NFC Forum Device Requirements

High Level Conformance Requirements

NFC Forum™

Device Requirements 1.0

NFCForum_DeviceRequirements_1.0

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1. Introduction

1.1 Objectives

This document outlines the set of functionalities and features that are required to be supported by NFC-Forum-compliant devices to ensure basic interoperability.

1.2 Purpose

The NFC Forum is publishing a set of technical specifications around NFC technology. The purpose of this document is to define which high level features of the NFC Forum specifications must be implemented by a device to be eligible to receive the NFC Forum Certification Mark. These are identified as requirements in this document.

This document provides terminology and definitions, followed by a description of the extent of the NFC Forum Brand Promise to NFC Forum Peer Mode, NFC Forum Reader/Writer Mode, and NFC Forum Card Emulation Mode.

It outlines which parts of the NFC Forum protocol stack need to be present to reach the interoperability requirements to support the NFC Forum Brand Promise.

The criteria and use cases considered for determining the features are provided in the appendices.

1.3 Interim Exceptions

Some functionalities and features included in this document may not yet be available. Exceptions to the Device Requirements are listed at http://www.nfc-forum.org/certification/NFC_Forum_Device_Requirements.zip.

1.4 Audience

This document is intended for use by manufacturers that want to implement the NFC Forum specifications in an NFC Forum Device.

1.5 Applicable Documents or References

The following documents contain provisions that are referenced in this specification. The latest version including all published amendments applies unless a publication date is explicitly stated.

[ACTIVITY]	NFC Activity Specification, Version 1.0, NFC Forum
[ANALOG]	NFC Analog, In progress, NFC Forum
[DIGITAL]	NFC Digital Protocol Technical Specification, Version 1.0, November 2010, NFC Forum
[LLCP]	NFC Logical Link Control Protocol (LLCP) Technical Specification, Version 1.0, December 2009, NFC Forum

[NDEF]	NFC Data Exchange Format (NDEF) Technical Specification, Version 1.0, July 2006 NFC Forum
[RFC2119]	Key words for use in RFCs to Indicate Requirement Levels, RFC 2119, S. Bradner, March 1997 Internet Engineering Task Force
[SNEP]	NFC Simple NDEF Exchange Protocol (SNEP), In progress, NFC Forum
[T1TOP]	Type 1 Tag Operation Specification Version 1.0, NFC Forum
[T2TOP]	Type 2 Tag Operation, Version 1.0 NFC Forum
[T3TOP]	Type 3 Tag Operation, Version 1.0, NFC Forum
[T4TOP]	Type 4 Tag Operation, Version 2.0, NFC Forum

1.6 Administration

This document is maintained by the Near Field Communication Forum, Inc., located at:

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The Minimum Level of Interoperability Working Group maintains this document.

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 Supplier MAY claim compatibility with the authorized version of an NFC Forum specification, whether a member of the NFC Forum or not, provided that testing for certification was carried out as described in the Certification Policy, using validated test tools to execute the test cases in accordance with the test plan. The list of the authorized NFC Forum Test Specifications and the validated test tools are available on the Certification Program website at http://www.nfc-forum.org/certification. In particular, Suppliers MUST NOT claim that a product has been "certified" unless that product has successfully passed the NFC Forum Certification Program.

- Permission to use the NFC Forum logo is automatically granted to designated members only as stipulated on the most recent Membership Benefits list during the period of time for which their membership dues are paid. The current list of Membership Benefits can be found at http://www.nfc-forum.org/join/membership_benefits/.
- 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 member website at http://www.nfc-forum.org/members/final_docs/NFC_Forum_logo_Kit.zip. The aspect ratio of the logo SHALL be maintained, but the size MAY vary. Nothing MAY be added to or deleted from the logo.
- Because 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

This NFC Forum Device Requirements document conforms to the Intellectual Property guidelines specified in the NFC Forum's *Intellectual Property Rights Policy*, as approved on November 9, 2004, and outlined in the *NFC Forum Rules of Procedure*, as approved on December 17, 2004 and revised on June 25, 2010.

1.9 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 [RFC2119].

1.10 Abbreviations

Abbreviation	Description
APDU	Application Protocol Data Unit
IEC	International Electrotechnical Commission
ICS	Implementation Conformance Statement
ISO	International Organization for Standardization
LLCP	Logical Link Control Protocol, as defined in [LLCP]
NDEF	NFC Data Exchange Format, as defined in [NDEF]
NFC	Near Field Communication
OSI	Open Systems Interconnection
RF	Radio Frequency

1.11 Glossary

ICS (Implementation Conformance Statement)

Implementation Conformance Statement. This document is a checklist of the capabilities supported by an NFC Forum implementation, and it is filled in by the supplier of an OSI implementation or system.

Listen Mode

Initial mode of an NFC Forum Device when it does not generate a carrier. In this mode, the NFC Forum Device listens for the Remote Field of another device, as defined in [ACTIVITY].

