Research & Vehicle Technology
"Infotainment Systems Product Development"

Feature – NFC Entry & Start InterfaceClient

Infotainment Subsystem Part Specific Specification (SPSS)

Version 1.1
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FORD CONFIDENTIAL

Revision History

Date	Ver	Notes	
January 29, 2021	1.0	Initial Release	
July 9, 2021	1.1		
		STR-681966/B-Terminology and Abbreviations	MBORREL4: Added BUN, removed PaaK
		STR-830044/B-Architectural Design	MBORREL4: Added REQ-421702, REQ-421704. Added boundary diagram and REQ-423121
		STR-915628/A-Boundary Diagram	MBORREL4: New STR
		NFCES-BD-REQ-423121/A-NFCES Boundary Diagram	MBORREL4: New req.
		NFCES-CLD-REQ-421702/A-NFCES Server2	MBORREL4: New class for BUN
		NFCES-CLD-REQ-421704/A-NFCES OnBoardClient2	MBORREL4: New class for BCM
		STR-681969/B-Physical Mapping of Classes	MBORREL4: Added NFCServer2, NFCESOnBoardClient2
		STR-814874/B-Logical Signal Mapping	MBORREL4: Updated table
		NFCES-IIR-REQ-403768/B-NFCESInterfaceClient_Rx	MBORREL4: Added REQ-421705-707
		MD-REQ-421705/A-VehicleStartKeySource_St	MBORREL4: New req.
		MD-REQ-421706/A-VehicleStartKeyType_St	MBORREL4: New req.
		MD-REQ-421707/A-VehicleStartKeyIndex_St	MBORREL4: New req.
		MD-REQ-404939/B-DigitalKeyList_Rsp	MBORREL4: Added CAK to DeviceType, PairingID to Vector. Changed signal name
		MD-REQ-404941/B-DigitalKey_Rsp	MBORREL4: Updated Request Status. Changed signal name
		MD-REQ-404938/B-DigitalKeyList_Rq	MBORREL4: Changed signal name
		MD-REQ-404940/B-DigitalKey_Rq	MBORREL4: Replaced FESN with PairingID. Changed signal name
		STR-830046/B-General Requirements	MBORREL4: Added REQ-421701
		NFCES-REQ-362366/B-Feature Configuration - InterfaceClient	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
		NFCES-REQ-403966/B-CCS & NFC Fleet Restrictions	MBORREL4: Added 'Acceptance Criteria', added CCS entity values
		NFCES-REQ-403965/B-NFC Fleet Restriction Behavior	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
		NFCES-REQ-403964/B-NFC Powermode Conditions	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
		NFCES-REQ-403967/B-Pairing NFC Key to Enhanced Memory Profile	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
		NFCES-REQ-421701/A-NFCESServer2 Configuration	MBORREL4: New req.
		NFCES-UC-REQ-404010/B-User Enters NFC Key Screen	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
		NFCES-UC-REQ-404011/B-NFC Key List Updated while NFC Screen Open	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
		NFCES-REQ-403969/B-Requesting the NFC Key List	MBORREL4: Added 'Acceptance Criteria', added PairingID, added clarification on screen entry. Changed signal name
		NFCES-REQ-403970/B-Sorting and Displaying the NFC Key List	MBORREL4: Added 'Acceptance Criteria', corrected KeyStatus. Changed signal name
		NFCES-REQ-406217/B-Waiting for NFCESServer Response	MBORREL4: Added 'Acceptance Criteria', changed signal name

NFCES-REQ-406218/B-Failed NFCESServer Response	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-405551/B-Displaying NFC Key Statuses	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-REQ-405552/B-NFC Key List Character Limit	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-REQ-403971/B-Updating the NFC Key List While Being Viewed	MBORREL4: Added 'Acceptance Criteria', changed signal name
STR-831459/B-Activity Diagrams	MBORREL4: Removed placeholder REQ-403919. Added REQ-362250
NFCES-ACT-REQ-362250/A-Requesting NFC Key List	MBORREL4: New req.
NFCES-SD-REQ-403920/B-Requesting NFC Key List	MBORREL4: Updated title, added diagram
STR-831447/B-Use Cases	MBORREL4: Added REQ-421722
NFCES-UC-REQ-404000/B-Add NFC Key – User Approves Request	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-404001/B-Add NFC Key – User Denies Request	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-404002/B-Add NFC Key – Connectivity Lost before Add Request Sent	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-404003/B-Add NFC Key – Connectivity Lost after Add Request Sent	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-404004/B-Add NFC Key – MyKey Active	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-404005/B-Delete NFC Key – User Approves Request	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-404006/B-Delete NFC Key – User Denies Request	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-404007/B-Delete NFC Key – Connectivity Lost before Delete Request Sent	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-404008/B-Delete NFC Key – Connectivity Lost after Delete Request Sent	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-404009/B-Delete NFC Key – MyKey Active	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-405389/B-Add/Delete NFC Key – Connectivity Lost before Selecting Button	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-405390/B-Master Reset Performed - Retail Vehicle	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-405391/B-Master Reset Performed - Fleet Vehicle	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-UC-REQ-421722/A-Master Reset Disabled - NFC Key used to start vehicle	MBORREL4: New req.
STR-831446/B-Requirements	MBORREL4: Added REQ-421723, REQ-421724, REQ-421725
NFCES-REQ-406219/B-NFC Key Failed Response	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403982/B-Add NFC Key – User Input	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-REQ-403983/B-Add NFC Key – User Input Enable/Disable	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403989/B-Add NFC Key – FriendlyName	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.

NFCES-REQ-403984/B-Add NFC Key – NFCESInterfaceClient Request	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403990/B-Add NFC Key – Progress Screen Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403991/B-Add NFC Key – Add Request Sent Approval Required Notification	MBORREL4: Updated to require approval, added 'Acceptance Criteria', changed signal name
NFCES-REQ-421723/A-Add NFC Key – Add Request Sent Approval Not Required Notification	MBORREL4: New req.
NFCES-REQ-405015/B-Add NFC Key – Waiting for Tap Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-405016/B-Add NFC Key –Tap Timeout Failure Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-404985/B-Add NFC Key – Already Pending Failure Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403985/B-Add NFC Key – Key Already Paired Failure Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403987/B-Add NFC Key – Storage Full Failure Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-405017/B-Add NFC Key – Key Not Programmed Failure Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-405018/B-Add NFC Key – No Connectivity Failure Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-405019/B-Add NFC Key – System Failure Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403973/B-Add NFC Key – Final Success Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403974/B-Add NFC Key – Final System Failure Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403975/B-Add NFC Key – Final Denied Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403976/B-Add NFC Key – Final Expired Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403988/B-Add/Delete NFC Key – No Connectivity Notification	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-REQ-403986/B-Add/Delete NFC Key – MyKey Active Notification	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-REQ-403992/B-Delete NFC Key – User Input	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.
NFCES-REQ-403993/B-Delete NFC Key – User Input Enable/Disable	MBORREL4: Updated 4th bullet. Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403997/B-Delete NFC Key – Deleting Starting NFC Key	MBORREL4: Updated per newly added signals. Added 'Acceptance Criteria'
NFCES-REQ-421724/A-Disable Master Reset per Starting NFC Key	MBORREL4: New req.
NFCES-REQ-403994/B-Delete NFC Key – User Input Confirmation	MBORREL4: Added 'Acceptance Criteria' only, no requirement changes made. Same content as previous Rev.

NFCES-REQ-403995/B-Delete NFC Key – NFCESInterfaceClient Request	MBORREL4: Updated for PairingID, added 'Acceptance Criteria', changed signal name
NFCES-REQ-403996/B-Delete NFC Key – Delete Request Sent Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403981/B-Delete NFC Key – Already Pending Failure Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-405020/B-Delete NFC Key – No Connectivity Failure Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-405021/B-Delete NFC Key – System Failure Notification	MBORREL4: Added 'Acceptance Criteria', changes signal name
NFCES-REQ-403977/B-Delete NFC Key – Final Success Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403978/B-Delete NFC Key – Final System Failure Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403979/B-Delete NFC Key – Final Denied Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403980/B-Delete NFC Key – Final Expired Notification	MBORREL4: Added 'Acceptance Criteria', changed signal name
NFCES-REQ-403972/B-Persisting NFC Notifications	MBORREL4: Added 7 day max and 'Acceptance Criteria', changed signal name
NFCES-REQ-421725/A-Request Key List upon Final Notifications	MBORREL4: New req.
STR-831449/B-Activity Diagrams	MBORREL4: Removed placeholder REQ-403913. Added REQ-424659, REQ-424759
NFCES-ACT-REQ-424659/A-Add Digital Key	MBORREL4: New req.
NFCES-ACT-REQ-424759/A-Delete Digital Key	MBORREL4: New req.
STR-831450/B-Sequence Diagrams	MBORREL4: Added REQ-362251
NFCES-SD-REQ-362251/A-Add Digital Key	MBORREL4: New req.
NFCES-SD-REQ-403914/B-Delete Digital Key	MBORREL4: Updated title, added diagram

Table of Contents

1   Overview

NFC Entry and Start feature enables customers to unlock, start their vehicle, etc. using an NFC-enabled device (e.g. key card or smartphone) as a vehicle key. To unlock the vehicle, the customer holds their NFC-enabled device near an exterior NFC reader of the vehicle. To authorize start and drive-away, the customer holds their NFC-enabled device near, or places it on, an interior NFC reader of the vehicle.

1.1   Terminology and Abbreviations

The following table lists terminologies that are used in this document along with a brief description.

