Generic Control Record Type Definition

Technical Specification

NFC Forum™

GC-RTD 1.0

NFCForum-TS-GenericControlRTD_1.0

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RESTRICTIONS ON USE

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1 Overview

The Generic Control Record Type Definition defines an NFC Forum Well Known Type on how to activate a specific application or to set a property in a destination device through NFC communication.

1.1 Objectives

The objective of this document is to function as a normative reference to the Generic Control RTD.

1.2 Purpose

The purpose of the Generic Control RTD is to provide a way to request a specific action to an NFC Forum device (a destination device) from another NFC Forum device, a tag, or a card (source device) through NFC communication. A MIME type record in an NDEF message can provide access to an associated function; however, the association is defined solely in the destination device. It implies that a function to be accessed may differ from device to device when more than one function shares the same MIME type. To prevent such uncertainty, the Generic Control RTD allows the message issuer to specify specific functions to be accessed with the message. Moreover, the NDEF parser does not need to resolve the association of data and functions.

1.3 Mission Statement and Goals

To define a simple and generic RTD for manipulating (activating and operating) various applications and functions in smart equipment with NFC capabilities, such as a mobile phone, a PDA, and vice versa through NFC so that the generic RTD:

- Avoids a flood of unnecessary external record types for virtually identical purposes
- Saves resources (storage and processing) on NFC Forum devices (NFC-enabled equipment)
- Helps application providers to avoid defining new external record types, which increases complexity, resources, and management

1.4 Applicable Documents or References

Document Name	Document Citation
[JPEG]	E. Hamilton: “JPEG File Interchange Format (version 1.02)”. September 1, 1992. http://www.w3.org/Graphics/JPEG/
[NDEF]	“NFC Data Exchange Format Specification”, NFC Forum, 2006.
[NFC RTD]	“NFC Record Type Definition (RTD) Specification”, NFC Forum, January 2006.
[PNG]	“Portable Network Graphics (PNG) Specification (Second Edition)”, W3C Recommendation 10 November 2003. http://www.w3.org/TR/PNG/
[RFC 2119]	S. Bradner, “Key words for use in RFCs to Indicate Requirement Levels”, RFC 2119, Harvard University, March 1997.

[RFC 2046]	N. Freed, N. Borenstein, "Multipurpose Internet Mail Extensions (MIME) Part Two: Media Types". RFC 2046, Innosoft, First Virtual, November 1996.
[RFC 3986]	T. Berners-Lee, R. Fielding, L. Masinter, "Uniform Resource Identifiers (URI): Generic Syntax", RFC 3986, MIT/LCS, U.C. Irvine, Xerox Corporation, January 2005.
[SP RTD]	"Smart Poster Record Type Definition", NFC Forum, 2006.
[TEXT RTD]	"NFC Text Record Type Definition", NFC Forum, 2006.
[URI RTD]	"URI Record Type Definition", NFC Forum, 2006.
[URI SCHEME]	List of Uniform Resource Identifier (URI) schemes registered by IANA is available at: http://www.iana.org/assignments/uri-schemes
[3GPP AT]	"AT command set for user Equipment (UE)", 3GPP TS 27.007, 3rd Generation Partnership Project.

1.5 Administration

The NFC Forum Data Exchange Format Specification is an open specification supported by the Near Field Communication Forum, Inc., located at:

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Wakefield, MA, 01880

Tel.: +1 781-876-8955
Fax: +1 781-610-9864

http://www.nfc-forum.org/

The Reference Applications Framework technical working group maintains this specification.

1.6 Special Word Usage

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 RFC 2119.

1.7 Name and Logo Usage

The Near Field Communication Forum's policy regarding the use of the trademarks *NFC Forum* and the NFC Forum logo is as follows:

- Any company MAY claim compatibility with NFC Forum specifications, whether a member of the NFC Forum or not.
- Permission to use the NFC Forum logos is automatically granted to designated members only as stipulated on the most recent Membership Privileges document, during the period of time for which their membership dues are paid.
- Member's distributors and sales representatives MAY use the NFC Forum logo in promoting member's products sold under the name of the member.
- The logo SHALL be printed in black or in colour as illustrated on the Logo Page that is available from the NFC Forum at the address above. The aspect ratio of the logo SHALL be

maintained, but the size MAY be varied. Nothing MAY be added to or deleted from the logos.