NFC Forum Card Emulation Mode

The mode used when an NFC Forum Device is using the optional part of the NFC Forum Protocol Stack that responds to Master/Slave Communication from a reader/writer terminal. When in NFC Forum Card Emulation Mode, the NFC Forum Device (emulating either an NFC Forum Tag or a contactless card) cannot start communication on its own. The Master/Slave Communication is initiated by a reader/writer terminal. The communication for this mode is abbreviated as CE.

.NFC Forum Device

A device capable of operating either in NFC Forum Peer Mode or in NFC Forum Reader/Writer Mode. It may also be capable of operating in NFC Forum Card Emulation Mode.

NFC Forum Peer Mode

The mode used when an NFC Forum Device is using the part of the NFC Forum Protocol Stack that enables Peer-to-Peer Communication with another NFC Forum Device using this same mode. The initiator starts the communication and the target responds to it. Both NFC Forum Devices have the capability to be either initiator or target. This mode uses the NFC-DEP Protocol as described by [DIGITAL]. The communication for this mode is abbreviated as P2P.

NFC Forum Reader/Writer Mode

The mode used when an NFC Forum Device is using the part of the NFC Forum Protocol Stack that enables Master/Slave Communication with NFC Forum tags or contactless cards. The NFC Forum Device starts the Master/Slave Communication and sends commands to an NFC Forum tag or contactless card. The communication for this mode is abbreviated as RW.

NFC Forum Tag

A product that is expected to behave in the same manner as a contactless tag, compatible to at least one of the mandated tag operation specifications supported by the NFC Forum Protocol Stack. (It implements the necessary protocols and supports NDEF so that an NFC Forum Device can communicate with and exchange data with the component).

NFC-A

The technology based on the modulation scheme, bit level coding, and frame format as defined in [DIGITAL].

NFC-B

The technology based on the modulation scheme, bit level coding, and frame format as defined in [DIGITAL].

NFC-DEP Protocol

Half-duplex block transmission protocol as defined in [DIGITAL].

NFC-F

The technology based on the modulation scheme, bit level coding, and frame format as defined in [DIGITAL].

Operating Volume

The three-dimensional space as defined by the NFC Forum, in which an NFC Forum Device in Poll Mode can communicate with an NFC Forum Device in Listen Mode or has to be able to communicate with a responding device.

Poll Mode

Initial mode of an NFC Forum Device when it generates a carrier and polls for other devices. Defined in [ACTIVITY].

Record Type Definition (RTD)

An NFC Forum RTD defines NDEF payload data formats and their associated type names.

SC (Smart Card)

A contactless tag or smart card based on one of the technologies ([ISO/IEC_14443A], [ISO/IEC_14443B], or [JIS_X_6319-4]) compatible with those defined by the NFC Forum (NFC-A, NFC-B, or NFC-F).

Technology

A group of transmission parameters defined by the NFC standard that make up a complete communication protocol. These parameters include carrier frequency, bit rate, modulation scheme, bit level coding, frame format, protocol, and command set. They use the same carrier frequency (13.56 MHz), but use a different modulation scheme, bit level coding, and frame format, and may share the protocol and command set.

Type X Tag

A contactless tag or smart card supporting NDEF, which can be accessed by a device implementing the tag operation specifications.

Note: “X” must be replaced by “1”, “2”, “3”, “4”, “4A”, or “4B”.

Type Y Tag Platform

The underlying communication protocol of a Type X Tag according to [DIGITAL].

Note: When used in a document, “Y” must be replaced by “3”, “4A” or “4B”.

2. Terminology and Definitions

2.1 The NFC Forum Brand Promise

The NFC Forum Certification Program provides a level of assurance that a certified device implements a certain level of functionality and fulfills the NFC Forum certification criteria.

IMPORTANT NOTE: The NFC Forum Brand Promise refers to compliance with the appropriate NFC Forum specifications and does not guarantee interoperability.

2.2 Technology Definitions

In this document, the terms NFC-A, NFC-B, and NFC-F are used when referring to NFC Forum Devices. The terms ISO/IEC 14443A, ISO/IEC 14443B, and JIS X 6319-4 (also known as FeliCa) are used for the equivalent technologies that are not defined by the NFC Forum.

3. Architecture

This section details the extent to which the NFC Forum Brand Promise of the NFC Forum Certification Program applies to the different modes of operation. Mentioning a layer or referring to a specification in this section does not mean that all features of a particular layer or specification are mandatory.

3.1 Primary Mode of Operation

An NFC Forum Device shall be able to operate in Listen Mode as the default mode and also in Poll Mode as defined in [ACTIVITY].