Acronym	Description
BCM	Body Control Module
BUN	Bluetooth Low Energy, Ultra Wide Band, Near field Communication Module
CAN	Controller Area Network
CCC	Car Connectivity Consortium
DID	Data Identifier
ECG	Enhanced Communication Gateway
FTCP	Ford Telematics Communication Protocol
GPS	Global Positioning System
HMI	Human Machine Interface
IVIC	In Vehicle Infotainment Connectivity
NFAM	Near Field Auxiliary Module
NFC	Near Field Communication
PEPS	Passive Entry, Passive Start
SoA	Service Oriented Architecture
TCU	Telematics Control Unit

2 Architectural Design

2.1 Boundary Diagram

2.1.1 NFCES-BD-REQ-423121/A-NFCES Boundary Diagram
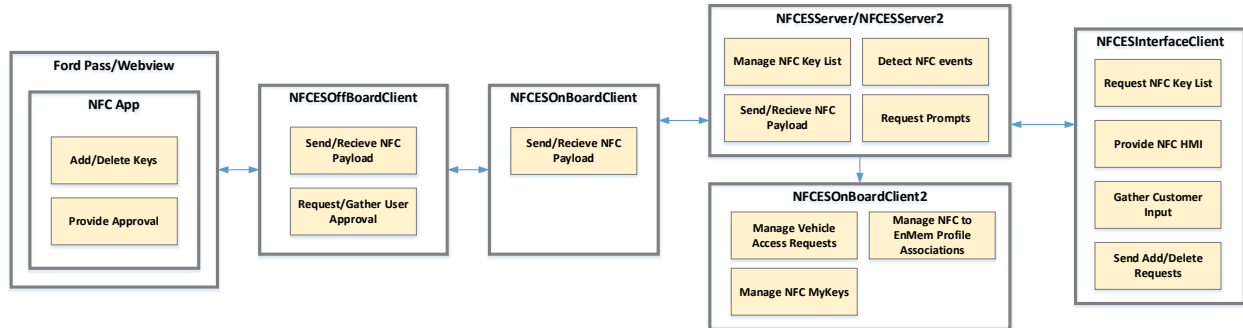
2.2 NFCES-CLD-REQ-362235/A-NFCES Server

The NFC Entry and Start Server (NFCESServer) is responsible for the tasks listed below:
- Transmitting NFC Key List to NFCESInterfaceClient
- Receiving NFC Key List request from NFCESInterfaceClient
- Receiving add/delete key requests from NFCESInterfaceClient & NFCESOnBoardClient
- Transmitting NFC Event information to the NFCESOnBoardClient
- Managing authorized NFC Key List
- Detecting NFC Key taps and events

Please review the implementation guide/ block diagram to locate the NFCESServer class.

2.3 NFCES-CLD-REQ-421702/A-NFCES Server2

The NFC Entry and Start Server2 (NFCESServer2) is responsible for the tasks listed below:
- Transmitting NFC Key List to NFCESInterfaceClient
- Receiving NFC Key List request from NFCESInterfaceClient
- Receiving add/delete key requests from NFCESInterfaceClient & NFCESOnBoardClient
- Transmitting NFC Event information to the NFCESOnBoardClient
- Managing authorized NFC Key List
- Detecting NFC Key taps and events

Note: NFCESServer2 & NFCESServer are mutually exclusive.

Please review the implementation guide/ block diagram to locate the NFCESServer2 class.

2.4 NFCES-CLD-REQ-362234/A-NFCES InterfaceClient

The NFC Entry and Start InterfaceClient (NFCESInterfaceClient) is responsible for the tasks listed below:
- Receiving NFC Key List from NFCESServer
- Transmitting NFC Key List request to NFCESServer
- Transmitting add/delete key requests to NFCESServer
- Providing an NFC Key List Management HMI to user
- Displaying feature relevant notifications

Please review the implementation guide/ block diagram to locate the NFCESInterfaceClient class.

2.5   NFCES-CLD-REQ-362238/A-NFCES OnBoardClient

The NFC Entry and Start OnBoardClient (NFCESOnBoardClient) is responsible for the tasks listed below:
- Receiving commands from NFCESOffBoardClient
- Translating and transmitting NFCESOffBoardClient commands to the NFCESServer
- Receiving request/status information from NFCESServer
- Translating NFC request/status information and transmitting alerts to the NFCESOffBoardClient

Please review the implementation guide/ block diagram to locate the NFCESOnBoardClient class.

2.6   NFCES-CLD-REQ-421704/A-NFCES OnBoardClient2

The NFC Entry and Start OnBoardClient2 (NFCESOnBoardClient2) is responsible for the tasks listed below:
- Transmitting NFC key source, type, and index status information to the NFCESInterfaceClient

Please review the implementation guide/ block diagram to locate the NFCESOnBoardClient2 class.

2.7   NFCES-CLD-REQ-362237/A-NFCES OffBoardClient

The NFC Entry and Start OffBoardClient (NFCESOffBoardClient) is responsible for the tasks listed below:
- Transmitting commands to the NFCESServer
- Receiving alerts from NFCESOnBoardClient
- Request user authorization for add/delete key requests

Please review the implementation guide/ block diagram to locate the NFCESOffBoardClient class.

2.8   NFCES-CLD-REQ-362236/A-NFCES OffBoardGateway

The NFC Entry and Start OffBoardGateway (NFCESOffBoardGateway) is responsible for the tasks listed below:
- Transmitting data/messages between the NFCESOnBoardClient and the NFCESOffBoardClient

Please review the implementation guide/ block diagram to locate the NFCESOffBoardGateway class.

2.9   Physical Mapping of Classes

The table below shows an example of how the logical classes that make up the NFC Enter & Start feature may be mapped into physical modules. This mapping example is specific to the FNV3 architecture and does not necessarily carryover to other carlines or vehicle architectures.

Logical Class	Physical Module (ECU)
NFCESServer	NFAM
NFCESServer2	BUN
NFCESInterfaceClient	APIM
NFCESOnBoardClient	ECG
NFCESOnBoardClient2	BCM
NFCESOffBoardClient	NGSDN/Ford Cloud
NFCESOffBoardGateway	TCU

2.10 Logical Signal Mapping

The CAN signals mentioned throughout this document shall refer to the CAN signal's logical name. The logical names shall be mapped to their actual CAN signal names. Please use the table below to perform the mapping. The InfoCAN database file is the master file for the actual CAN signal names. Note: There may be cases where the actual CAN signal name is used in this documentation.

Logical Name	CAN Signal Name

IgnitionStatus_St	Ignition_Status
GearLeverPosition_St	GearLvrPos_D_Actl
VehicleSpeed_St	Veh_V_ActlEng
IgnKeyType_D_Actl	IgnKeyType_D_Actl
CarMode_St	LifeCycMde_D_Actl
DigitalKeyList_Rq	See TP SPSS
DigitalKeyList_Rsp	See TP SPSS
DigitalKey_Rq	See TP SPSS
DigitalKey_Rsp	See TP SPSS
VehicleStartKeySource_St	VehStrtKeySrc_D_Stat
VehicleStartKeyType_St	VehStrtKeyType_D_Stat
VehicleStartKeyIndex_St	VehStrtKeyIndx_No_Actl

2.11 NFCESInterfaceClient Interface

2.11.1 NFCES-IIR-REQ-403768/B-NFCESInterfaceClient_Rx

2.11.1.1 MD-REQ-027149/A-IgnitionStatus_St (TcSE ROIN-225464-1)
Message Type: Status

Signal used to indicate ignition state.

Name	Literals	Value	Description
Type	-	-	Indicates ignition state
	Unknown	0x0	
	Off	0x1	
	Accessory	0x2	
	Run	0x4	
	Start	0x8	
	Invalid	0xF	

2.11.1.2 MD-REQ-028253/A-GearLeverPosition_St (TcSE ROIN-282103-1)
Message Type: Status

Status used to indicate the current gear selected.

Name	Literals	Value	Description
Type	-	-	Used to indicate current gear selected.
	Park	0x0	
	Reverse	0x1	
	Neutral	0x2	
	Drive	0x3	
	Sport_DriveSport	0x4	
	Low	0x5	
	First	0x6	
	Second	0x7	
	Third	0x8	
	Fourth	0x9	
	Fifth	0xA	

	Sixth	0xB	
	Undefined_Treat_as_Fault	0xC	
	Undefined_Treat_as_Fault1	0xD	
	Unknown_Position	0xE	
	Fault	0xF	

2.11.1.3 MD-REQ-014025/A-VehicleSpeed_St (TcSE ROIN-223023-1)

Message Type: Status

Status used to indicate vehicle speed.

Name	Literals	Value	Description
Type	-	-	Indicates vehicle speed. Unit: kph Resolution:0.01 Offset:0
	kph	0x0 to 0xFFFF	

2.11.1.4 MD-REQ-238455/A-IgnKeyType_D_Actl

Message Type: Status

This signal represents the MyKey system status and is provided to all affected system components to configure their local modes.

Name	Literals	Value	Description
IgnKeyType_D_Actl	-	-	Type of key that is in the ignition
	KeyReadInProgress	0x0	Key(s) will be read now
	KeyInIgnStandardKey	0x1	Admin (full) mode
	KeyInIgnMyKey	0x2	MyKey restricted mode
	Key_Not_Prgrm_Read_Failure	0x3	Key not programmed
	Unknown	0xE	Disable MyKey System mode
	Invalid	0xF	Initial value

2.11.1.5 MD-REQ-086348/A-CarMode_St

Message Type: Status

Name	Literals	Value	Description
Type	-	-	Defines what car mode state is active.
	Normal	0x0	
	Factory	0x1	
	NotUsed	0x2	
	Transportation	0x3	

2.11.1.6 MD-REQ-421705/A-VehicleStartKeySource_St

Message Type: Status

Signal used to indicate the key source used to start the vehicle.

Name	Literals	Value	Description
Type	-	-	Key source used to start vehicle.

Null	0x0	
Digital_Key	0x1	
Peps_and_Ikt	0x2	
Legacy_Paak	0x3	

2.11.1.7 MD-REQ-421706/A-VehicleStartKeyType_St

Message Type: Status

Signal used to indicate the key type used to start the vehicle.

Name	Literals	Value	Description
Type	-	-	Key type used to start vehicle.
	Null	0x0	
	User	0x1	
	Factory	0x2	
	Not_Used	0x3	

2.11.1.8 MD-REQ-421707/A-VehicleStartKeyIndex_St

Message Type: Status

Signal used to indicate the key index used to start the vehicle.

Name	Literals	Value	Description
Type	-	-	Key index used to start vehicle.
	unitless	0x00-0xFF	0-255

2.11.1.9 MD-REQ-404939/B-DigitalKeyList_Rsp

Message Type: Response

This signal is used to provide the Digital Key List to the requestor.

Name	Literals	Value	Description
List Size	-	-	The provided list size
	Inactive	0x00	
	List Size 1	0x01	
	List Size 2	0x02	
	…		
	List Size 254	0xFE	
	No Entry	0xFF	
Total Number Of Keys Available	-	-	The total number of keys available in the list (paired keys)
	Invalid	0x00	
	1 Key Available	0x01	
	2 Keys Available	0x02	
	…		
	254 Keys Available	0xFE	
	No Entry	0xFF	

Additional Key Storage Available	-	-	Indicator for whether there is additional storage available for new keys
	No	0x00	
	Yes	0x01	
	Reserved	0x02-0xFF	
Vector			Array (1…N) of record (IndexNumber, DeviceType, KeyType, KeyStatus, FriendlyName, FESN, PairingID) with TotalNumberOfKeysAvailable defined in ListSize
IndexNumber	-	-	
	Inactive	0x00	
	Index 1	0x01	
	Index 2	0x02	
	…	…	
	Index 255	0xFF	
DeviceType	-	-	Describes Device type
	NFC Card	0x00	
	Digital Key	0x01	
	CAK	0x02	
	Reserved	0x03 - 0xFF	
KeyType	-	-	Describes Key type
	Factory	0x00	
	Retail User	0x01	
	Fleet User	0x02	
	Reserved	0x03 – 0xFF	
KeyStatus	-	-	Describes Key status
	Pending Add	0x00	
	Pending Delete	0x01	
	Added/Confirmed	0x02	
	Reserved	0x03 – 0xFF	
FESN	-	-	Data array that consists of textual information up to 8 characters in length, plus end of string
FriendlyName	-	-	Data array that consists of textual information up to 64 characters in length, plus end of string
PairingID	-	-	Data array that consists of textual information up to 8 characters in length, plus end of string

2.11.1.10 MD-REQ-404941/B-DigitalKey_Rsp

Message Type: Response

This signal is used to provide add/delete status to the NFCESInterfaceClient.

