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NFC for device pairing

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RFID and EEPROM Marketing

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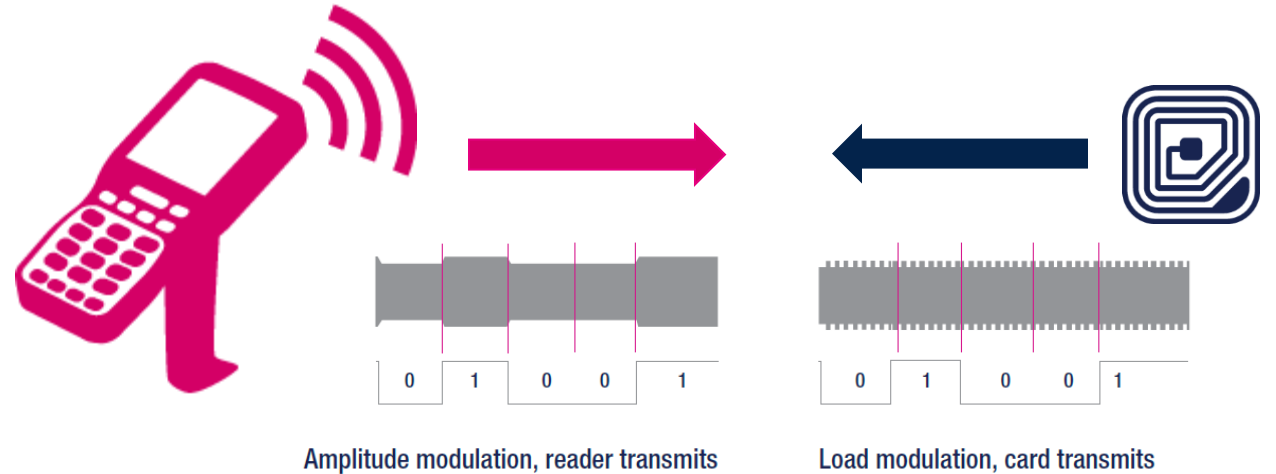
What is near field communication?





Near field communications principle of operation

- NFC is a subset of Radio Frequency Identification which uses a RFID **reader** and a RFID **tag**
- The **reader** generates an alternating magnetic field (carrier frequency) that powers the tag
- The **reader** modulates the carrier frequency to provide information to the tag
- The **tag** loads/unloads a reader's field to provide answer to the reader





What is NFC bringing to users over RFID ?

Infrastructure in everyone's pocket

Leverage RFID proven technology

Short operating distance guarantees inherent **privacy & security**

Built-in feature in all new smartphones





NFC communication modes

NFC Forum defines 3 communication modes



Tag Reader / Writer

Connect the world of apps with the physical world



Card Emulation

Use your device as a card



Peer to Peer

Connect devices through physical proximity



NDEF message applications

Standard NFC format for multiple types of data



Open a web page

Dial a phone number

Send a SMS text message

Open a vCard

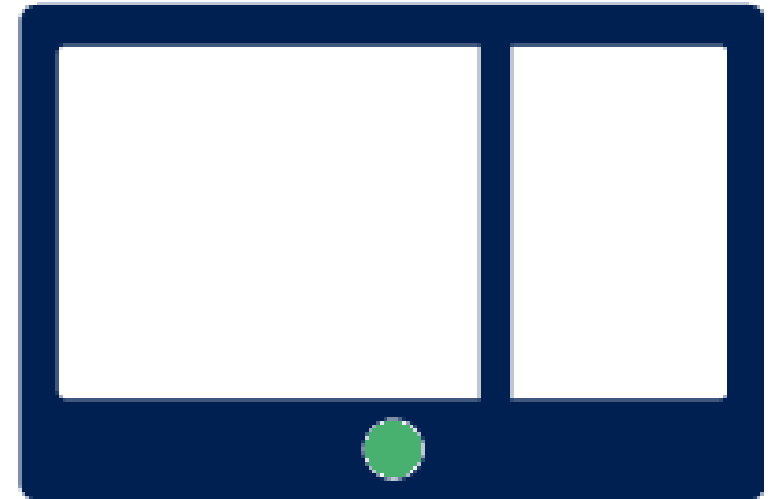
Handover (BT / Wi-Fi pairing)