3.2 NFC Forum Brand Promise for NFC Forum Peer Mode

An NFC Forum Device in NFC Forum Peer Mode shall support:

- Physical Layer (NFC-A, NFC-F) as defined by [ANALOG]
- Digital Layer (NFC-A, NFC-F) up to the device selection as defined by [DIGITAL] and [ACTIVITY]
- INITIATOR of NFC-DEP Protocol as defined by [DIGITAL]
- TARGET of NFC-DEP Protocol as defined by [DIGITAL]
- Logical Link Control Protocol as defined by [LLCP]
- Service Discovery Protocol
- Simple NDEF Exchange Protocol
- Capabilities to parse NDEF messages as specified in [NDEF]

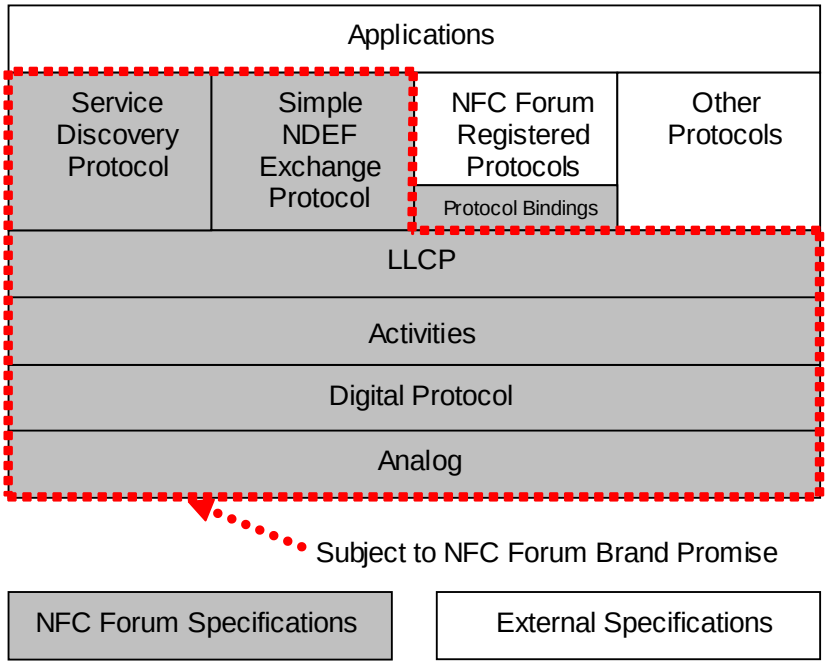

Figure 1: Device Architecture – NFC Forum Peer Mode

In Figure 1, the Applications block includes NDEF applications. NDEF applications may use the Simple NDEF Exchange Protocol [SNEP] to exchange NDEF data or may use one of the other protocols for this purpose.

3.3 NFC Forum Brand Promise for NFC Forum Reader/Writer Mode

An NFC Forum Device in NFC Forum Reader/Writer Mode shall support, as shown in Figure 2:

- Physical layer as defined by [ANALOG]
- All three technologies (NFC-F, NFC-A, NFC-B) up to the device selection as defined by [DIGITAL] and [ACTIVITY]
- Capabilities to read and write NFC Forum Type 1-4 Tags as defined by [T1TOP], [T2TOP], [T3TOP], and [T4TOP]
- Capabilities to parse NDEF messages as specified in [NDEF]

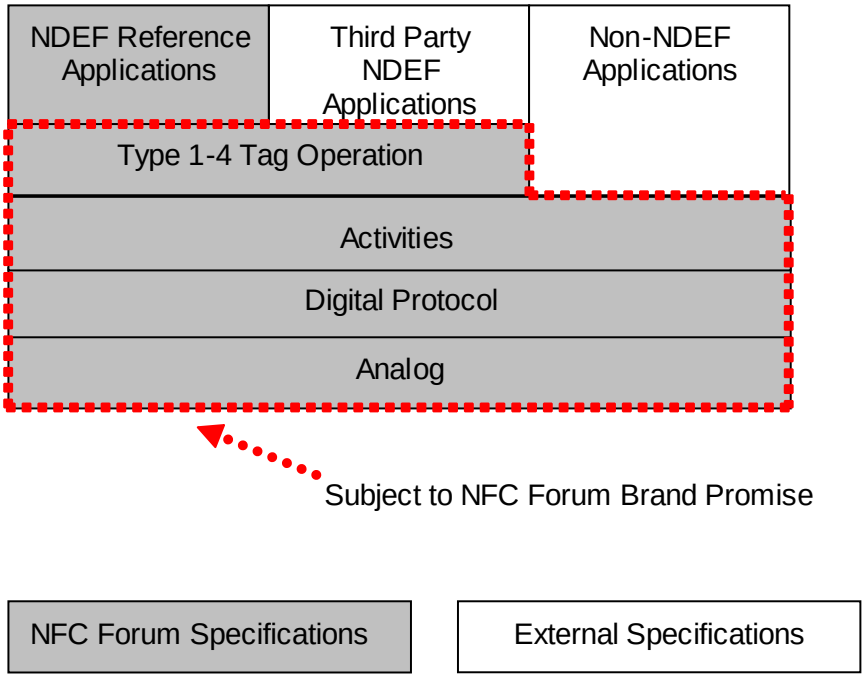

Figure 2: Device Architecture – NFC Forum Reader/Writer Mode

3.4 NFC Forum Brand Promise for NFC Forum Card Emulation Mode (Optional)

The NFC Forum Card Emulation Mode is optional for an NFC Forum Device. However, where NFC Forum Card Emulation Mode is supported, the NFC Forum Device shall provide RF and protocol functionality (as defined in [ANALOG], [DIGITAL], and [ACTIVITY]) that enables the emulation of contactless card products.

