.5

File Transfer Interruption Reason	1-to-1 File Transfer (Yes: Y; No: N)			
	Resumable from Sender?		Resumable from Receiver?	
	Manually	**Automatically**	**Manually**	**Automatically**
Sender manually suspends the ongoing File Transfer**	Y	N	N	N
Receiver manually suspends the ongoing File Transfer**	N	N	Y	N
Receiver manually rejects the incoming Fire Transfer request	N	N	N*	N
Receiver automatically rejects the incoming File Transfer	N	N	N	N
Sender is interrupted due to network issues/conditions	Y	Y	Y	N
Receiver is interrupted due to network issues/conditions	Y	N	Y	Y
Receiver does not answer the File Transfer Invite	Y	N	Y	N
Server does not relay the sender's Invite to receiver	N	N	N	N

Table 9: Resumption in 1-to-1 FT without Store and Forward

* If the receiver wants to retrieve the file later, the receiver user may inform the sender and request to have the file sent again. In such case, the sender initiates a new file transfer request including the file.

** The manual user suspend request of MSRP transmission for a file transfer is described in [RFC5547], [RFC4975] and [CPM CONV TS].

4.5.1.3.2

Group File Transfer without Store and Forward support

If during a Group File Transfer, the connectivity is lost by a recipient client and there is no Store and Forward for File Transfer supported, the recipient client should not attempt to resume the file transfer after re-joining the Group Chat. RCS client shall not provide any means to resume an interrupted group file transfer on the recipient side.

NOTE: The Group Chat focus rejects any Group File Transfer resume requests, as defined in section 3.5.4.2 in [RCC.07 RCS5.1 UNI].

Instead, upon request from the user to resume/re-transmit the file, the RCS client might initiate a new File Transfer pull request with the sender, using the file details received in the original SDP parameters. For fully automatic recovery without user intervention the originator shall set the FT request as automatic accept (auto-accept).

Alternatively, the RCS client may offer the possibility to the user to manually request the initiator to resend the whole file (this could be done via other means, e.g., standalone messaging), and then handle the file transfer in a new file transfer session.

Without Store and Forward, resume is not possible from the sender side (e.g., when sender lost connection) since the user does not know how much each of the recipients received from that file. So the sender in a group File Transfer has to re-send the full file.

File Transfer with Store and Forward

No differences with [RCC.07 RCS5.1 UNI].

4.5.2 File Transfer fallback

The determination for the fall back mechanism to be applied by the client for File Transfer is done following the procedures in section 4.2.4.3 "Technology selection", selecting either Large Message Mode or MMS.

4.5.3 NNI

For MSRP chunk size see section 3.3.

4.6 Messaging Interworking

No difference with the interworking of SIMPLE IM and OMA CPM as described in section 6.3 of [PRD IR.90].

4.7 Content Sharing

Image Share based on IR.79 is not in scope of this document. Image Sharing feature is achieved in via File Transfer instead.

Video Share based on IR.74 and IR.84 is not in scope of this document. Video Sharing feature is achieved via IR.94 instead. The user experience shall follow the [RCC.61 SDD].

4.8 Social Presence Information

Social Presence Information is not in scope of this document.

4.9 IP Voice Call

IP Voice Call in this document is based on IR.92 (VoLTE) for primary devices.

Secondary devices may use RCS IP Call as defined in [RCC.07 RCS5.1 UNI] and [RCC.61 SDD].

4.9.1 Technical implementation

For implementation guidelines of VoLTE based on [PRD-IR.92] refer to [VoLTE-SD-IG] document.

Following default values are recommended for the IP Voice Call related configuration parameters in the device based on [RCC.07 RCS5.1 UNI] section 3.8 and [RCC.61 SDD] section 10:

Configuration parameter	Description (also see NOTE)	Normative (based on Recommended Default values)
PROVIDE RCS IP VOICE CALL	Recommended Default Values: Value=0 for primary devices Value=1 for secondary devices (Enabled). Service Provider configurable	Mandatory
RCS IP VOICE CALL BREAK OUT	Recommended Default Values: Value=0 for primary devices Value=1 for secondary devices (whether a device in RCS-AA mode can use the RCS IP Voice Call service to reach any user or only RCS users that have indicated the corresponding capability).	Optional (primary devices) Mandatory (secondary devices)
RCS IP VOICE CALL BREAK OUT CS	Recommended Default Values: Value=0 for primary devices and secondary devices (whether a device in RCS-CS mode can use the RCS IP Voice Call service to reach any user, or only RCS users that have indicated the corresponding capability).	Optional

Table 10: IP Voice Call

4.9.2   Supplementary Services

Supplementary services supported are described in [PRD IR.92], [RCC.07 RCS5.1 UNI] and in the [RCC.61 SDD] section 10.2 User Story US10-10.