NFC for device pairing



Traditional method of pairing

1) First, power on the device



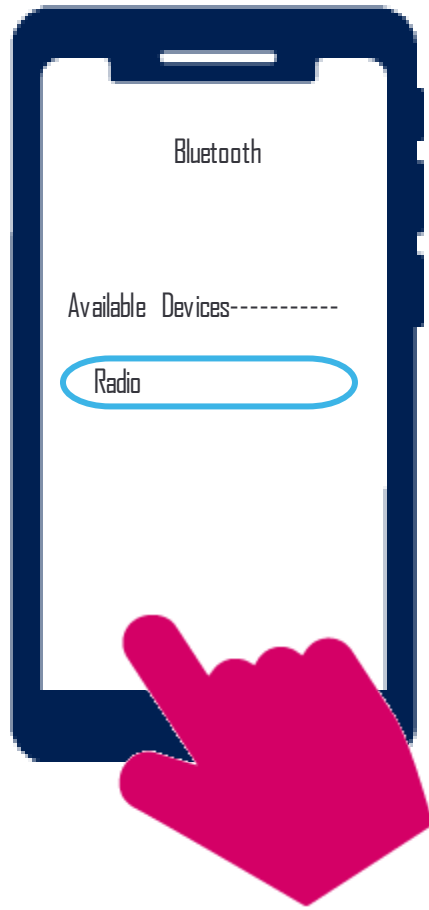
Traditional method of pairing

2) Scan for devices to connect



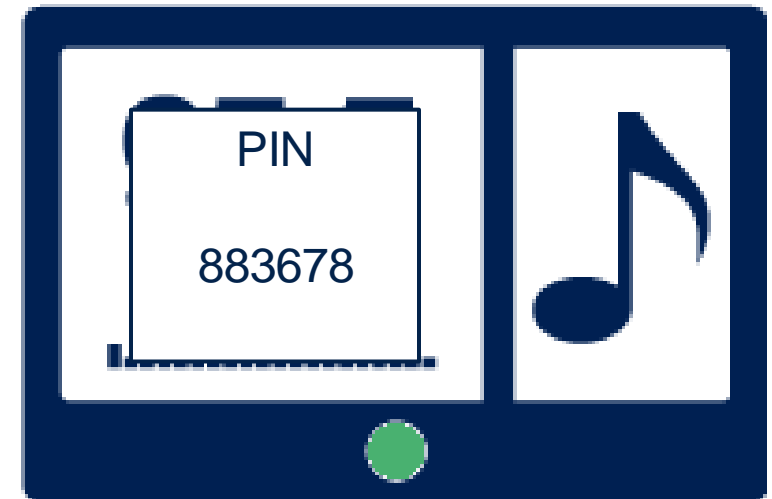
Traditional method of pairing

3) Select device to pair to



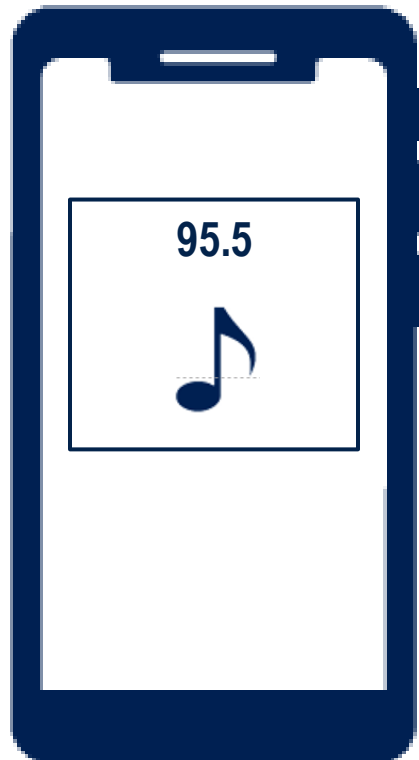
Traditional method of pairing

4) Confirm PIN



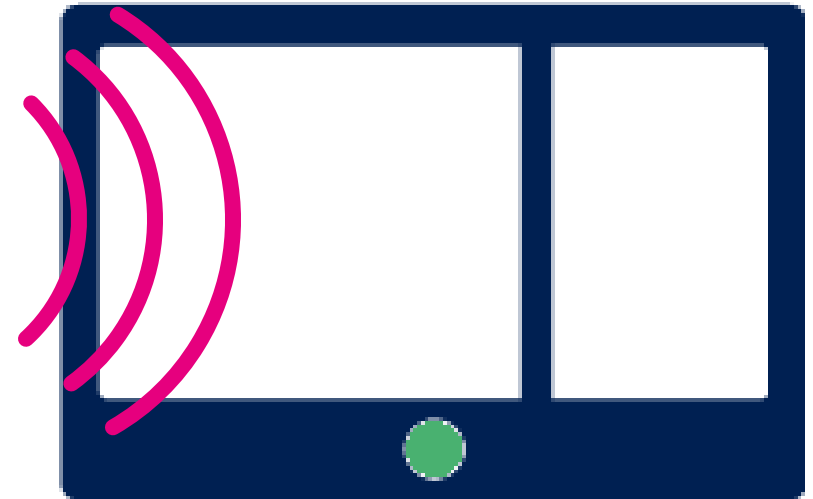
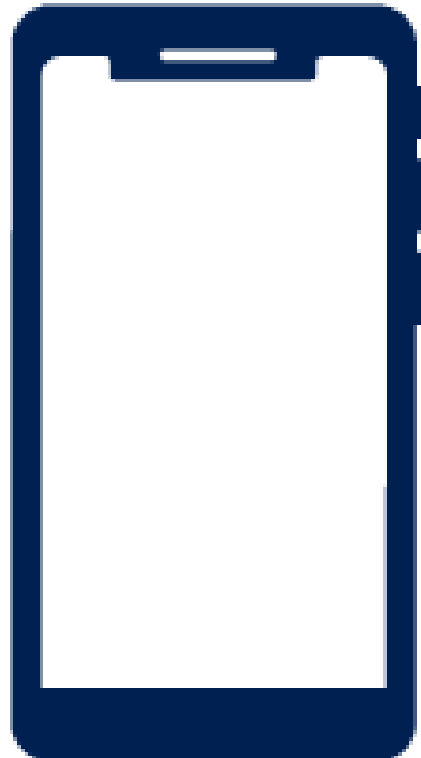
Traditional method of pairing

5) Devices are paired



NFC pairing

1) Tap phone to device



NFC pairing

2) Device is automatically powered and paired



Benefits to end-customer

- **Faster and simpler** – no need for BT/Wi-Fi sub-menus or searching through lists to find surrounding devices
- **No conflicts** – pair only the devices you intend to pair