- Since the NFC Forum name is a trademark of the Near Field Communication Forum, the following statement SHALL be included in all published literature and advertising material in which the name or logo appears:

  NFC Forum and the NFC Forum logo are trademarks of the Near Field Communication Forum.

1.8 Intellectual Property

The Generic Control Record Type Definition Specification conforms to the Intellectual Property guidelines specified in the NFC Forum's Intellectual Property Right Policy, as approved on November 9, 2004 and outlined in the NFC Forum Rules of Procedures, as approved on December 17, 2004, and revised on June 23, 2007.

1.9 Glossary

HO

(Negotiated) Handover

NDEF

NFC Data Exchange Format

RTD

Record Type Definition

SP

Smart Poster

RFU

Reserved for Future Use

2 Generic Control

2.1 Introduction

A Generic Control RTD provides a simple way to virtually request any specific action to an NFC Forum device (a destination device) from another NFC Forum device, tag, or card (source device) through NFC communication.

It is designed with the philosophy to allow:

- Access to functions or applications which are not covered by MIME type records or other NFC Forum Global Type records.
- The source device to explicitly indicate a certain function or a certain application on the destination device to perform a certain action.

A MIME type record in an NDEF message provides indirect access to an associated function or an application. When there are multiple functionalities and/or applications on a destination device and some of them share the same MIME type, only one of them is chosen for processing data contained in the record. Association between the data and function or application is determined by the destination device. This may lead to a different result than the source device expects.

Other NFC Forum Global Type records implicitly assume a dedicated application. This does not resolve all the limitations of MIME type records because only a limited number of popular types are defined as NFC Forum Global Types.

To resolve the issue above, a Generic Control is capable of requesting any application on the destination device. It allows the Generic Control to explicitly specify a certain function or a certain application to be accessed.

2.2 Dependencies

If an NDEF message contains one or more records other than Generic Control records, the processing sequence of multiple records is undefined.

The first record MAY restrict the processing sequence of the later records and MAY set the context of processing as described in NFC Record Type Definition Technical Specification [NFC RTD].

3 NDEF Structure

3.1 Message Sequence

There is no specific message sequence as the information is just read and acted upon. The receiving device is not assumed to reply to the source device for the Generic Control RTD message. Another NFC communication can be started when the activated function is designed to do so.

3.2 Record Mapping

3.2.1 Structure

The content of a Generic Control payload is an NDEF message.

The content of this message consists of a Configuration Byte and several NDEF sub-records. A Generic Control record contains the following components.

- A *Configuration Byte* for specifying several profiles to help determine how to handle the rest of the payload
- A *Target record* for identifying a function to handle the data contained in the Generic Control record
- An *Action record* for specifying the desired action for the function identified by the Target record to be applied to the data
- A *Data record* for specifying data to be processed by the function identified by the Target record

The structure of a Generic Control record is shown in Figure 1. Type names and content of payloads are introduced in 3.2.2 for the top-level record and in 3.3 for sub-records.

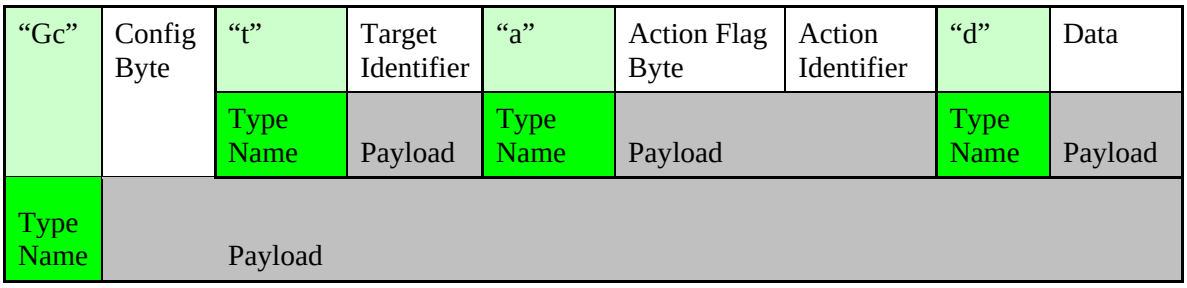

Figure 1: The Structure of a Generic Control Record

3.2.2 Syntax

The Well-known Type for the Generic Control record type is "Gc" (in NFC binary encoding: 0x47, 0x63).