The NFC Forum Brand Promise covers only emulation of Type 3 Tag Platform, Type 4A Tag Platform, and Type 4B Tag Platform as defined in [DIGITAL] and [ACTIVITY]. Tag Platform means the underlying communication protocol of the associated tag. In the scope of this

document, this is referred to as an emulation platform. The emulation platform and, therefore, NFC Forum Card Emulation Mode, excludes the application level (software and data).

Emulation of any other cards or tags is outside the scope of the NFC Forum Brand Promise.

With the emulation platform as defined above, the NFC Forum Brand Promise for NFC Forum Card Emulation Mode covers the device activation functionality and half-duplex communication. This functionality comes in addition to the device detection and collision detection already covered under [DIGITAL] and [ACTIVITY] in Listen Mode.

An NFC Forum Device supporting NFC Forum Card Emulation Mode must implement at least one emulation platform and may implement more than one emulation platform.

For each of the emulation platforms implemented and declared in the Implementation Conformance Statement (ICS), the NFC Forum ensures interoperability of the following functions, as shown in Figure 3:

- Physical layer as defined by [ANALOG]
- Device detection as defined by [DIGITAL] and [ACTIVITY]
- Collision detection and resolution as defined by [DIGITAL] and [ACTIVITY]
- Device activation as defined by [DIGITAL] and [ACTIVITY]
- Half-duplex communication as defined by [DIGITAL] and [ACTIVITY]
- Device de-activation, if applicable and as defined by [DIGITAL] and [ACTIVITY]

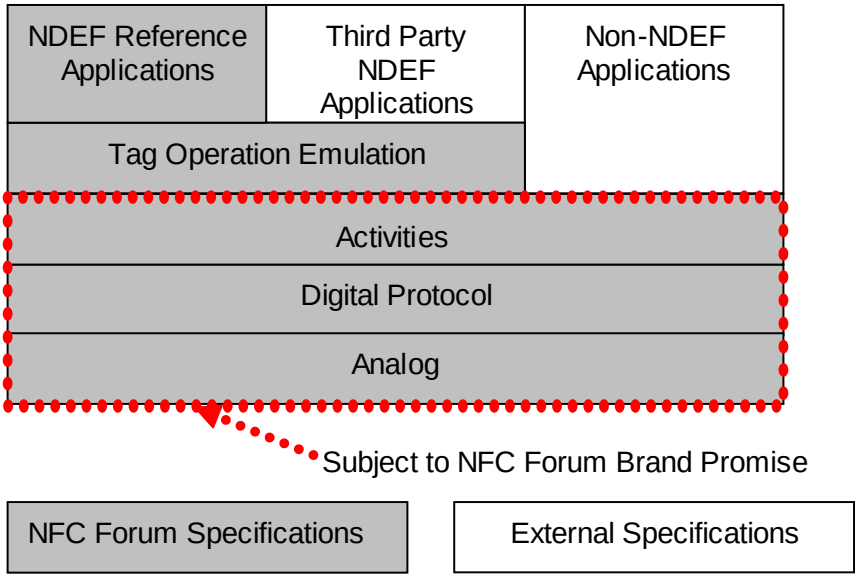

Figure 3: Device Architecture – NFC Forum Card Emulation Mode (Optional)

4. Requirements for NFC Forum Compliant Devices

The requirements for an NFC Forum Device are listed in the following sections:

- General Requirements (see Table 1): Defines general capabilities of NFC-Forum-compliant devices
- RF Requirements (see Table 2): Defines common performance requirements (for example, Operating Volume)
- Requirements for NFC Forum Peer Mode (see Table 3): Defines in detail the capabilities of NFC-Forum-compliant devices in NFC Forum Peer Mode
- Requirements for NFC Forum Reader/Writer Mode (see Table 4): Defines in detail the capabilities of NFC–Forum-compliant devices in NFC Forum Reader/Writer Mode
- Requirements for NFC Forum Card Emulation Mode (Optional) (see Table 5): Defines in detail the capabilities of NFC Forum Devices in NFC Forum Card Emulation Mode