Name	Literals	Value	Description
OpCode	-	-	Describes which opcode is being requested
	Reserved	0x00	
	AddKey	0x01	
	DeleteKey	0x02	
	DeleteAllKeys	0x03	
	Reserved	0x04 - 0xFF	
Request Status	-	-	Describes the status of the request
	Reserved	0x00	
	Final Success	0x01	
	Final Rejected	0x02	
	Final Timeout	0x03	
	Final System Error	0x04	
	Success - Request Sent - Approval Required	0x05	
	Rejected - No space available	0x06	
	Rejected - Already pending	0x07	
	Rejected - Already programmed	0x08	
	Rejected - Tap timeout	0x09	
	Rejected - Not programmed to vehicle	0x0A	
	Rejected - System Error	0x0B	
	Waiting for Card Tap	0x0C	
	Rejected - No Connectivity	0x0D	
	Success - Request Sent - No Approval Required	0x0E	
	Reserved	0x0F - 0xFF	
FESN	-	-	Data array that consists of textual information up to 8 characters in length, plus end of string.
FriendlyName	-	-	Data array that consists of textual information up to 64 characters in length, plus end of string

2.11.1.11 MD-REQ-406216/A-SdnConnectionStatusBroadcast

This API is used to receive the SDN Connection Status from FCI. The FCI publishes this status via this API.

Method Type	OnChange
QoS Level	Default

Retained	No				
R/O	**Name**	**Type**	**Literals**	**Value**	**Description**
Request					
-	-	-	-	-	N/A
Response					
O	InterfaceType	Enum	-	-	
			Connection_Interface_Unknown	0x0	
			Connection_TCU_Cell	0x1	
			Connection_TCU_Wifi	0x2	
			Connection_SYNC_Wifi	0x3	
			Connection_SYNC_SDL	0x4	
O	SdnConnStatus	Enum	-	-	
			SDN_Connected	0x0	
			SDN_Disconnected	0x1	

2.11.2 NFCES-IIR-REQ-403769/A-NFCESInterfaceClient_Tx

2.11.2.1 MD-REQ-404938/B-DigitalKeyList_Rq

Message Type: Request

This signal is used to request the Digital Key List from the NFCESServer.

Name	**Literals**	**Value**	**Description**
OpCode	-	-	Describes which opcode is being requested
	Reserved	0x00	
	Read	0x01	
	Reserved	0x02 - 0xFF	
NumberOfItems	-	-	The number of items being requested
	Invalid	0x00	
	1	0x01	
	2	0x02	
	…		
	254	0xFE	
	No Entry	0xFF	
StartIndex	-	-	The position in the list from which the request shall start
	Invalid	0x00	
	1	0x01	
	2	0x02	
	…		
	254	0xFE	
	No Entry	0xFF	

2.11.2.2 MD-REQ-404940/B-DigitalKey_Rq

Message Type: Request

This signal is used to request an add/delete of a Digital Key from the NFCESServer.

Name	Literals	Value	Description
OpCode	-	-	Describes which opcode is being requested
	Reserved	0x00	
	AddKey	0x01	
	DeleteKey	0x02	
	DeleteAllKeys	0x03	
	Reserved	0x04 - 0xFF	
FriendlyName	-	-	Data array that consists of textual information up to 64 characters in length, plus end of string
PairingID	-	-	Data array that consists of textual information up to 8 characters in length, plus end of string

3 General Requirements

3.1 NFCES-REQ-362366/B-Feature Configuration - InterfaceClient

The NFCESInterfaceClient shall have a configurable parameter/DID to allow the NFC Key feature to be enabled/disabled.
- When the parameter indicates that NFC Key is enabled, all the functionality and signals defined in this SPSS shall be supported.
- When the parameter indicates that NFC Key is disabled, none of the functionality defined in this SPSS shall be supported.
  - The default value for this parameter shall be Disabled.

Acceptance Criteria
The configurable parameter being set to 'enabled' will result in the relevant HMI screens/menu/popups being shown or presented upon their respective triggers. The relevant interfaces and functions will also become active/initiated. The configurable parameter being set to 'disabled' will result in none of the above.

3.2 NFCES-REQ-403966/B-CCS & NFC Fleet Restrictions

The NFCESInterfaceClient shall monitor the CCS entity 'NFC_Fleet (FEATURE106)' to determine whether to perform the NFC Fleet Restrictions:
- When the bSAllow of CCS entity NFC_Fleet (ID 106, type 1) is Disabled, the NFC Fleet Restrictions shall be disabled.
- When the bSAllow of CCS entity NFC_Fleet (ID 106, type 1) is Enabled, the NFC Fleet Restrictions shall be enabled.

Acceptance Criteria
The CCS entity being set to 'enabled' will result in NFC Fleet behaviors becoming active. The CCS entity being set to 'disabled' will result in NFC Fleet behaviors becoming inactive.

3.3 NFCES-REQ-403965/B-NFC Fleet Restriction Behavior

If the NFC Fleet Restrictions are enabled per REQ-403966, the NFCESInterfaceClient shall:
- Disable all notifications related to successfully adding or deleting devices from the vehicle
- Disable "Add Key" functionality
- Disable "Delete Key" functionality

Acceptance Criteria
NFC Fleet behavior being active will result in the removal of the Add Key button, Delete Key button on the HMI, and the removal of all popups related to successfully adding or deleting NFC devices from the vehicle.

3.4 NFCES-REQ-403964/B-NFC Powermode Conditions

The NFCESInterfaceClient shall only allow the NFC feature functionality when the following preconditions are met:
- IgnitionStatus_St = "(0x4) Run" AND GearLeverPosition_St = "(0x0) Park"
  OR
- VehicleSpeed_St <= Driver Restrictions Threshold

Acceptance Criteria
When the listed preconditions are not met, the NFC Key menu will not be available, and/or the functionality provided by this feature will not be made available.

3.5 NFCES-REQ-403967/B-Pairing NFC Key to Enhanced Memory Profile

The NFCESInterfaceClient shall allow a customer to pair one NFC key to one Enhanced Memory Profile. Refer to the Enhanced Memory SPSS for full details.

Acceptance Criteria
When Enhanced Memory and NFC Key are supported/configured ON at the same time, the Enhanced Memory menu shall allow the pairing of an NFC device to a Personal Profile.

3.6 NFCES-REQ-421701/A-NFCESServer2 Configuration

The NFCESInterfaceClient shall have a configurable parameter/DID to determine whether NFCESServer2 is present on the vehicle.
- When the parameter indicates that NFCESServer2 is Present, the TP interfaces (listed below) sent to/received by the NFCESServer2 shall be used.

- When the parameter indicates that NFCESServer2 is Not Present, the TP interfaces (listed below) sent to/received by the NFCESServer shall be used.
  - The default value for this parameter shall be 'Not Present.'

TP Interfaces:
- REQ-404939-DigitalKeyList_Rsp
- REQ-404941-DigitalKey_Rsp
- REQ-404938-DigitalKeyList_Rq
- REQ-404940-DigitalKey_Rq

Acceptance Criteria

When NFCESServer2 is present, the TP interfaces shall be sent to it instead of the NFCCESServer. The two Servers are mutually exlusive, and this req. dictates which message to send/receive TP signals on.

4   Functional Definition

4.1   NFCES-FUN-REQ-403918/A-NFC Key List

4.1.1   Use Cases

4.1.1.1   NFCES-UC-REQ-404010/B-User Enters NFC Key Screen

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met
Scenario Description	User starts vehicle with any key Using NFCESInterfaceClient, user navigates to NFC Key List NFCESInterfaceClient requests NFC Key List from NFCESServer
Post-conditions	NFCESInterfaceClient displays NFC Key List
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.1.1.2   NFCES-UC-REQ-404011/B-NFC Key List Updated while NFC Screen Open

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity
Scenario Description	User currently viewing NFC Key List Vehicle receives addition/deletion approval from NFCESOffBoardClient NFCESServer sends update to NFCESInterfaceClient NFCESInterfaceClient requests NFC Key List from NFCESServer
Post-conditions	NFCESInterfaceClient displays updated NFC Key List
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.1.2   Requirements

4.1.2.1   NFCES-REQ-403969/B-Requesting the NFC Key List

When the user enters the NFC Key List screen (either from a different domain/menu, or from any of the Add/Delete Key screens), the NFCESInterfaceClient shall request the NFC Key List using DigitalKeyList_Rq. The NFCESInterfaceClient shall request the entire list by specifying NumberOfItems = 254, and StartIndex = 1.

Example
- 10 NFC keys are currently created and the NFCESInterfaceClient requests the entire list.
- NFCESInterfaceClient uses DigitalKeyList_Rq and sets the following:
  - OpCode = Read
  - NumberOfItems = 254
  - StartIndex = 1
- NFCESServer responds with DigitalKeyList_Rsp and includes the following:
  - List Size = List Size 10
  - Total Number Of Keys Available = 10 Keys Available
  - Additional Key Storage Available = Yes
  - IndexNumber = Index 1

- o DeviceType = NFC Card/Digital Key/CAK
- o KeyType = Factory/Retail/Fleet
- o KeyStatus = PendingAdd/PendingDelete/AddedConfirmed
- o FESN = {FESN of key 1}
- o FriendlyName = {Name of key 1}
- o PairingID = {Pairing ID of key 1}
- o
- o IndexNumber = Index 2
- o DeviceType = NFC Card/Digital Key/CAK
- o KeyType = Factory/Retail/Fleet
- o KeyStatus = PendingAdd/PendingDelete/AddedConfirmed
- o FESN = {FESN of key 2}
- o FriendlyName = {Name of key 2}
- o PairingID = {Pairing ID of key 2}
- o
- o …
- o
- o IndexNumber = Index 10
- o DeviceType = NFC Card/Digital Key/CAK
- o KeyType = Factory/Retail/Fleet
- o KeyStatus = PendingAdd/PendingDelete/AddedConfirmed
- o FESN = {FESN of key 10}
- o FriendlyName = {Name of key 10}
- o PairingID = {Pairing ID of key 10}

Acceptance Criteria

Entering the NFC Key screen will result in a request for the NFC Key list (resulting in the NFC Key list being shown to the user).