- **Secure communications** – encrypt a link by exchanging credentials securely with just a tap
- **Low cost** - ideal for BT devices that are too small or cannot afford a user interface for PIN or password entry
- **Ease of use** - unlike QR codes, Line of Sight is not required with NFC
- **Save power** – use NFC to automatically turn on a battery-powered BT device and instantly pair



Devices for pairing



Device options for pairing

ST25T Tags

Basic NFC pairing responder solution
Ideal for simple and low-cost applications



ST25D Dynamic Tags

Secure NFC pairing responder solution
NFC tag with I²C. Ideal for embedded systems



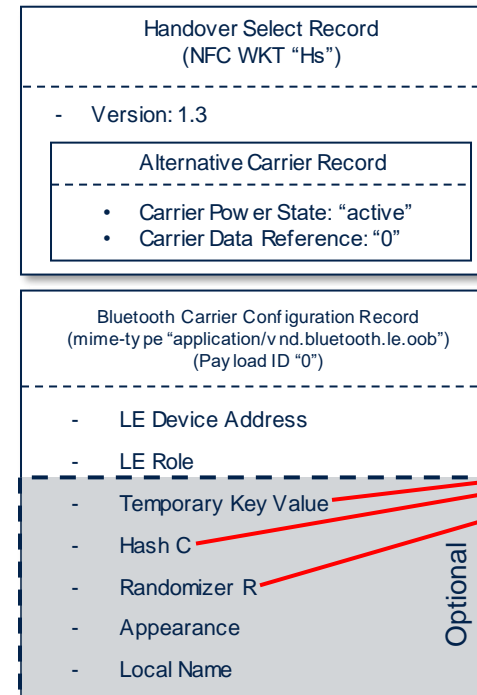
ST25R Readers

Secure NFC pairing initiator and responder
Highly flexible. Perfect for dual role devices



What is secure NFC pairing?