The first byte of the payload of a "Gc" record is its Configuration Byte. The meanings of each bit in the Configuration Byte are shown in Table 1. The rest of the payload contains sub-records of a Target record, an Action record, and a Data record. The Generic Control RTD does not assume any particular order for these sub-records inside the Generic Control payload. However, it is RECOMMENDED that a Target record is specified first, an Action record is specified next, and a Data record is specified at the end for ease of readability and efficiency of processing.

Table 1: Configuration Byte of a Generic Control Record

Bit	Name	Symbol	Explanation
0	RFU	-	MUST be zero (0).
1	Sequence Control	SC	Set (1) if Exit Condition is to be checked.
2		EC	Set (1) if the following records are to be ignored when this record is not processed successfully.
3…7	RFU	-	MUST be zero (0).

3.2.3 Sequence Control for Multiple Records

When multiple Generic Control records are contained in a top-level NDEF message, it is RECOMMENDED that the assumption is that those records are expected to be processed in FIFO (first-in, first-out) manner. Only a Generic Control record MUST appear in the top-level NDEF message.

Sequence Control Flags in the Configuration Byte provide criteria to terminate the process in the middle of multiple Generic Control record sequences, depending on the result of each Generic Control record.

The reading device MUST refer the Configuration Byte and follow the criteria.

3.3 List of Records

The following record types are defined as NFC Local Types. The scopes of the records are limited locally in a Generic Control record only.

3.3.1 The Target Record

The NFC Local Type Name of the Target record is “t” (0x74).

A Generic Control record MUST contain one and only one Target record.

A Target record contains an instance of a Text RTD record [TEXT RTD] or an URI RTD record [URI RTD]. The destination device SHALL be responsible for translation of the sub-record’s content. If the destination device does not understand the sub-record’s content, the destination device SHOULD simply ignore the Generic Control record that contains the unresolved Target record.

3.3.2 The Action Record

The Action record is a Local Type record specific to the Generic Control RTD, which specifies the requested action for the target function to handle the data.

The NFC Local Type Name of the Action record is “a” (0x61).

A Generic Control record MAY contain one Action record. Generic Control records MUST NOT contain more than one Action record. When the Action record is omitted, the default action of the function may be applied. The default action is up to each function.

If none of the entities identified with the Target record or the destination device understand the Action record content, the Generic Control record SHOULD simply be ignored. Interpretations, as actual actions, of content in an Action record are up to the target function.

The payload of an Action record contains one Action Flag Byte and one data record. The Action Flag Byte indicates the data record type. The Action Flag Byte MUST be the first byte in the payload. Table 2 shows details of the Action Flag Byte.

Table 2: Action Flag Byte

Bit	Name	Symbol	Explanation
0	Numeric Code	NC	Set (1) if a numeric code is used to specify the action.
1..7	RFU	-	MUST be zero (0).

When Bit 0 of the Action Flag Byte is clear (NC=0), then the rest of the payload contains a sufficient NDEF record such as a Text RTD record, MIME type record, or vice versa. The target function SHOULD be able to interpret the data to perform intended action.

When Bit 0 of the Action Flag Byte is set (NC=1), the next single byte is the numeric code of an action. The value of the single byte SHALL be interpreted as shown in Table 3.

Table 3: Action Numeric Codes

Value	Action
0	The default action of the target function (for example, opening a page for a Web browser, dialing a number for a phone, and so on).
1	Store for later use (for example, add a URL to bookmarks for a Web browser, store data as a phone number into a directory for a phone, and so on).
2	Open for editing (for example, open a URI in a URI editor for a Web browser, open a directory editor for a phone, and so on).
3..FF	RFU

The numeric encoding is only effective when the target function is capable of handling the codes as stated in the table. If an incapable function received one of the numeric codes above, it MAY ignore the code and perform the default action, or it MAY ignore the parent Generic Control record.

If a receiving device encounters a value marked as RFU, it MAY treat it as having a value of zero.