4.1.2.2 NFCES-REQ-403970/B-Sorting and Displaying the NFC Key List

Upon receiving the NFC key list DigitalKeyList_Rsp with CES = Final Result – Success, the NFCESInterfaceClient shall:
- Store the list temporarily, in order to sort/display
  - o The stored list shall be discarded upon exiting the NFC Key screen
- Sort the list in alphanumerical order based on the FriendlyName
  - o Factory Cards shall be shown/grouped first, followed by added/non-factory cards
  - o If the FriendlyName was not populated in the response, the FESN shall be used in its place
- Display the sorted list
  - o If the NFCESInterfaceClient screen size limits the amount of NFC Keys that can be displayed, a scroll bar shall be provided, and the remainder of the list shall be shown upon scrolling (the NFCESInterfaceClient shall not request for new list data upon scrolling)

The NFCESInterfaceClient shall display the NFC FriendlyName, FESN, and NFC Key Status (when "Pending") of each key. If the NFC FriendlyName field was not populated in DigitalKeyList_Rsp, the NFCESInterfaceClient shall display the FESN in its place.

Acceptance Criteria

The NFC Key list will be shown to the user in alphanumerical order based on the FriendlyName (and grouped based on type), with a scroll bar if needed.

4.1.2.3 NFCES-REQ-406217/B-Waiting for NFCESServer Response

While waiting for the NFCESServer to transmit its response, or while the NFCESServer transmits DigitalKeyList_Rsp with CES = Intermediate Result – Wait, the NFCESInterfaceClient shall display a popup indicating that it is 'updating.' The user shall not be able to click on the list of NFC keys until the screen has finished updating, at which point the updating popup shall close.

Acceptance Criteria

Receiving a wait response will result in an 'updating' popup to be shown to the user, preventing the user from interacting with the NFC Key list.

4.1.2.4   NFCES-REQ-406218/B-Failed NFCESServer Response

If the NFCESServer responds with DigitalKeyList_Rsp with a CES = Final Result – Fail, the NFCESInterfaceClient shall again request the NFC key list via DigitalKeyList_Rq (per REQ-403969). If the second attempt also fails, no list shall be populated, and an error notification shall be displayed.

Acceptance Criteria
Receiving a failed response will result in a retry request. Receiving another failed response will result in an empty NFC Key list and an 'error' popup.

4.1.2.5   NFCES-REQ-405551/B-Displaying NFC Key Statuses

The NFCESInterfaceClient shall:
- Enable/not grey-out any NFC Key whose KeyStatus = "(0x02) Added/Confirmed"
- Disable/grey-out any NFC Key whose KeyStatus = "(0x00) Pending Add" or "(0x01) Pending Delete"

Acceptance Criteria
Receiving a keystatus of 'added/confirmed' will result in that NFC Key list item being enabled/not greyed-out. Receiving a keystatus of 'pending add' or 'pending delete' will result in that NFC Key list item being disabled/greyed-out.

4.1.2.6   NFCES-REQ-405552/B-NFC Key List Character Limit

The NFCESInterfaceClient shall limit the number of NFC FriendlyName characters that shall be displayed. The maximum NFC key name characters shall be equal to the maximum number of allowable characters to be displayed that is listed in the following requirements (refer to the Bluetooth Connectivity SPSS and Media Player SPSS documents):
1. BTC-FUR-REQ-194148-Device Friendly Name
2. MP-FUR-REQ-205797-USB Device Name
3. MP-FUR-REQ-205793-Unnamed USB Device

Acceptance Criteria
The NFC Key FriendlyName received will be shown/limited to the number of allowable characters in the referenced requirements.

4.1.2.7   NFCES-REQ-403971/B-Updating the NFC Key List While Being Viewed

If the user is viewing the NFC Key List screen when the NFCESServer transmits DigitalKey_Rsp with any of the below Request Statuses, the NFCESInterfaceClient shall request the NFC key list via DigitalKeyList_Rq (per REQ-403969). Once the NFCESInterfaceClient receives the updated list, it shall update the display to show the new information. If the NFCESInterfaceClient is in the process of updating the NFC Key list, the NFCESInterfaceClient shall display a popup indicating that it is 'updating.' The user shall not be able to click on the NFC key list until the list has finished updating, at which point the popup shall close. The NFCESInterfaceClient shall disregard any updates from the NFCESServer regarding the NFC key list if the user has left the NFC Key List screen.

If the user is NOT in the NFC Key List screen when the NFCESServer transmits DigitalKey_Rsp with any of the below Request Statuses, the NFCESInterfaceClient shall not request the list as described above (the latest list is always requested when the user enters the NFC Key List screen).

DigitalKey_Rsp
- Request Status = "0x01: Final Success", "0x02: Final Rejected",
         "0x03: Final Timeout", "0x04: Final System Error"

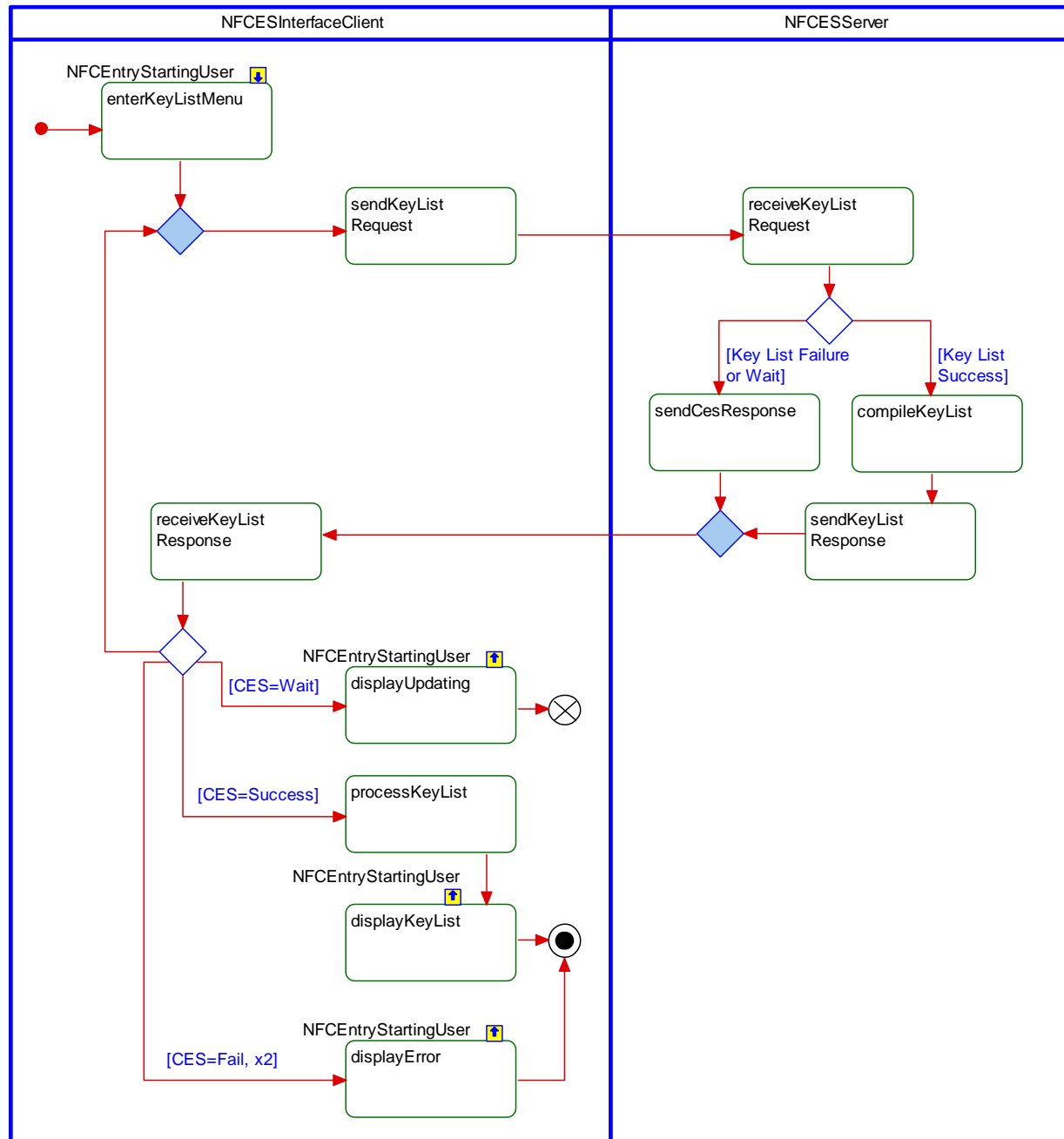| **Acceptance Criteria** |
|---|
| Receiving the indicated responses (when viewing the NFC Key list) will result in the list being updated/refreshed. |

4.1.3 White Box View

4.1.3.1 *Activity Diagrams*

4.1.3.1.1 NFCES-ACT-REQ-362250/A-Requesting NFC Key List
Activity Diagram

4.1.3.2 Sequence Diagrams

4.1.3.2.1 NFCES-SD-REQ-403920/B-Requesting NFC Key List
Sequence Diagram

:NFCEntryStartingUser   :NFCESInterfaceClient   :NFCESServer

Input()

enterKeyListMenu()

sendKeyListRequest()

DigitalKeyList_Rq(OpCode=Read, NumberOfItems=254, StartIndex=1)

receiveKeyListRequest()

alt [Key List Failure or Wait]

sendCesResponse()

DigitalKeyList_Rsp(CES=Wait OR Fail)

[Key List Success]

compileKeyList()

sendKeyListResponse()

DigitalKeyList_Rsp(CES=Success, ListSize, TotalNumberOfKeys, AdditionalKeyStorage, Vector)

receiveKeyListResponse()

'Vector' refers to the array representing the key list. See REQ-404939

alt [CES = Wait]

displayUpdating()

UpdateView()

[CES = Success]

processKeyList()

displayKeyList()

UpdateView()

[CES = Fail]

sendKeyListRequest()

DigitalKeyList_Rq(OpCode=Read, NumberOfItems=254, StartIndex=1)

receiveKeyListRequest()

alt [Key List Failure or Wait]

sendCesResponse()

DigitalKeyList_Rsp(CES=Wait OR Fail)

[Key List Success]

compileKeyList()

sendKeyListResponse()

DigitalKeyList_Rsp(CES=Success, ListSize, TotalNumberOfKeys, AdditionalKeyStorage, Vector)

receiveKeyListResponse()

alt [CES = Wait]

displayUpdating()