4.1 General Requirements

Table 1: General Requirements

GEN No.	General Requirement	Remark
GEN-1	An NFC Forum Device SHALL be able to communicate in NFC Forum Peer Mode and SHALL be able to communicate in NFC Forum Reader/Writer Mode and MAY be able to communicate in NFC Forum Card Emulation Mode.	See Sections 4.3, 4.4, and 4.5.
GEN-2	An NFC Forum Device SHALL have a Poll Mode and a Listen Mode.	
GEN-3	An NFC Forum Device SHALL be capable of detecting any NFC Forum Tag (potentially containing an NDEF message) or another NFC Forum Device.	
GEN-3.1	An NFC Forum Device in Poll Mode SHALL detect an NFC Forum Tag or an NFC Forum Device in Peer Mode within 5 seconds of the tag or device being brought into the Operating Volume.	This is not a requirement to force a device to always poll, but if the device is polling, this requirement applies. This requirement applies to the digital protocol layer.
GEN-4	An NFC Forum Device SHALL be able to poll for all technologies—NFC-A, NFC-B, and NFC-F.	
GEN-5	An NFC Forum Device SHALL achieve a minimum operating range.	See Section 4.2.
GEN-6	An NFC Forum Device SHALL detect if multiple NFC Forum Devices and NFC Forum Tags respond to a poll command. There is no requirement to identify each responding device.	

GEN No.	General Requirement	Remark
GEN-7	NDEF data produced by an NFC Forum Device SHALL be well-formed.	According to [NDEF].
GEN-8	An NFC Forum Device that is capable of consuming particular NDEF data SHALL accept the same NDEF data in any well-formed NDEF message.	"Consuming" means that the upper layers of the stack or the application itself will process the data (message in the NDEF message) and use it if it is meaningful. If it is not meaningful (content or size-wise), it will either ignore it or generate some kind of error message. The error message to the user should indicate that the information is meaningless to the application (for example, "not valid content").

GEN-9	An NFC Forum Device must set the parameters to disable the support of advanced protocol features, as follows:
	• NFC-A
	  • In the RATS command, the NFC Forum Device in Poll Mode MUST set FSDI equal to 8h.
	  • In response to the RATS command, the NFC Forum Device in Listen Mode MUST set the following to 0b:
	  • Bits b7 to b5 and b3 to b1 of TA(1)
	  • Bit b5 of TC(1)
	• NFC-B
	  • In the ALLB_REQ and SENSB_REQ commands, the NFC Forum Device in Poll Mode MUST set bits b5 and b6 to 0b.
	  • In the SENSB_RES response, the NFC Forum Device in Listen Mode MUST set the following to 0b:
	  • Bits b7 to b5 and b3 to b1 of the Bit_Rate_Capability field
	  • Bits b3 and b2 of the Protocol_Type field
	  • Bit b4 of the ADC field
	In the ATTRIB command, the NFC Forum Device in Poll Mode must set bits b5 to b8 and b3 to b4 of Param 1 to 0b.
		Support for the advanced protocol features as described in [DIGITAL] publication will be allowed when the necessary specifications are developed.

GEN No.	General Requirement	Remark

	• NFC-F
	  • The NFC Forum Device in Poll Mode must set RC in the POLL_REQ Command equal to '00'h or '01'h.
	  • The NFC Forum Device in Listen Mode must exclude RD bytes from the response to a POLL_REQ Command with RC set to a value different from '00'h or' 01'h.	

4.2 RF Requirements

Table 2: RF Requirements

RF No.	RF Requirement	Remark
RF-1	An NFC Forum Device SHALL be capable of exchanging data with another NFC Forum Device or an NFC Forum Tag within a well-defined Operating Volume.	The Operating Volume will be defined by [ANALOG]. The intention is that the definition of the Operating Volume will provide an operating range of 15mm.

4.3 Requirements for NFC Forum Peer Mode

Table 3: Requirements for NFC Forum Peer Mode

P2P No.	P2P Requirement	Remark
P2P-1	Two NFC Forum Devices SHALL be able to communicate in Peer Mode to exchange data.	
P2P-1.1	An NFC Forum Device in Peer Mode SHALL be able to exchange data as initiator in passive communication mode using at least one of the following bit rates: 106, 212, or 424 kbit/s.	
P2P-1.2	An NFC Forum Device in Peer Mode SHALL be able to exchange data at 106, 212, and 424 kbit/s as the target in passive communication mode.	
P2P-1.3	An NFC Forum Device SHALL support payload sizes up to and including 254 bytes. The definition of payload is according to NFC-DEP Protocol as defined by [DIGITAL].	
P2P-2	An NFC Forum Device in Peer Mode SHALL support LLCP.	

P2P No.	P2P Requirement	Remark
P2P-3	In Peer Mode, two NFC Forum Devices SHALL be capable of exchanging NDEF Data as defined by [SNEP].	