The numeric encoding is allowed for consistent expression with the Action Record of Smart Poster. Please refer Technical Specification of Smart Poster RTD [SP RTD] for more information.

3.3.3 The Data Record

The NFC Local Type Name of the Data record is “d” (0x64).

A Data record MAY contain any type of data. The data of records contained in the Data record SHOULD simply be passed to the target function.

Interpretations of content in a data record are up to the target function.

4 Implementation Considerations

4.1 Record Handling Architecture

To reside with processes to handle MIME type records and other NFC Global Type records, the architecture diagram concerning Generic Control records handling SHOULD be like that shown in Figure 2.

Once a record type is identified by the NDEF parser, the record data is forwarded to the record dispatcher and the dispatcher determines which handler will take care of the record. After the association between the data and a corresponding application (or function) is resolved by a handler (MIME handler for MIME type records and RTD handler for NFC Forum Global Type records), the application launcher launches the associated application, if necessary, and delivers the data to the application.

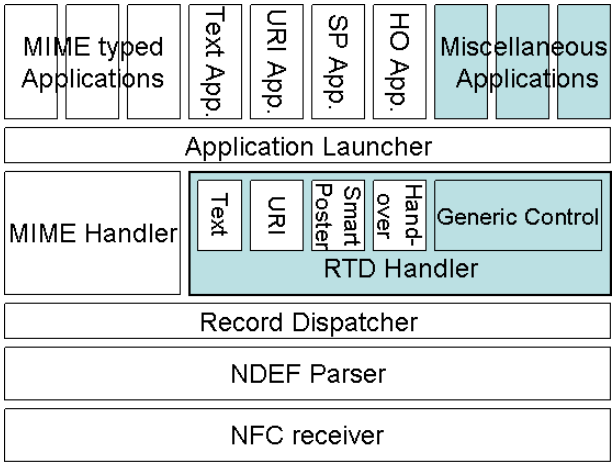

Figure 2: Record Handling Architecture

4.2 Remarks on Security and Privacy

The destination device is responsible for security issues that may be caused by execution of actions described in Generic Control records (for example, the destination device may produce a notification to its user).

The destination device is responsible for privacy issues that may be caused by execution of actions described in Generic Control records.

The sending device or issuer is responsible for privacy issues that may be caused by transferring data within Generic Control records. A Generic Control record simply conveys data with no specific consideration on privacy issues.

4.3 Authentication

A Generic Control record does not provide any specific feature for authenticating a partner device or an application. If authentication is required, it should be done before or after transferring a Generic Control record. Authentication is based on implementation.

When the destination device is in Read (/Write) mode and the source device is a tag or a card, authentication information may be contained in the data sub-record of the Generic Control record

that is stored in the tag or the card, so that the destination device or application can verify the authentication information before performing any action.

When two devices are communicating in Peer-to-Peer mode, authentication information may be exchanged before transferring a Generic Control record.

It is also possible to use a Generic Control record to convey authentication information for another Generic Control record which requires authenticated status. Association of these multiple Generic Control records should be managed by the communicating devices. Since a Generic Control record does not provide a feature for such association, some information to ensure the association should be embedded in a data sub-record of a Generic Control record.

4.4 Response from the Destination Device to Source Device

A Generic Control record RTD basically describes a record of a one-way transfer. When a response from the destination device to the source device is required, it is possible to use another Generic Control record (which is transferred in the opposite direction by swapping the role of the source device and the destination device) as a response.

When such mutual communication is expected, maintaining consistency of protocol among two devices is the responsibility of the devices' applications.

It is recommended that the source device should be robust enough that it can recover properly, even when the destination device does not send back any response.

A. Examples

The contents of this appendix are informative.

The following examples present a full NDEF message, as if they were read from a NFC Forum tag or received from another NFC Forum device.

A.1 A Generic Control Record to Access an Application

The table below is an example of the Generic Control record which will add 500 points to a customer royalty bonus application. The target application is identified as "file://localhost/Appli/CustomerBonus" with URI style notation. The Action "add" and the data "500" are specified as Text records.