UpdateView()

[CES = Success]

processKeyList()

displayKeyList()

UpdateView()

[CES = Fail]

displayError()

UpdateView()

4.2 NFCES-FUN-REQ-403912/A-Add/Delete NFC Key

4.2.1 Use Cases

4.2.1.1 NFCES-UC-REQ-404000/B-Add NFC Key – User Approves Request

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity User has Ford/Lincoln mobile app installed on their smart device Users smart device has network connectivity User has a key to the vehicle that is not a MyKey User has a physical NFC key that has not been programmed to the vehicle
Scenario Description	User starts vehicle with any key User selects Add NFC key on NFCESInterfaceClient NFCESInterfaceClient prompts user to enter name for new key User enters key name using NFCESInterfaceClient NFCESInterfaceClient prompts user to scan new NFC key User places new NFC key near interior NFC reader NFCESInterfaceClient displays message indicating that key add request has been sent to vehicle owner for approval User receives request to add NFC key in Ford/Lincoln mobile app User approves request NFCESOffBoardClient transmits command to vehicle
Post-conditions	NFCESInterfaceClient displays approval confirmation NFC Key is now paired to vehicle and may be used for entry
List of Exception Use Cases	Add NFC Key – User Denies Request Add NFC Key – Connectivity Lost before Add Request Sent Add NFC Key – Connectivity Lost after Add Request Sent
Interfaces	CAN, HMI, FTCP

4.2.1.2 NFCES-UC-REQ-404001/B-Add NFC Key – User Denies Request

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity User has Ford/Lincoln mobile app installed on their smart device Users smart device has network connectivity User has a key to the vehicle that is not a MyKey User has a physical NFC key that has not been programmed to the vehicle
Scenario Description	User starts vehicle with any key User selects Add NFC key on NFCESInterfaceClient NFCESInterfaceClient prompts user to enter name for new key User enters key name using NFCESInterfaceClient NFCESInterfaceClient prompts user to scan new NFC key User places new NFC key near interior NFC reader NFCESInterfaceClient displays message indicating that key add request has been sent to vehicle owner for approval User receives request to add NFC key in Ford/Lincoln mobile app

	User denies request NFCESOffBoardClient transmits command to vehicle
Post-conditions	NFCESInterfaceClient displays request denied confirmation NFC Key is not paired to vehicle
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.1.3 NFCES-UC-REQ-404002/B-Add NFC Key – Connectivity Lost before Add Request Sent

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity User has Ford/Lincoln mobile app installed on their smart device Users smart device has network connectivity User has a key to the vehicle that is not a MyKey User has a physical NFC key that has not been programmed to the vehicle
Scenario Description	User starts vehicle with any key User selects Add NFC key on NFCESInterfaceClient NFCESInterfaceClient prompts user to enter name for new key User enters key name using NFCESInterfaceClient Vehicle loses Network Connectivity
Post-conditions	NFC Key Add process is aborted NFCESInterfaceClient displays message indicating that network connectivity is required to add a key. NFC Key is not paired to vehicle
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.1.4 NFCES-UC-REQ-404003/B-Add NFC Key – Connectivity Lost after Add Request Sent

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity User has Ford/Lincoln mobile app installed on their smart device Users smart device has network connectivity User has a key to the vehicle that is not a MyKey User has a physical NFC key that has not been programmed to the vehicle
Scenario Description	User starts vehicle with any key User selects Add NFC key on NFCESInterfaceClient NFCESInterfaceClient prompts user to enter name for new key User enters key name using NFCESInterfaceClient NFCESInterfaceClient prompts user to scan new NFC key User places new NFC key near interior NFC reader NFCESInterfaceClient displays message indicating that key add request has been sent to vehicle owner for approval User receives request to add NFC key in Ford/Lincoln mobile app Vehicle loses Network Connectivity OR Users smart device loses Network Connectivity

Post-conditions	NFC Key Add process times out and is aborted Notification is sent to users smart device indicating that key add command was not delivered successfully (if users device has Network Connectivity) NFCESInterfaceClient displays message indicating that key add request has timed out NFC Key is not paired to vehicle
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.1.5   NFCES-UC-REQ-404004/B-Add NFC Key – MyKey Active

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity User starts the vehicle with a MyKey
Scenario Description	User selects Add NFC key on NFCESInterfaceClient
Post-conditions	NFCESInterfaceClient displays message indicating that the requested action is not permitted with a MyKey active
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.1.6   NFCES-UC-REQ-404005/B-Delete NFC Key – User Approves Request

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity User has Ford/Lincoln mobile app installed on their smart device Users smart device has network connectivity User has a key that can start the vehicle and it is not a MyKey or the key the user wants to delete
Scenario Description	User starts vehicle with a key other than the one they want to delete Using NFCESInterfaceClient, user navigates to NFC Key List and selects the "delete" option for the key they want to delete NFCESInterfaceClient confirms user intent ("are you sure?") NFCESInterfaceClient send key delete request to NFCESServer User receives notification of deletion approval request on their smart device User approves deletion request NFCESOffBoardClient transmits command to vehicle
Post-conditions	Vehicle deletes pairing with specified key NFCESInterfaceClient displays success message
List of Exception Use Cases	Delete NFC Key – User Denies Request Delete NFC Key – Connectivity Lost before Delete Request Sent Delete NFC Key – Connectivity Lost after Delete Request Sent
Interfaces	CAN, HMI, FTCP

4.2.1.7 NFCES-UC-REQ-404006/B-Delete NFC Key – User Denies Request

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity User has Ford/Lincoln mobile app installed on their smart device Users smart device has network connectivity User has a key that can start the vehicle and it is not a MyKey or the key the user wants to delete
Scenario Description	User starts vehicle with a key other than the one they want to delete Using NFCESInterfaceClient, user navigates to NFC Key List and selects the "delete" option for the key they want to delete NFCESInterfaceClient confirms user intent ("are you sure?") NFCESInterfaceClient send key delete request to NFCESServer User receives notification of deletion approval request on their smart device User denies deletion request NFCESOffBoardClient transmits command to vehicle
Post-conditions	Vehicle does not delete pairing with specified key NFCESInterfaceClient displays request denied confirmation
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.1.8 NFCES-UC-REQ-404007/B-Delete NFC Key – Connectivity Lost before Delete Request Sent

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity User has Ford/Lincoln mobile app installed on their smart device Users smart device has network connectivity User has a key that can start the vehicle and it is not a MyKey or the key the user wants to delete
Scenario Description	User starts vehicle with a key other than the one they want to delete Using NFCESInterfaceClient, user navigates to NFC Key List and selects the "delete" option for the key they want to delete NFCESInterfaceClient confirms user intent ("are you sure?") Vehicle loses Network Connectivity
Post-conditions	NFC Key Delete process is aborted NFCESInterfaceClient displays message indicating that network connectivity is required to delete a key. NFC Key remains paired to vehicle
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.1.9 NFCES-UC-REQ-404008/B-Delete NFC Key – Connectivity Lost after Delete Request Sent

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized

	Vehicle has network connectivity
	User has Ford/Lincoln mobile app installed on their smart device
	Users smart device has network connectivity
	User has a key that can start the vehicle and it is not a MyKey or the key the user wants to delete
Scenario Description	User starts vehicle with a key other than the one they want to delete
	Using NFCESInterfaceClient, user navigates to NFC Key List and selects the "delete" option for the key they want to delete
	NFCESInterfaceClient confirms user intent ("are you sure?")
	NFCESInterfaceClient send key delete request to NFCESServer
	User receives notification of deletion approval request on their smart device
	User approves deletion request
	Vehicle loses Network Connectivity OR Users smart device loses Network Connectivity
Post-conditions	NFC Key Delete process times out and is aborted
	Notification is sent to users smart device indicating that key delete command was not delivered successfully (if users device has Network Connectivity)
	NFCESInterfaceClient displays message indicating that key delete request has timed out
	NFC Key remains paired to vehicle
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.1.10 NFCES-UC-REQ-404009/B-Delete NFC Key – MyKey Active

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met
	Vehicle is authorized
	Vehicle has network connectivity
	User starts the vehicle with a MyKey
Scenario Description	Using NFCESInterfaceClient, user navigates to NFC Key List and selects the "delete" button for the key they want to delete
Post-conditions	NFCESInterfaceClient displays message indicating that the requested action is not permitted with a MyKey active
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.1.11 NFCES-UC-REQ-405389/B-Add/Delete NFC Key – Connectivity Lost before Selecting Button

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met
	Vehicle is authorized
	Vehicle has network connectivity
	User has Ford/Lincoln mobile app installed on their smart device
	Users smart device has network connectivity
	User has a key to the vehicle that is not a MyKey
Scenario Description	User starts vehicle with any key
	Vehicle loses or has no Network Connectivity

	User attempts to select Add NFC key or Delete NFC Key on NFCESInterfaceClient
Post-conditions	NFC Key Add/Delete process is not started NFCESInterfaceClient displays message indicating that network connectivity is required to add or delete a key.
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.1.12 NFCES-UC-REQ-405390/B-Master Reset Performed - Retail Vehicle

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity Vehicle is not subscribed to Fleet Services Vehicle has previously added NFC Keys
Scenario Description	User starts vehicle Using NFCESInterfaceClient, user navigates to Reset menu and selects the "Master Reset" button
Post-conditions	NFCESInterfaceClient performs a Master Reset NFCESServer deletes all NFC Keys
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.1.13 NFCES-UC-REQ-405391/B-Master Reset Performed - Fleet Vehicle

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity Vehicle is subscribed to Fleet Services Vehicle has previously added NFC Keys
Scenario Description	User starts vehicle Using NFCESInterfaceClient, user navigates to Reset menu and selects the "Master Reset" button
Post-conditions	NFCESInterfaceClient performs a Master Reset NFCESServer does not delete NFC Keys
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.1.14 NFCES-UC-REQ-421722/A-Master Reset Disabled - NFC Key used to start vehicle

Actors	NFC User, NFCESInterfaceClient, NFCESServer
Pre-conditions	Powermode conditions are met Vehicle is authorized Vehicle has network connectivity Vehicle is not subscribed to Fleet Services Vehicle has previously added NFC Keys
Scenario Description	User starts vehicle with NFC User Key Using NFCESInterfaceClient, user navigates to Reset menu
Post-conditions	Master Reset button is disabled
List of Exception Use Cases	
Interfaces	CAN, HMI, FTCP

4.2.2 Requirements

4.2.2.1 NFCES-REQ-406219/B-NFC Key Failed Response

The NFCESInterfaceClient shall display a notification indicating that a system error has occurred when DigitalKey_Rsp is received from the NFCESServer with CES = Final Result – Fail. When this occurs, no other values are received beyond the CES.

