URI Record Type Definition

Technical Specification

NFC Forum™

RTD-URI 1.0

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RESTRICTIONS ON USE

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1 Overview

The URI Service RTD (Record Type Description) is an NFC RTD describing a record to be used with the NFC Data Exchange Format (NDEF) to retrieve a URI stored in a NFC-compliant tag or to transport a URI from one NFC device to another.

The URI (either a URN or URL) also provides a way to store URIs inside other NFC elements, such as a Smart Poster (please see the Smart Poster RTD for more information).

1.1 Objectives

The RTD defines the use of NDEF by the means of the NDEF records mapping.

1.2 Purpose

1.2.1 Mission Statement and Goals

The purpose of the URI RTD is to provide a “primitive” to contain URIs as defined by RFC 3986 in a compact manner.

1.3 References

[NDEF]	“NFC Data Exchange Format Specification”, NFC Forum, 2006.
[NFC RTD]	“NFC Record Type Definition (RTD) Specification”, NFC Forum, 2006.
[RFC 2119]	S. Bradner, “Key words for use in RFCs to Indicate Requirement Levels”, RFC 2119, Harvard University, March 1997. http://www.apps.ietf.org/rfc/rfc2119.html
[RFC 3492]	A. Costello: “Punycode: A Bootstring encoding of Unicode for Internationalized Domain Names in Applications (IDNA)”, RFC 3492, March 2003. http://www.apps.ietf.org/rfc/rfc3492.html
[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. http://www.apps.ietf.org/rfc/rfc3986.html
[RFC 3987]	M. Duerst, M. Suignard, “Internationalized Resource Identifiers (IRIs)”, RFC 3987, Microsoft Corporation, January 2005. http://rfc.net/rfc3987.html
[SMARTPOSTER]	“Smart Poster RTD Specification”, NFC Forum, 2006.
[URI SCHEME]	List of Uniform Resource Identifier (URI) schemes registered by IANA. http://www.iana.org/assignments/uri-schemes

1.4 Administration

The URI RTD Specification is an open specification supported by the Near Field Communication Forum, Inc., located at:

401 Edgewater Place, Suite 600
Wakefield, MA, 01880

Tel.: +1 781-876-8955
Fax: +1 781-224-1239

http://www.nfc-forum.org

The Reference Applications technical working group maintains this specification.

This specification has been contributed to by Sony, Panasonic, Philips and Nokia.

1.5 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.

1.6 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 color 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.

1.7 Intellectual Property

The URI 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.

1.8 Acronyms

This table defines all relevant terms and acronyms used in this specification.

Table 1. Acronyms

Acronyms	Definition
NDEF	NFC Data Exchange Format
URI	Uniform Resource Identifier
URL	Uniform Resource Locator (this is a special case of an URI)
RFU	Reserved for Future Use
NFC	Near Field Communication

2 URI Service

This document defines URI Service with data model, describing the application scenarios for simple Smart Poster applications, the structure of an URI located on an NFC compliant device or tag, and provides examples.

The URI record type MAY also be used as a part of some other RTD, in which case it implies no specific action. A typical example of this might be a case where the developer wants to build his own record type containing multiple URLs. In this case, it is impossible to divine the meaning of each URL automatically, so it is left to the handler taking care of the developer's own type.

Devices are NOT required to implement any particular URI protocol.

2.1 NDEF Message Sequences

There are no specific message sequences.

2.2 Dependencies

The Smart Poster RTD [SMARTPOSTER] may be considered to be an extended version of the URI RTD. It uses auxiliary records to add metadata to the URI.

3 NDEF Structure

3.1 Messaging Sequence

There is no particular messaging sequence.

3.2 Records Mapping

3.2.1 URI Record Type

The Well Known Type for an URI record is “U” (0x55 in the NDEF binary representation).

The structure of an URI record is described below.

Table 2. URI Record Contents

Name	Offset	Size	Value	Description
Identifier code	0	1 byte	URI identifier code	The URI identifier code, as specified in Table 3.
URI field	1	N	UTF-8 string	The rest of the URI, or the entire URI (if identifier code is 0x00).

3.2.2 URI Identifier Code

In order to shorten the URI, the first byte of the record data describes the protocol field of an URI. The following table MUST be used to encode and decode the URI, though applications MAY use the 0x00 value to denote no prefixing when encoding, regardless of whether there actually is a suitable abbreviation code.

For explanations of the different protocols, please refer to the protocol documentations themselves. NFC devices are not required to support any particular protocol.

Table 3. Abbreviation Table

Decimal	Hex	Protocol
0	0x00	N/A. No prepending is done, and the URI field contains the unabridged URI.
1	0x01	http://www.
2	0x02	https://www.
3	0x03	http://
4	0x04	https://
5	0x05	tel:
6	0x06	mailto:
7	0x07	ftp://anonymous:anonymous@
8	0x08	ftp://ftp.
9	0x09	ftps://

Decimal	Hex	Protocol
10	0x0A	sftp://
11	0x0B	smb://
12	0x0C	nfs://
13	0x0D	ftp://
14	0x0E	dav://
15	0x0F	news:
16	0x10	telnet://
17	0x11	imap:
18	0x12	rtsp://
19	0x13	urn:
20	0x14	pop:
21	0x15	sip:
22	0x16	sips:
23	0x17	tftp:
24	0x18	btspp://
25	0x19	btl2cap://
26	0x1A	btgoep://
27	0x1B	tcpobex://
28	0x1C	irdaobex://
29	0x1D	file://
30	0x1E	urn:epc:id:
31	0x1F	urn:epc:tag:
32	0x20	urn:epc:pat:
33	0x21	urn:epc:raw:
34	0x22	urn:epc:
35	0x23	urn:nfc:
36…255	0x24..0xFF	RFU

For example, if the content of this field is 0x02, and the content of the URI field reads as “nfc-forum.org”, the resulting URI is “https://www.nfc-forum.org”.