Table 4: Example of a Generic Control RTD Message

Offset	Content	Length	Explanation
0	0xD1	1	NDEF header. TNF=0x01 (Well Known Type), SR=1, MB=1, ME=1
1	0x02	1	Record Name Length
2	0x4A	1	Length of the Generic Control data (74Bytes)
3	"Gc"	2	The record name
5	0x00	1	Configuration Byte SC=0, EC=0
6	0xD1	1	NDEF header. TNF=0x00, SR=1, MB=1, ME=1
7	0x01	1	Record Name Length
8	0x22	1	Length of the Target data (34 Bytes)
9	"t"	1	The record name of Target record
10	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
11	0x01	1	Record Name Length
12	0x1E	1	Length of the Target data (30 Bytes)
13	"U"	1	The record name
14	0x1D	1	URI identifier code ("file://")
15	"localhost/Appli/CustomerBonus"	29	Value of Target
44	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
45	0x01	1	Record Name Length
46	0x0E	1	Length of the Target data (14 Bytes)

Offset	Content	Length	Explanation
47	“a”	1	The record name of Action record
48	0x00	1	Action Flag NC = 0 (text name)
49	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
50	0x01	1	Record Name Length
51	0x09	1	Length of the Target data (9 Bytes)
52	“T”	1	The record name
53	0x05	1	Status Byte
54	“en-US”	5	Language Code
59	“add”	3	Value of Action
62	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
63	0x01	1	Record Name Length
64	0x0D	1	Length of the Target data (13 Bytes)
65	“d”	1	The record name of Data record
66	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
67	0x01	1	Record Name Length
68	0x09	1	Length of the Target data (9 Bytes)
69	“T”	1	The record name
70	0x05	1	Status Byte
71	“en-US”	5	Language Code
76	“500”	3	Value of Data

A.2 A Generic Control Record to Access a Property

The table below is an example of the Generic Control record which sets a mobile phone to silent mode. This example assumes that the function to manage the properties such as Silent Mode, Ringer Tone, Language Preference, and so on is identified by “PropertyManager”. It also assumes that the Property Manager accepts a command “Set”, a parameter name string “SilentMode”, and data string “On” to activate Silent Mode.

Table 5: Example of a Generic Control RTD Message to Set a Device Property

Offset	Content	Length	Explanation
0	0xD1	1	NDEF header. TNF=0x01 (Well Known Type), SR=1, MB=1, ME=1
1	0x02	1	Record Name Length
2	0x54	1	Length of the Generic Control data (84Bytes)
3	“Gc”	2	The record name
5	0x00	1	Configuration Byte SC=0, EC=0
6	0xD1	1	NDEF header. TNF=0x00, SR=1, MB=1, ME=1
7	0x01	1	Record Name Length
8	0x19	1	Length of the Generic Control data (25Bytes)
9	“t”	1	The record name of Target record
10	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
11	0x01	1	Record Name Length
12	0x15	1	Length of the Target data (21 Bytes)
13	“T”	1	The record name
14	0x05	1	Status Byte
15	“en-US”	5	Language Code
20	“PropertyManager”	15	Value of Target
35	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
36	0x01	1	Record Name Length
37	0x0E	1	Length of the Target data (14 Bytes)
38	“a”	1	The record name of Action record
39	0x00	1	Action Flag NC = 0 (text name)
40	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
41	0x01	1	Record Name Length
42	0x09	1	Length of the Target data (9 Bytes)
43	“T”	1	The record name
44	0x05	1	Status Byte

Offset	Content	Length	Explanation
45	“en-US”	5	Language Code
50	“Set”	3	Value of Action
53	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
54	0x01	1	Record Name Length
55	0x20	1	Length of the Target data (32 Bytes)
56	“d”	1	The record name of Data record
57	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
58	0x01	1	Record Name Length
59	0x10	1	Length of the Target data (16 Bytes)
60	“T”	1	The record name
61	0x05	1	Status Byte
62	“en-US”	5	Language Code
67	“SilentMode”	10	Value of Data
77	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
78	0x01	1	Record Name Length
79	0x08	1	Length of the Target data (8 Bytes)
80	“T”	1	The record name
81	0x05	1	Status Byte
82	“en-US”	5	Language Code
87	“ON”	2	Value of Data

A.3 Multiple Generic Control Records on a Tag

Below is an example of Multiple Generic Control records. The first record sets the Silent Mode of the device to OFF. The second record accesses the Music Player and plays (music) data reachable with the specified URI. If the first record causes an error, the second record MAY be abandoned.