Acceptance Criteria
Receiving the indicated response will result in a 'System Error' popup being displayed.

4.2.2.2 NFCES-REQ-403982/B-Add NFC Key – User Input

The NFCESInterfaceClient shall provide a user interface (button/graphic) to allow the addition/creation of an NFC Key. This user interface shall not be show or made available when the NFCESInterfaceClient is configured for Fleet.

Acceptance Criteria
An Add Key button will be present for a user to add an NFC Key (when not a fleet vehicle).

4.2.2.3 NFCES-REQ-403983/B-Add NFC Key – User Input Enable/Disable

The NFCESInterfaceClient shall enable (show, unhide, etc.) the Add NFC Key user interface (button/graphic) when the following are true:
- Ignition_Status = Run
- IgnKeyType_D_Actl != (0x2) KeyInIgnMyKey
- Vehicle has connectivity
- DigitalKeyList_Rsp last indicated that Additional Key Storage Available = "(0x01) Yes"

Acceptance Criteria
The Add Key button will only be made available to the user when the listed preconditions are met.

4.2.2.4 NFCES-REQ-403989/B-Add NFC Key – FriendlyName

The NFCESInterfaceClient shall prompt and provide the user a means to enter an NFC Key FriendlyName.

Acceptance Criteria
The user will be presented with a popup and means (ex. keyboard) to enter a FriendlyName for their NFC Key.

4.2.2.5 NFCES-REQ-403984/B-Add NFC Key – NFCESInterfaceClient Request

When permitted per REQ-403983, the NFCESInterfaceClient shall send DigitalKey_Rq to the NFCESServer when the user requests to add an NFC Key. The request shall include the below parameters:

DigitalKey_Rq
- Opcode = 0x01: AddKey
- FriendlyName = {Name of key}

Acceptance Criteria

A press of the Add Key button (when permitted) will result in the indicated request being sent.

4.2.2.6 NFCES-REQ-403990/B-Add NFC Key – Progress Screen Notification

When the DigitalKey_Rq is sent requesting an AddKey operation, the NFCESInterfaceClient shall display a progress notification indicating that the request is being sent (progress screen).

Acceptance Criteria

Sending the indicated request will result in a 'progress' popup being displayed.

4.2.2.7 NFCES-REQ-403991/B-Add NFC Key – Add Request Sent Approval Required Notification

The NFCESInterfaceClient shall display a notification indicating that the Add Key Request Requiring Approval has been successfully sent when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x05: Success - Request Sent - Approval Required
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in an 'Add Request Sent - Approval Required' popup being displayed.

4.2.2.8 NFCES-REQ-421723/A-Add NFC Key – Add Request Sent Approval Not Required Notification

The NFCESInterfaceClient shall display a notification indicating that the Add Key Request Not Requiring Approval has been successfully sent when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x0E: Success - Request Sent - No Approval Required
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in an 'Add Request Sent - Approval Not Required' popup being displayed.

4.2.2.9 NFCES-REQ-405015/B-Add NFC Key – Waiting for Tap Notification

The NFCESInterfaceClient shall display a notification instructing the user to tap their NFC Key when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x0C: Waiting for Card Tap
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in a 'Tap your NFC device' popup being displayed.

4.2.2.10 NFCES-REQ-405016/B-Add NFC Key –Tap Timeout Failure Notification

The NFCESInterfaceClient shall display a notification indicating that the tap time has elapsed when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x09: Rejected - Tap timeout
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria
Receiving the indicated response will result in a 'Tap Timed Out' popup being displayed.

4.2.2.11 NFCES-REQ-404985/B-Add NFC Key – Already Pending Failure Notification

The NFCESInterfaceClient shall display a notification indicating a pending NFC Key Add operation when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x07: Rejected - Already pending
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria
Receiving the indicated response will result in a 'Add Key Pending' popup being displayed.

4.2.2.12 NFCES-REQ-403985/B-Add NFC Key – Key Already Paired Failure Notification

The NFCESInterfaceClient shall display a notification indicating that the tapped NFC Key is already paired to the vehicle when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x08: Rejected - Already programmed
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria
Receiving the indicated response will result in a 'Key Already Paired' popup being displayed.

4.2.2.13 NFCES-REQ-403987/B-Add NFC Key – Storage Full Failure Notification

The NFCESInterfaceClient shall display a notification indicating a failed NFC Key Add operation due to storage full when DigitalKey_Rsp is received with the values below:

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x06: Rejected - No space available
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria
Receiving the indicated response will result in a 'Storage Full' popup being displayed.

4.2.2.14 NFCES-REQ-405017/B-Add NFC Key – Key Not Programmed Failure Notification

The NFCESInterfaceClient shall display a notification indicating that the tapped key is not programmed when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x0A: Rejected - Not programmed to vehicle
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria
Receiving the indicated response will result in a 'Key Not Programmed' popup being displayed.

4.2.2.15 NFCES-REQ-405018/B-Add NFC Key – No Connectivity Failure Notification

The NFCESInterfaceClient shall display a notification indicating a failed NFC Key Add operation due to no connectivity when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x0D: Rejected - No Connectivity
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria
Receiving the indicated response will result in a 'No Connectivity' popup being displayed.

4.2.2.16 NFCES-REQ-405019/B-Add NFC Key – System Failure Notification

The NFCESInterfaceClient shall display a notification indicating a failed NFC Key Add operation due to system error (on NFCESServer) when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x0B: Rejected - System Error
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria
Receiving the indicated response will result in a 'system error' popup being displayed.

4.2.2.17 NFCES-REQ-403973/B-Add NFC Key – Final Success Notification

The NFCESInterfaceClient shall display a notification indicating a successful NFC Key Add operation when DigitalKey_Rsp is received from the NFCESServer. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x01: Final Success
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria
Receiving the indicated response will result in a 'Successful Key Add' popup being displayed.

4.2.2.18 NFCES-REQ-403974/B-Add NFC Key – Final System Failure Notification

The NFCESInterfaceClient shall display a notification indicating a failed NFC Key Add operation due to system error (on NFCESOffBoardClient) when DigitalKey_Rsp is received from the NFCESServer. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp

- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x04: Final System Error
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in a 'System Error' popup being displayed.

4.2.2.19 NFCES-REQ-403975/B-Add NFC Key – Final Denied Notification

The NFCESInterfaceClient shall display a notification indicating a denied NFC Key Add operation when DigitalKey_Rsp is received from the NFCESServer. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x02: Final Rejected
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in a 'Denied Key Add' popup being displayed.

4.2.2.20 NFCES-REQ-403976/B-Add NFC Key – Final Expired Notification

The NFCESInterfaceClient shall display a notification indicating an expired NFC Key Add operation when DigitalKey_Rsp is received from the NFCESServer. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x01: AddKey
- Request Status = 0x03: Final Timeout
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in an 'Expired Key Add' popup being displayed.

4.2.2.21 NFCES-REQ-403988/B-Add/Delete NFC Key – No Connectivity Notification

The NFCESInterfaceClient shall display a notification indicating a failed NFC Key Add/Delete (whichever was requested) due to No Connectivity, when connectivity is lost and the Add/Delete button is pressed. Connectivity shall be obtained from FCI and shall be considered lost when:

SdnConnectionStatusBroadcast(
- InterfaceType = Connection_TCU_Cell
- SDNConnStatus= SDN_Disconnected)

Note: Loss of connectivity for this feature is in regards to the capability to send/receive FTCP, which is why only the 'Connection_TCU_Cell' interface type is considered.

Acceptance Criteria

Pressing the Add or Delete Key button when there is no connectivity (per listed interface) will result in a 'No Connectivity' popup being displayed.

4.2.2.22 NFCES-REQ-403986/B-Add/Delete NFC Key – MyKey Active Notification

The NFCESInterfaceClient shall display a notification indicating that a MyKey cannot be used to add/delete an NFC key, when IgnKeyType_D_Actl = (0x2) KeyInIgnMyKey and the user presses the Add or Delete NFC Key button.

Acceptance Criteria

Pressing the Add or Delete Key button when a MyKey is the active key (per listed interface) will result in a 'MyKey Cannot be Used' popup being displayed.

4.2.2.23 *NFCES-REQ-403992/B-Delete NFC Key – User Input*

The NFCESInterfaceClient shall provide a user interface (button/graphic) to allow the deletion/removal of an NFC Key. This user interface shall not be show or made available when the NFCESInterfaceClient is configured for Fleet.

Acceptance Criteria
A Delete Key button will be present for a user to delete an NFC Key (when not a fleet vehicle).

4.2.2.24 *NFCES-REQ-403993/B-Delete NFC Key – User Input Enable/Disable*

The NFCESInterfaceClient shall enable (show, unhide, etc.) the Delete NFC Key user interface (button/graphic) when the following are true:

- Ignition_Status = Run
- IgnKeyType_D_Actl != (0x2) KeyInIgnMyKey
- Vehicle has connectivity
- The NFC Key selected for deletion is not the one used to start the vehicle (see REQ-403997)
- DigitalKeyList_Rsp(KeyType != (0x00) Factory) for the selected NFC Key

Acceptance Criteria
The Delete Key button will only be made available to the user when the listed preconditions are met.

4.2.2.25 *NFCES-REQ-403997/B-Delete NFC Key – Deleting Starting NFC Key*

The NFCESInterfaceClient shall disable the Delete button for the NFC Key used to start the vehicle. If the user selects the Starting NFC Key for deletion, the NFCESInterfaceClient shall not send the delete request and shall instead display a notification to the user indicating an error due to the selected key being in use.

The Starting NFC Key shall be communicated periodically to the NFCESInterfaceClient by the NFCESOnBoardClient2 using VehicleStartKeySource_St, VehicleStartKeyType_St, and VehicleStartKeyIndex_St.

After requesting and receiving the NFC Key List per REQ-403969, the NFCESInterfaceClient shall disable the Delete button for the NFC Key whose Index and Key Type match that of the values received in VehicleStartKeySource_St and VehicleStartKeyIndex_St.

Acceptance Criteria
Pressing the Delete Key button for the NFC Key that was used to start the vehicle will result in an "Error due to selected key in use" popup being displayed.

4.2.2.26 *NFCES-REQ-421724/A-Disable Master Reset per Starting NFC Key*

The NFCESInterfaceClient shall disable the Master Reset button when the below conditions are true:

- VehicleStartKeyType_St = User, AND
- VehicleStartKeySource_St = Digital_Key

If the above signals become missing or their values cannot be determined, the Master Reset button shall be enabled.

Acceptance Criteria
The Master Reset button is disabled when the NFC Key that was used to start the vehicle was a user's digital key (not a Factory Card).