4.4 Requirements for NFC Forum Reader/Writer Mode

Table 4: Requirements for NFC Forum Reader/Writer Mode

RW No.	Reader/Writer Mode Requirement	Remark
RW-1	An NFC Forum Device SHALL be capable of reading NDEF data structures from all NFC Forum Tag Types when a single tag is present in the Operating Volume.	
RW-1.1	An NFC Forum Device SHALL be capable of reading NDEF data structures of an NFC Forum Type 1 Tag.	
RW-1.2	An NFC Forum Device SHALL be capable of reading NDEF data structures of an NFC Forum Type 2 Tag.	
RW-1.3	An NFC Forum Device SHALL be capable of reading NDEF data structures of an NFC Forum Type 3 Tag.	
RW-1.3.1	An NFC Forum Device reading an NFC Forum Type 3 Tag SHALL support payload sizes up to 253 bytes and SHALL support a bit rate of 212kbit/s. The definition of payload is according to [DIGITAL] for Type 3 Tag Platform.	
RW-1.4	An NFC Forum Device SHALL be capable of reading NDEF data structures of an NFC Forum Type 4 Tag.	
RW-1.4.1	An NFC Forum Device reading an NFC Forum Type 4 Tag SHALL support 256 data bytes within the response APDU, a payload size of 254 bytes, and a bit rate of 106kbit/s. The definition of data bytes is used in accordance with [T4TOP] and payload is used in accordance with [DIGITAL].	256 bytes is the maximum amount of data that can be read by a command APDU.
RW-2	An NFC Forum Device SHALL be capable of writing NDEF data structures to all NFC Forum Tag Types when a single tag is present in the Operating Volume.	
RW-2.1	An NFC Forum Device SHALL be capable of writing NDEF data structures to an NFC Forum Type 1 Tag.	
RW-2.2	An NFC Forum Device SHALL be capable of writing NDEF data structures to an NFC Forum Type 2 Tag.	
RW-2.3	An NFC Forum Device SHALL be capable of writing NDEF data structures to an NFC Forum Type 3 Tag.	

RW No.	Reader/Writer Mode Requirement	Remark
RW-2.3.1	An NFC Forum Device writing NDEF data to an NFC Forum Type 3 Tag SHALL support payload sizes up to 253 bytes and SHALL support a bit rate of 212kbit/s. The definition of payload is according to [DIGITAL] for Type 3 Tag Platform.	
RW-2.4	An NFC Forum Device SHALL be capable of writing NDEF data structures to an NFC Forum Type 4 Tag.	
RW-2.4.1	An NFC Forum Device writing NDEF data to an NFC Forum Type 4 Tag SHALL support 255 data bytes within the command APDU, a payload size of 254 bytes, and a bit rate of 106kbit/s. The definition of data bytes is used in accordance with [T4TOP] and payload is used in accordance with [DIGITAL].	255 bytes is the maximum amount of data that can be written by a command APDU.

4.5 Requirements for NFC Forum Card Emulation Mode (Optional)

The implementation of Card Emulation Mode is optional. However, if Card Emulation Mode is implemented and claimed in the ICS, then it must conform to the following requirements.

Table 5: Requirements for NFC Forum Card Emulation Mode (Optional)

CE No.	Card Emulation Mode Requirement (Optional)	Remarks
CE-1	If Card Emulation Mode is implemented on an NFC Forum Device, at least one of the following technologies SHALL be supported: NFC-A (PICC), NFC-B (PICC), or NFC-F (PICC).	
CE-1.1	If card emulation according to NFC-A (PICC) is implemented, the NFC Forum Device SHALL be compliant to the Type 4A Tag Platform as per [DIGITAL] and [ACTIVITY].	
CE-1.2	If card emulation according to NFC-B (PICC) is implemented, the NFC Forum Device SHALL be compliant to the Type 4B Tag Platform as per [DIGITAL] and [ACTIVITY].	
CE-1.3	If card emulation according to NFC-F (PICC) is implemented, the NFC Forum Device SHALL be compliant to the Type 3 Tag Platform as per [DIGITAL] and [ACTIVITY].	

NOTE In NFC Forum Card Emulation Mode, no requirements are specified for tag emulation to exchange NDEF data between NFC Forum Devices.

A. Use Cases (Informative)

Two broad categories of use cases were considered in identifying the requirements:

- Those in which the communication protocols are wholly defined by the NFC Forum
- Those in which an NFC Forum Device communicates with another device using compatible legacy protocols

The use cases are described in the sections below and illustrated in the accompanying figures.

Figure 4 describes the conventions used in the figures below to indicate the roles of the different actors in the use cases. Note that this usage is confined to the illustrations of the use cases in this document and does not indicate the general usage of the marks.