Table 6: Example of a Message Containing Multiple Generic Control Records

Offset	Content	Length	Explanation
0	0xD1	1	NDEF header. TNF=0x01 (Well Known Type), SR=1, MB=1, ME=1
1	0x02	1	Record Name Length

Offset	Content	Length	Explanation
2	0x55	1	Length of the Generic Control data (85Bytes)
3	“Gc”	2	The record name
5	0x06	1	Configuration Byte SC=1, EC=1
6	0xD1	1	NDEF header. TNF=0x00, SR=1, MB=1, ME=1
7	0x01	1	Record Name Length
8	0x19	1	Length of the Generic Control data (25Bytes)
9	“t”	1	The record name of Target
10	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
11	0x01	1	Record Name Length
12	0x15	1	Length of the Target data (21 Bytes)
13	“T”	1	The record name
14	0x05	1	Status Byte
15	“en-US”	5	Language Code
20	“PropertyManager”	15	Value of Target
35	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
36	0x01	1	Record Name Length
37	0x0E	1	Length of the Generic Control data (14Bytes)
38	“a”	1	The record name of Action record
39	0x00	1	Action Flag NC = 0 (text name)
40	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
41	0x01	1	Record Name Length
42	0x09	1	Length of the Target data (9 Bytes)
43	“T”	1	The record name
44	0x05	1	Status Byte
45	“en-US”	5	Language Code
50	“Set”	3	Value of Action

Offset	Content	Length	Explanation
53	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
54	0x01	1	Record Name Length
55	0x21	1	Length of the Generic Control data (33Bytes)
56	“d”	1	The record name of Data record
57	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
58	0x01	1	Record Name Length
59	0x10	1	Length of the Target data (16 Bytes)
60	“T”	1	The record name
61	0x05	1	Status Byte
62	“en-US”	5	Language Code
67	“SilentMode”	10	Value of Data
77	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
78	0x01	1	Record Name Length
79	0x09	1	Length of the Target data (9 Bytes)
80	“T”	1	The record name
81	0x05	1	Status Byte
82	“en-US”	5	Language Code
87	“OFF”	3	Value of Data
90	0xD1	1	NDEF header. TNF=0x01 (Well Known Type), SR=1, MB=1, ME=1
91	0x02	1	Record Name Length
92	0x54	1	Length of the Generic Control data (84Bytes)
93	“Gc”	2	The record name
95	0x00	1	Configuration Byte SC=0, EC=0
96	0xD1	1	NDEF header. TNF=0x00, SR=1, MB=1, ME=1
97	0x01	1	Record Name Length
98	0x20	1	Length of the Target data (32Bytes)

Offset	Content	Length	Explanation
99	“t”	1	The record name of Target record
100	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
101	0x01	1	Record Name Length
102	0x1C	1	Length of the Target data (28 Bytes)
103	“U”	1	The record name
104	0x1D	1	URI identifier code (“file://”)
105	“localhost/Appli/MusicPlayer”	27	Value of Target
132	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
133	0x01	1	Record Name Length
134	0x0F	1	Length of the Target data (15Bytes)
135	“a”	1	The record name of Action record
136	0x00	1	Action Flag NC = 0 (text name)
137	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
138	0x01	1	Record Name Length
139	0x0A	1	Length of the Target data (10 Bytes)
140	“T”	1	The record name
141	0x05	1	Status Byte
142	“en-US”	5	Language Code
147	“play”	4	Value of Action
151	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
152	0x01	1	Record Name Length
153	0x18	1	Length of the Target data (24Bytes)
154	“d”	1	The record name of Data record
155	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
156	0x01	1	Record Name Length
157	0x14	1	Length of the Target data (20 Bytes)
158	“U”	1	The record name
159	0x03	1	URI identifier code (“http://”)

Offset	Content	Length	Explanation
160	“nfc-forum.org/music”	19	Value of Data

A.4 Using AT Commands for Mobile Terminals

AT command sets [3GPP AT] are widely adopted for mobile handset terminals to control their functions. Using AT commands through NFC helps to control the destination device.