4.2.2.27 *NFCES-REQ-403994/B-Delete NFC Key – User Input Confirmation*

When the user requests to delete an NFC Key, the NFCESInterfaceClient shall require and provide an additional user interface (button/graphic) for the user to provide confirmation of the delete request.

Acceptance Criteria
Pressing the Delete Key button (when permitted) will result in a confirmation popup, asking the user to confirm their selection.

4.2.2.28 *NFCES-REQ-403995/B-Delete NFC Key – NFCESInterfaceClient Request*

If the user selects to delete an NFC key from the NFC Key list, the NFCESInterfaceClient shall send DigitalKey_Rq to remove the NFC key by specifying the PairingID of the NFC Card or Digital Key. The request shall include the below parameters:

DigitalKey_Rq

- Opcode = 0x02: DeleteKey
- PairingID = {PairingID of key}

Acceptance Criteria

A press of the Delete Key button (when permitted, and after confirmation) will result in the indicated request being sent.

4.2.2.29 NFCES-REQ-403996/B-Delete NFC Key – Delete Request Sent Notification

The NFCESInterfaceClient shall display a notification indicating that the Delete Key Request has been successfully sent when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x02: DeleteKey
- Request Status = 0x01: Success - Request Sent
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in a 'Delete Request Sent' popup being displayed.

4.2.2.30 NFCES-REQ-403981/B-Delete NFC Key – Already Pending Failure Notification

The NFCESInterfaceClient shall display a notification indicating a pending NFC Key Delete operation when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x02: DeleteKey
- Request Status = 0x07: Rejected - Already pending
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in a 'Delete Key Pending' popup being displayed.

4.2.2.31 NFCES-REQ-405020/B-Delete NFC Key – No Connectivity Failure Notification

The NFCESInterfaceClient shall display a notification indicating a failed NFC Key Delete operation due to no connectivity when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x02: DeleteKey
- Request Status = 0x0D: Rejected - No Connectivity
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in a 'No Connectivity' popup being displayed.

4.2.2.32 NFCES-REQ-405021/B-Delete NFC Key – System Failure Notification

The NFCESInterfaceClient shall display a notification indicating a failed NFC Key Delete operation due to system error (on NFCESServer) when DigitalKey_Rsp is received from the NFCESServer with the below values. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x02: DeleteKey
- Request Status = 0x0B: Rejected - System Error
- FESN = {FESN of key}

- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in a 'System Error' popup being displayed.

4.2.2.33 NFCES-REQ-403977/B-Delete NFC Key – Final Success Notification

The NFCESInterfaceClient shall display a notification indicating a successful NFC Key Delete operation when DigitalKey_Rsp is received from the NFCESServer. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x02: DeleteKey
- Request Status = 0x01: Final Success
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in a 'Successful Key Delete' popup being displayed.

4.2.2.34 NFCES-REQ-403978/B-Delete NFC Key – Final System Failure Notification

The NFCESInterfaceClient shall display a notification indicating a failed NFC Key Delete operation when DigitalKey_Rsp is received from the NFCESServer. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x02: DeleteKey
- Request Status = 0x04: Final System Error
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in a 'Failed Key Delete' popup being displayed.

4.2.2.35 NFCES-REQ-403979/B-Delete NFC Key – Final Denied Notification

The NFCESInterfaceClient shall display a notification indicating a denied NFC Key Delete operation when DigitalKey_Rsp is received from the NFCESServer. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x02: DeleteKey
- Request Status = 0x02: Final Rejected
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in a 'Denied Key Delete' popup being displayed.

4.2.2.36 NFCES-REQ-403980/B-Delete NFC Key – Final Expired Notification

The NFCESInterfaceClient shall display a notification indicating an expired NFC Key Delete operation when DigitalKey_Rsp is received from the NFCESServer. This notification shall include the FESN as provided via DigitalKey_Rsp.

DigitalKey_Rsp
- CES = Final Result - Success
- Opcode = 0x02: DeleteKey
- Request Status = 0x03: Final Timeout
- FESN = {FESN of key}
- FriendlyName = {Name of key}

Acceptance Criteria

Receiving the indicated response will result in an 'Expired Key Delete' popup being displayed.

4.2.2.37 NFCES-REQ-403972/B-Persisting NFC Notifications

If the NFCESInterfaceClient receives DigitalKey_Rsp with any of the below Request Statuses at a time when the NFCESInterfaceClient cannot display the correlated notifications, the NFCESInterfaceClient shall persist/queue the notification until a time when it can display it. The NFCESInterfaceClient shall persist/queue a notification for a max of 7 days. The notifications shall be persisted through ignition cycles, battery disconnects, loss of power, etc.

DigitalKey_Rsp
- RequestStatus = "0x01: Final Success", "0x02: Final Rejected", "0x03: Final Timeout", "0x04: Final System Error"

Acceptance Criteria
Receiving the indicated response at a time when the HMI cannot display the associated popup will result popup being queued until a time when it can be displayed.

4.2.2.38 NFCES-REQ-421725/A-Request Key List upon Final Notifications

If the NFC Key List is being displayed when the NFCESInterfaceClient receives and displays any of the final notifications below, it shall also request for and update the NFC Key List via DigitalKeyList_Rq (see REQ-403969).
- Request Status = 0x01: Final Success, per REQ-403973, REQ-403977
- Request Status = 0x04: Final System Error, per REQ-403974, REQ-403978
- Request Status = 0x02: Final Rejected, per REQ-403975, REQ-403979
- Request Status = 0x03: Final Timeout, per REQ-403976, REQ-403980

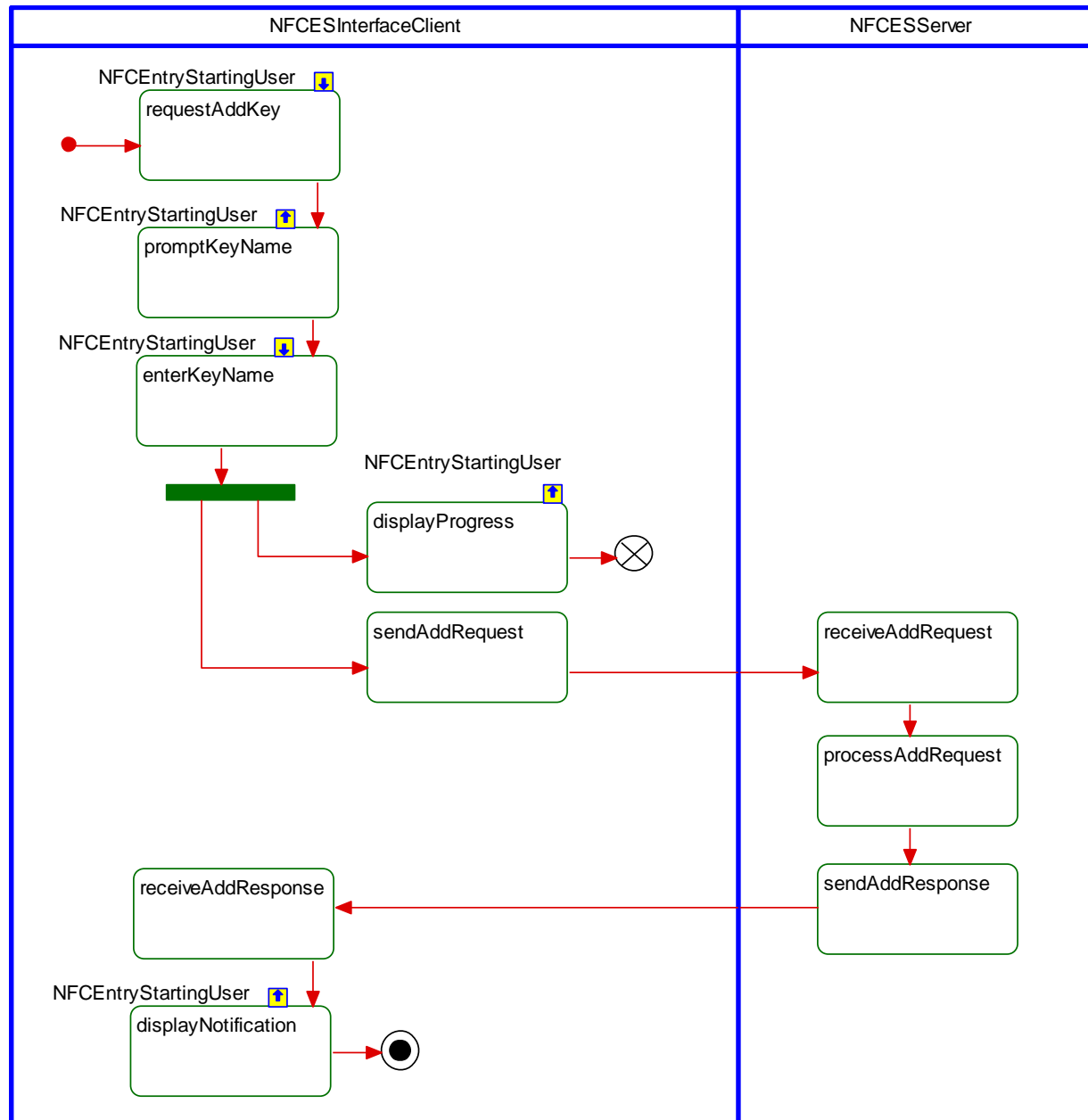| **Acceptance Criteria** |
|---|
| When a final notification is displayed, the NFC List shall be updated to show the current/latest key information. |