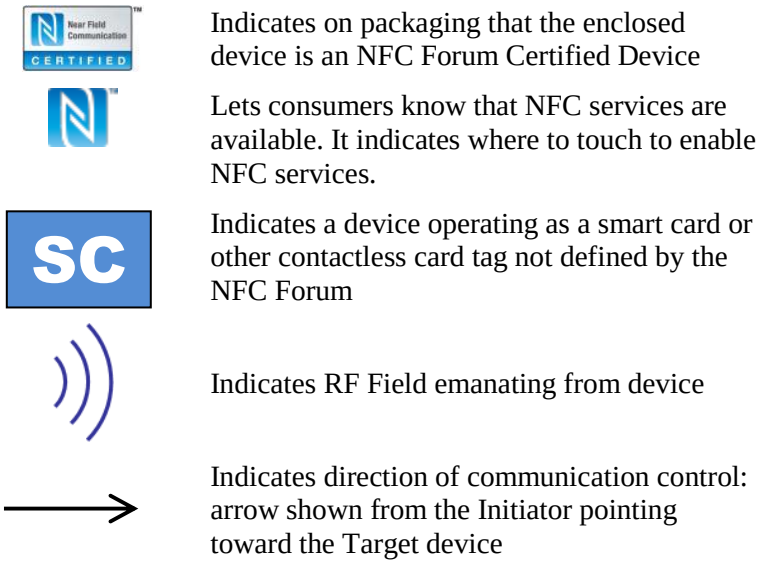

Figure 4: Conventions for Use Case Diagrams

A.1 NFC Forum Communication Use Cases

The use cases defined in this section deal with communication between an NFC Forum Device and another actor as defined below. Interoperability up to a certain level is ensured by the NFC Forum Certification Program.

1. An NFC Forum Device is able to communicate with another NFC Forum Device in NFC Forum Peer Mode. This is illustrated in Figure 5.

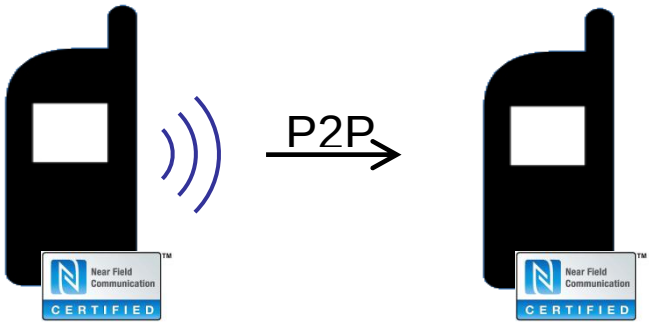

Figure 5: Two NFC Forum Devices Communicating in NFC Forum Peer Mode

2. An NFC Forum Device in NFC Forum Reader/Writer Mode is able to communicate with an external NFC Forum Tag. NFC Forum Tags were specified by the NFC Forum and specifications on how to operate these tags have been made available. This is illustrated in Figure 6.

Figure 6: NFC Forum Device in NFC Forum Reader/Writer Mode Communicating with an NFC Forum Tag

3. An NFC Forum Device in NFC Forum Reader/Writer Mode is able to communicate with an NFC Forum Device emulating an NFC Forum Tag. This is illustrated in Figure 7.

Figure 7: NFC Forum Device in NFC Forum Reader/Writer Mode Communicating with an NFC Forum Device in NFC Forum Card Emulation Mode

A.2 Legacy Communication Use Cases

The use cases defined in this section deal with communication between an NFC Forum Device and legacy systems that are not defined by the NFC Forum. However, parts of the implementation

of an NFC Forum Device, like the RF layer or lower layer protocols, are also used by legacy infrastructure. The NFC Forum takes into account that requirements for some parts of the protocol stack may impact the usability of NFC Forum Devices within existing contactless infrastructure, and therefore NFC Forum takes requirements of legacy systems into consideration when testing parts of the protocol stack that are also relevant for legacy systems.

An NFC Forum Device in Reader/Writer mode can communicate to an external smart card (or other contactless card or tag) that is supporting applications and protocols defined outside the NFC Forum. The smart card system is based on one of the technologies (ISO/IEC 14443A, ISO/IEC 14443B, and/or JIS X 6319-4) compatible with those defined by the NFC Forum (NFC-A, NFC-B, and/or NFC-F). This is illustrated in Figure 8.

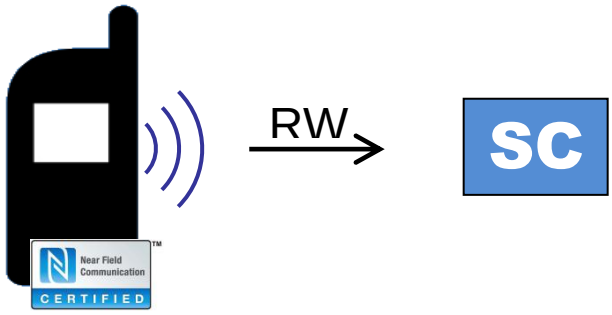

Figure 8: NFC Forum Device in NFC Forum Reader/Writer Mode Communicating with a SC

1. An NFC Forum Device in Reader/Writer mode can communicate with another NFC Forum Device emulating a smart card (or other contactless card or tag) that supports applications and protocols defined outside of the NFC Forum. The smart card system is based on a technology defined by the NFC Forum (NFC-A, NFC-B, and/or NFC-F). This is illustrated in Figure 9.