If the content this field is zero (0x00), then NO prepending SHALL be done.

All fields marked RFU SHALL be treated as if they were value zero (no prepending). A compliant system MUST NOT produce values that are marked RFU.

3.2.3 URI Field

This field provides the URI as per RFC 3987 [RFC 3987] (so that it is actually an IRI, or Internationalized Resource Identifier, but for legacy reasons we use the word URI). This IRI can be a URL or URN as explained before. The encoding used MUST be UTF-8, unless the URI scheme specifies some particular encoding.

The length of the IRI can be calculated by taking the length of the payload, and subtracting 1 for the protocol abbreviation code byte. This is the length in bytes, not in characters (as UTF-8 characters can occupy more than one byte).

URIs are defined only in the 7-bit US-ASCII space. Therefore, a compliant application SHOULD transform the UTF-8 IRI string to a 7-bit US-ASCII string by changing code points above 127 into the proper encoding. This coding has been defined in the RFC 3987 [RFC 3987] and IDN [RFC 3492] documents. For different schemes, the encoding may be different.

For example, if the URI (after the prepending of the URI type field) contains the following string: “http://www.hääyö.com/”, it is transformed, as per standard IDN [RFC 3492] rules, into “http://www.xn--hy-viaa5g.com” before acting on it. Most modern applications already support this new Internationalized Resource Identifier (IRI) scheme. It is RECOMMENDED that implementations include support for IRI where display of the URI in human-readable form is anticipated.

To clarify: yes, the URI MAY contain UTF-8 characters. However, the Internet cannot handle them, and therefore the URI needs to be transformed before use. For most devices, this conversion is handled by the application.

Any character value within the URI between (and including) 0 and 31 SHALL be recorded as an error, and the URI record to be discarded. Any invalid UTF-8 sequence SHALL be considered an error, and the entire URI record SHALL be discarded.

4 Handling Guideline

The URI RTD does not define any specific action that the device is required to perform. This is left to the implementation.

Please see the Smart Poster RTD [SMARTPOSTER] for an example on how to use the URI RTD in your own application.

A. Examples

These examples omit the MB and ME flags from the URI RTD, and assume the Short Record format. See the NDEF specification [NDEF] for more information.

A.1 Simple URL with No Substitution

To put the URL http://www.nfc.com on a tag using the NDEF protocol, add the following byte sequence. Total length: 12 bytes.

Table 4. Simple URL with No Substitution

Offset	Content	Explanation
0	0xD1	SR = 1, TNF = 0x01 (NFC Forum Well Known Type), ME=1, MB=1
1	0x01	Length of the Record Type (1 byte)
2	0x08	Length of the payload (8 bytes)
3	0x55	The URI record type (“U”)
4	0x01	URI identifier (“http://www.”)
5	0x6e 0x66 0x63 0x2e 0x63 0x6f 0x6d	The string “nfc.com” in UTF-8.

A.2 Storing a Telephone Number

To store a telephone number (for example, to make a mobile phone make a call to this number), use the following byte sequence. The number is ‘+358-9-1234567’. Total length is 17 bytes.

Table 5. Storing a Telephone Number

Offset	Content	Explanation
0	0xD1	SR = 1, TNF = 0x01 (NFC Forum Well Known Type), MB=1, ME=1
1	0x01	Length of the Record Type (1 byte)
2	0x0D	Length of the payload (13 bytes)
3	0x55	The Record Name (“U”)
4	0x05	Abbreviation for “tel:”
5	0x2b 0x33 0x35 0x38 0x39 0x31 0x32 0x33 0x34 0x35 0x36 0x37	The string “+35891234567” in UTF-8.

A.3 Storing a Proprietary URI on the Tag

To store a proprietary URI, you can use the following byte sequence. The URI in this case is “mms://example.com/download.wmv”. Total length is 35 bytes.

Table 6. Storing a Proprietary URI on the Tag

Offset	Content	Explanation
0	0xD1	SR = 1, TNF = 0x01 (NFC Forum Well Known Type), MB=1, ME=1
1	0x01	Length of the Record Type (1 byte)
2	0x1F	Length of the payload (31 bytes)
3	0x55	The Record Name (“U”)
4	0x00	No abbreviation
5	0x6d 0x6d 0x73 0x3a 0x2f 0x2f 0x65 0x78 0x61 0x6d 0x70 0x6c 0x65 0x2e 0x63 0x6f 0x6d 0x2f 0x64 0x6f 0x77 0x6e 0x6c 0x6f 0x61 0x64 0x2e 0x77 0x6d 0x76	The string “mms://example.com/download.wmv“.

B. Revision History

The following table outlines the revision history of the RTD_URI Technical Specification.

Table 7. Revision History

Document Name	Revision and Release Date	Status	Change Notice	Supersedes
NFCForum-TS-RTD_URI_1.0	1.0, July 2006	Final	None	