4.2.3　White Box View

4.2.3.1　*Activity Diagrams*

4.2.3.1.1　NFCES-ACT-REQ-424659/A-Add Digital Key
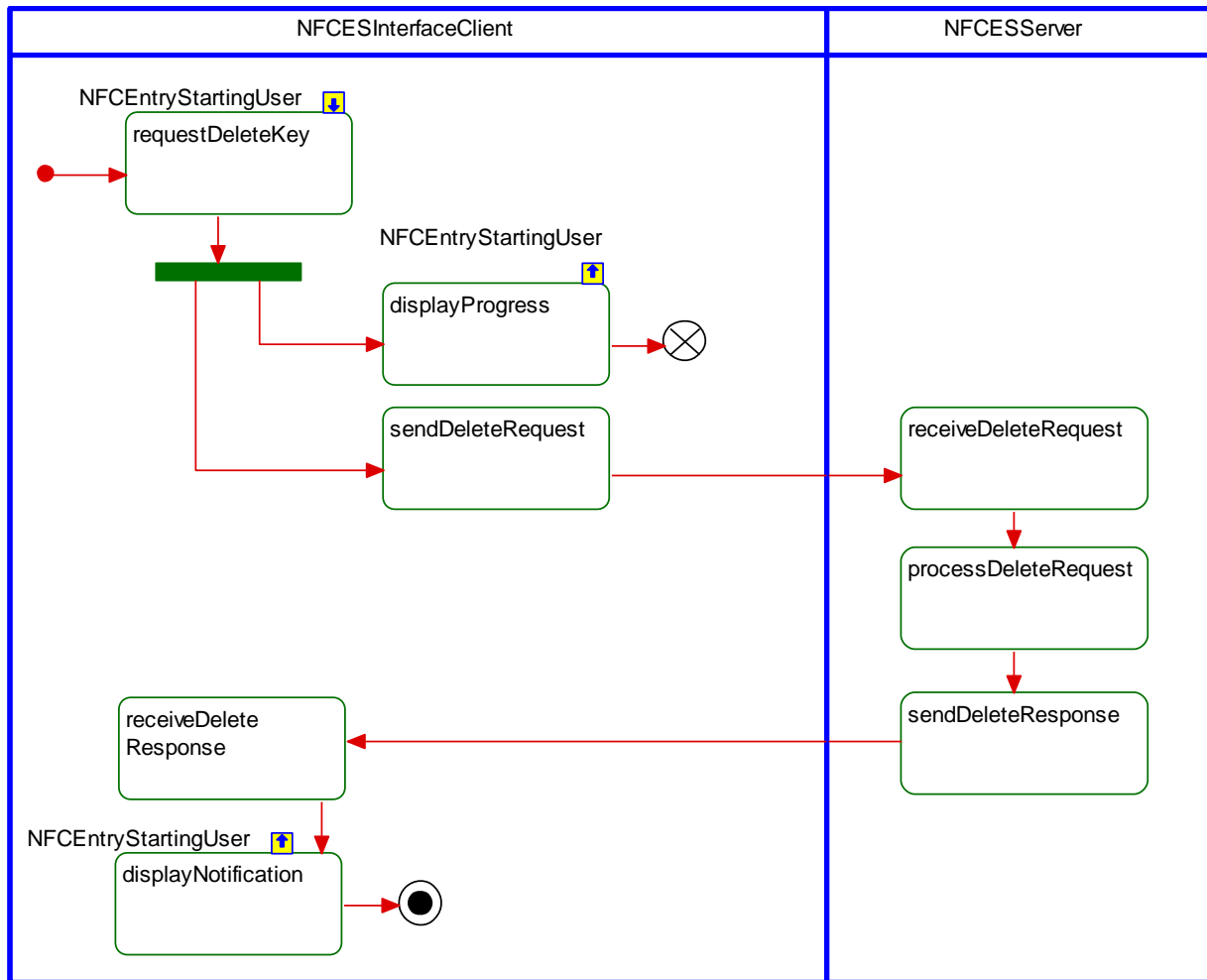**Activity Diagram**

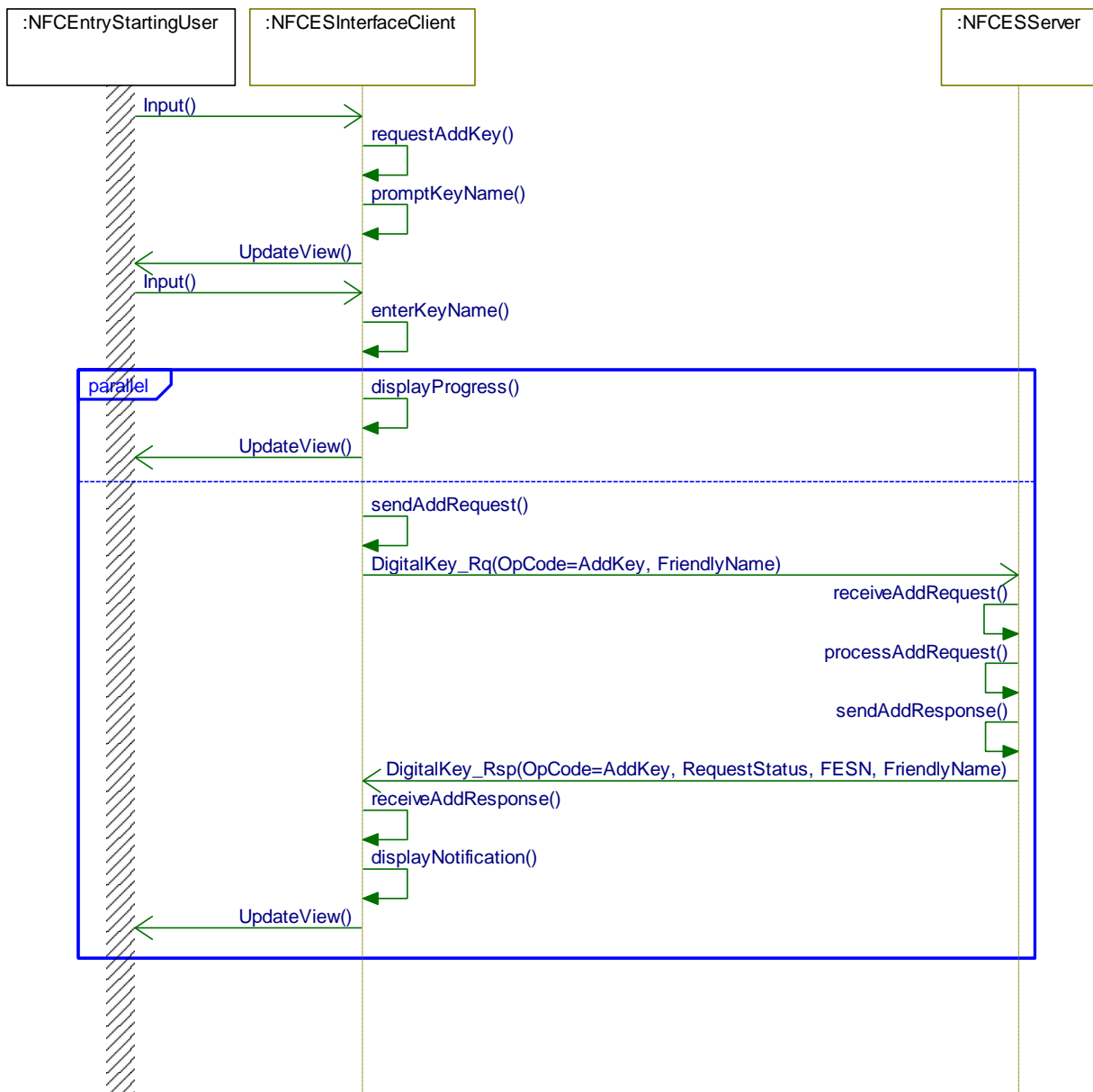### 4.2.3.1.2 NFCES-ACT-REQ-424759/A-Delete Digital Key

Activity Diagram

4.2.3.2   Sequence Diagrams

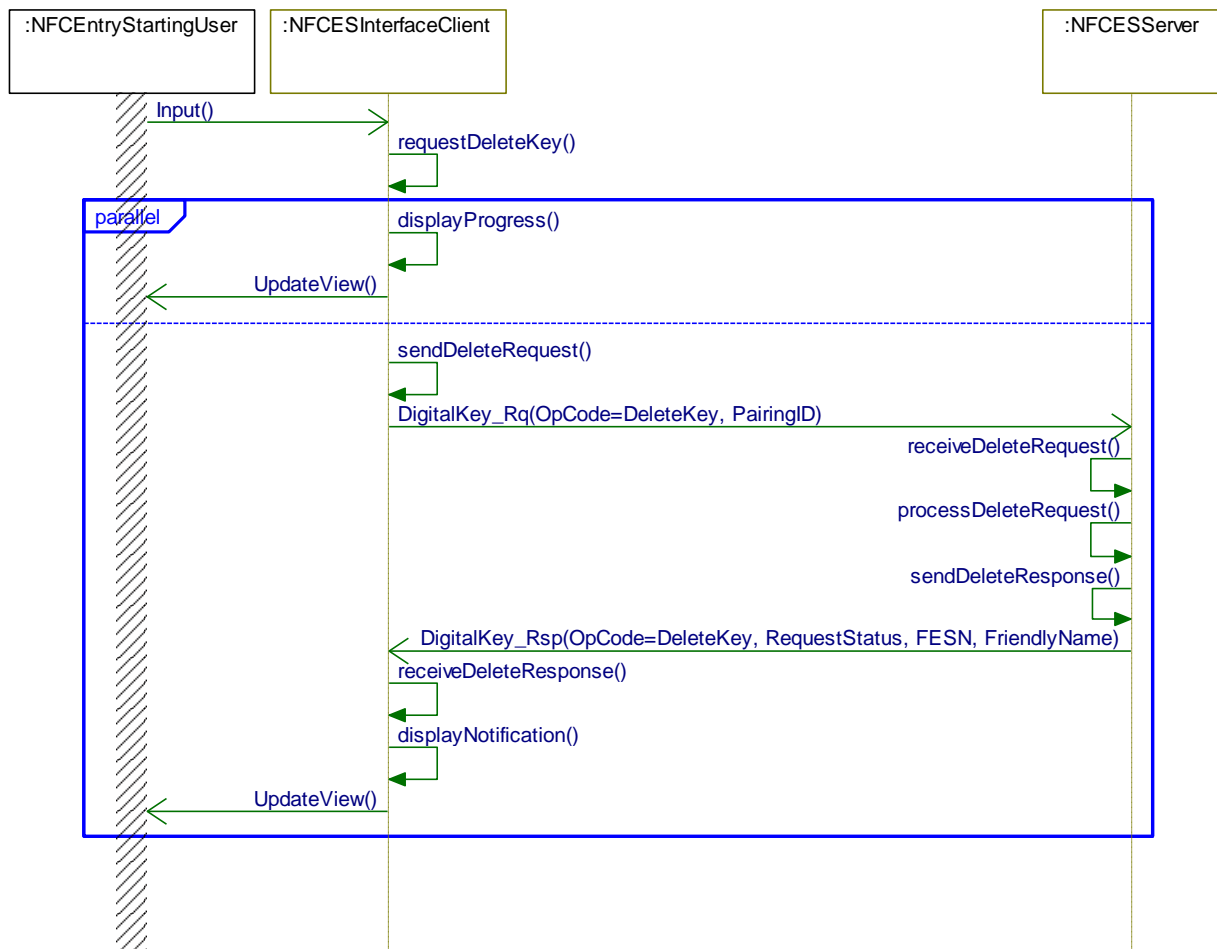### 4.2.3.2.1   NFCES-SD-REQ-362251/A-Add Digital Key
Sequence Diagram

4.2.3.2.2   NFCES-SD-REQ-403914/B-Delete Digital Key

Sequence Diagram

5   Appendix: Reference Documents

Reference #	Document Title
1	
2	
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