This example shows a message to set the “Vibrator mode” to “ON” with an AT command. In this example, Terminal Adapter (which is a component of a Mobile Terminal) to accept AT commands is assumed to be identified as “file://localhost/TA”.

Many AT commands expect a response from Terminal Adapter after receiving a command. Please see 4.4 when handling such transactions.

Table 7: Using AT Commands Example

Offset	Content	Length	Explanation
0	0xD1	1	NDEF header. TNF=0x01 (Well Known Type), SR=1, MB=1, ME=1
1	0x02	1	Record Name Length
2	0x31	1	Length of the Generic Control data (49Bytes)
3	“Gc”	2	The record name
5	0x00	1	Configuration Byte SC=0, EC=0
6	0xD1	1	NDEF header. TNF=0x00, SR=1, MB=1, ME=1
7	0x01	1	Record Name Length
8	0x11	1	Length of the Generic Control data (17Bytes)
9	“t”	1	The record name of Target record
10	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
11	0x01	1	Record Type Name Length
12	0x0D	1	Length of the Target data (13 Bytes)
13	“U”	1	The record name
14	0x1D	1	Abbreviation of “file://”
15	“localhost/TA”	12	Value of Target
27	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
28	0x01	1	Record Name Length
29	0x02	1	Length of the Generic Control data (2Bytes)

Offset	Content	Length	Explanation
30	“a”	1	The record name of Action record
31	0x01	1	Action Flag NC = 1 (numeric code)
32	0x00	1	Value of Action (the default action)
33	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
34	0x01	1	Record Name Length
35	0x11	1	Length of the Generic Control data (17Bytes)
36	“d”	1	The record name of Data record
37	0xD1	1	NDEF header. TNF=0x01, SR=1, MB=1, ME=1
38	0x01	1	Record Name Length
39	0x0D	1	Length of the Generic Control data (13Bytes)
40	“T”	1	The record name
41	0x05	1	Status Byte
42	“en-US”	5	Language Code
47	“+CVIB=1”	7	Value of Data

B. Test Requirements

It is recommended that the following requirements are satisfied when an NFC-equipped device is capable of handling (producing/parsing) NDEF records with the Generic Control type, although the capability itself is *Optional* for an NFC Forum-compliant device.

- TR-RTD-GC-1: A Generic Control record MUST be in the form of an NDEF record with NFC Forum Well-Known Type “Gc” (in NFC binary encoding: 0x47, 0x63).
- TR-RTD-GC-2: A Generic Control record MUST contain a Configuration Byte (shown in Table 1) for the first byte of the payload.
- TR-RTD-GC-3: A Generic Control record MUST contain one and only one target (NFC Forum Local Type) record as a sub-record.
- TR-RTD-GC-4: A Generic Control record MAY contain one and only one action (NFC Forum Local Type) record as a sub-record.
- TR-RTD-GC-5: A Generic Control record MAY contain one and only one data (NFC Forum Local Type) record as a sub-record.
- TR-RTD-GC-6: Type name of each sub-records (target, action and data) MUST be stated as “t”, “a” and “d” respectively.
- TR-RTD-GC-7: A target (NFC Forum Local Type) record MUST contain a URI record or Text record in its payload.
- TR-RTD-GC-8: An action (NFC Forum Local Type) record MUST contain an Action Flag Byte (shown in Table 2) at the first byte of its payload followed by an Action Identifier (defined in 3.3.2) when it is present.
- TR-RTD-GC-9: The Action Identifier MUST be in the numeric form when the NC Flag in the corresponding Action Flag Byte is set (1).
- TR-RTD-GC-10: A data (NFC Forum Local Type) record MUST contain one or more sub-records of any type in its payload when it is present.
- TR-RTD-GC-11: Multiple Generic Control records MAY appear in an NDEF message containing multiple NDEF records.
- TR-RTD-GC-12: Only Generic Control records MUST appear in an NDEF message starting with a Generic Control record.

C. Revision History

The following table outlines the revision history of Generic Control Record Type Definition.

Table 8: Revision History

Document Name	Revision and Release Date	Status	Change Notice	Supersedes
Generic Control Record Type Definition	1.0, March 2008	Final	None	