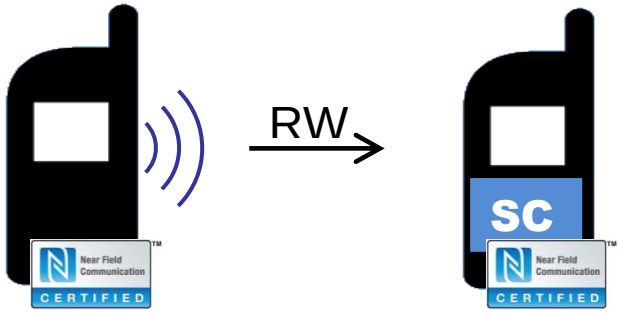

Figure 9: NFC Forum Device in NFC Forum Reader/Write Mode Communicating with an NFC Forum Device Emulating a SC

2. An NFC Forum Device emulating a smart card (or other contactless card or tag) can be accessed by an external reader/writer terminal. The smart card system is based on one of the technologies (ISO/IEC 14443A, ISO/IEC 14443B, and/or JIS X 6319-4) compatible with those defined by the NFC Forum (NFC-A, NFC-B, and/or NFC-F). This is illustrated in Figure 10.

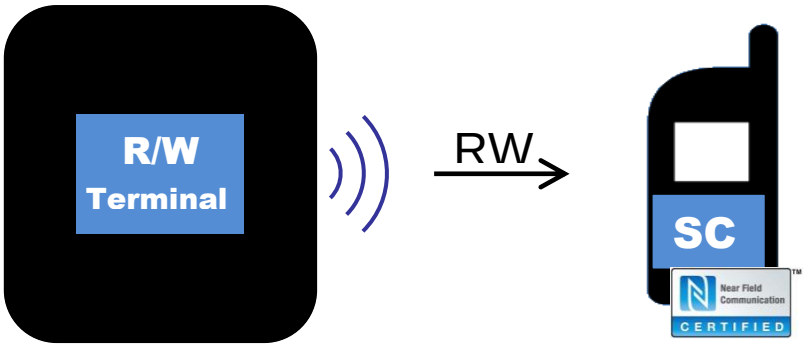

Figure 10: Reader/Writer Terminal and NFC Forum Device Emulating a SC

B. Requirements and Technical Specifications Cross Reference (Informative)

Table 6 shows the cross references between the requirements in this document and the relevant set of NFC Forum technical specifications.

Table 6: Cross Reference

Number			Relation	ANALOG	ACTIVITY	DIG PROT	LLCP	SNEP	NDEF	TxT OP	Comment
GEN											
GEN-1			P2P RW CE (Opt.)								
GEN-2					X						Device must be able to switch between modes. RF Collision Avoidance.
GEN-3					X						Detect is part of Profile definitions.
	GEN-3.1										
GEN-4					X	X					Technology Detection Activity
GEN-5			RF								
GEN-6					X						Combination of Technology Detection & Collision Resolution Activities
GEN-7									X		
GEN-8									X		
GEN-9						X					
RF											
RF-1				X							
P2P											
P2P-1			P2P-1.1 P2P-1.2		X						Combination of Technology Detection & Collision Resolution Activities
	P2P-1.1					X					
	P2P-1.2				X	X					
	P2P-1.3					X					

Number			Relation	ANALOG	ACTIVITY	DIG PROT	LLCP	SNEP	NDEF	TxT OP	Comment
P2P-2							X				
P2P-3								X			
RW											
RW-1			RW-1.1 RW-1.2 RW-1.3 RW-1.4		X						Combination of Technology Detection & Collision Resolution Activities
	RW-1.1					X				X	
	RW-1.2					X				X	
	RW-1.3					X				X	
		RW-1.3.1				X				X	
	RW-1.4					X				X	
		RW-1.4.1				X				X	
RW-2			RW-2.1 RW-2.2 RW-2.3 RW-2.4		X						Combination of Technology Detection & Collision Resolution Activities
	RW-2.1					X				X	
	RW-2.2					X				X	
	RW-2.3					X				X	
		RW-2.3.1				X				X	
	RW-2.4					X				X	
		RW-2.4.1				X				X	
CE											
CE-1			CE-1.1 CE-1.2 CE-1.3		X						Entrance to state machine.
	CE-1.1				X	X					
	CE-1.2				X	X					
	CE-1.3				X	X					

C. Revision History

The following table outlines the revision history of the NFC Forum Device Requirements document.

Table 7: Revision History

Document Name	Revision and Release Date	Status	Change Notice	Supersedes
NFC Forum Device Requirements	1.0, October, 2010	Release Version	First release	All drafts, including High Level Conformance Requirements document and MLOI document
NFC Forum Device Requirements	1.0, April 2012	Release Version	Update images in Appendix A.	Version 1.0, October 2010