Note that as per [RCC.61 SDD] the services that can be implemented on the device/client without network interaction shall be always implemented (i.e. Calling Line Identification Presentation (CLIP), Call Waiting (CW), and Call Hold).

4.10 IP Video Call

IP Video Call in this document is based on IR.94 (ViLTE) for primary devices.

RCS IP Video Call may be supported by secondary devices, as defined in [RCC.07 RCS5.1 UNI] and [RCC.61 SDD].

4.10.1   Technical implementation

Following configuration parameters defined in Annex A of [RCC.07 RCSRCC.07 RCS5.1 UNI5.1 UNI] are specific to IP Video Call. Following default values are recommended:

Configuration parameter	Description (also see NOTE)	Normative (based on Recommended Default values)
PROVIDE RCS IP VIDEO CALL	Recommended Default Value: 0 for primary devices Recommended Default Value: 1 for secondary devices (Enabled) Service Provider configurable	Mandatory
PROVIDE IR94 VIDEO	Recommended Default Value: 1 for primary devices with a IR.94 client N/A for secondary devices (enables or disables IR94 Video Calling)	Mandatory (primary devices) Optional (N/A) (secondary devices)
RCS IP VIDEO CALL UPGRADE FROM CS	Recommended Default Value: 0 for primary devices N/A for secondary devices (Upgrade to RCS IP Video Call from CS is allowed or not on a device in RCS-CS mode if the other party in the call indicates the corresponding capability).	Optional
RCS IP VIDEO CALL UPGRADE ATTEMPT EARLY	Recommended Default Value: 0 for primary devices N/A for secondary devices (Upgrade from CS is enabled without tearing down the CS call first, or requires tearing it down first).	Optional
RCS IP VIDEO CALL UPGRADE ALLOWED ON CAPABILITY ERROR	Recommended Default Value: 0 for primary devices Recommended Default Value: 1 for secondary devices (Enabled) (whether a device supporting RCS-AA or RCS-CS mode can initiate an RCS IP Video Call upgrade even if service capability exchange fails with 480 Temporarily Unavailable or 408 Timeout).	Optional (primary devices) Mandatory (secondary devices)

Table 11: IP Video Call configuration [RCC.07 RCS5.1 UNI]

The following new configuration parameter defined in the [RCC.61 SDD] is optional and does not need to be provisioned within the scope of this document. If the parameter is supported, its value shall be set to 0 (disabled).

Configuration parameter	Description (also see NOTE)	Normative (based on Recommended Default values)
IP VIDEO CALL DEFAULT MECH	Recommended Default Value: 0 for primary devices (i.e. IR.94) N/A for secondary devices (controls which IP Video Call Technical enabler shall be used on the originating side if both IR.94 and RCS IP Video Call are available)	Optional

Table 12: IP Video Call configuration [RCC.61 SDD]

NOTE: when not provisioned a value of 0 shall be assumed.

4.10.2 Supplementary Services

Supplementary services supported are described in [PRD IR.92], [RCC.07 RCS5.1 UNI] and in the [RCC.61 SDD] section 11.2 User Story US11-16.

Supplementary services shall be aligned across voice and video calls.

4.11 Geo-location services

Geo-location Pull is not in scope of this document. Geo-location Push is achieved via File Transfer realization as described in [RCC.07 RCS5.1 UNI] section 3.10.4.1.

Annex A   Document Management

A.1   Document History

Version	Date	Brief Description of Change	Approval Authority	Editor / Company
0.1	30/03/2015	NARCS approved draft submitted to PSMC	NARCS / PSMC	Cristina Badulescu/Ericsson
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