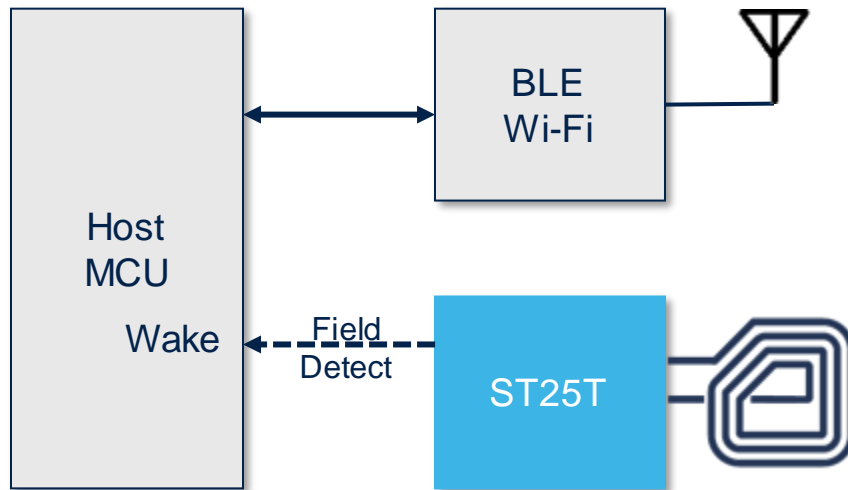
- NFC, with its inherently short range, is already a secure way of pairing devices
- NFC pairing records can also contain information about the keys used to encrypt the BLE or Wi-Fi traffic as well as authentication data. This changes with every pairing event
- To support secure pairing the NDEF record has to be modifiable by the host MCU



Security Info
Changes with each pairing



Tags for pairing



Low cost

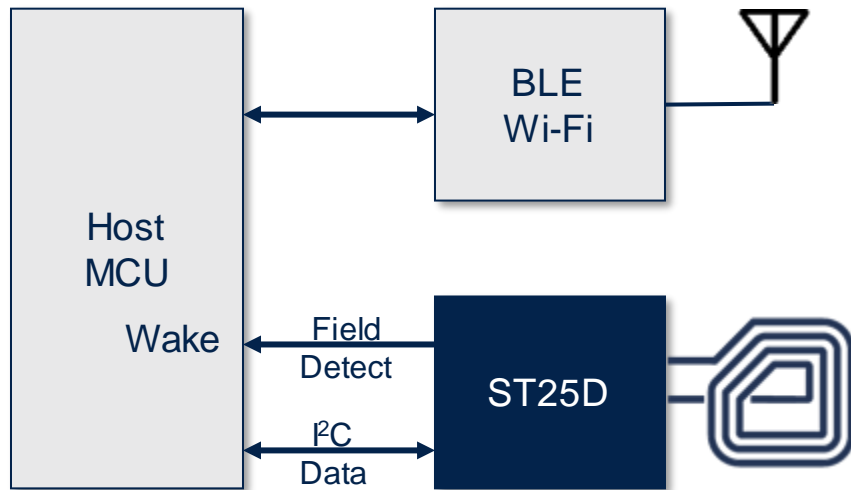
- Tag stores static pairing information
- Optional NFC Field detect function can be used to power a system 'on' from sleep
- Can be a sticker tag to add after-market
- No secure pairing. Host cannot update tag contents

ST Offerings

- ST25TA02K-P
- ST25TV04K-P



Dynamic tags for pairing



Flexible Solution

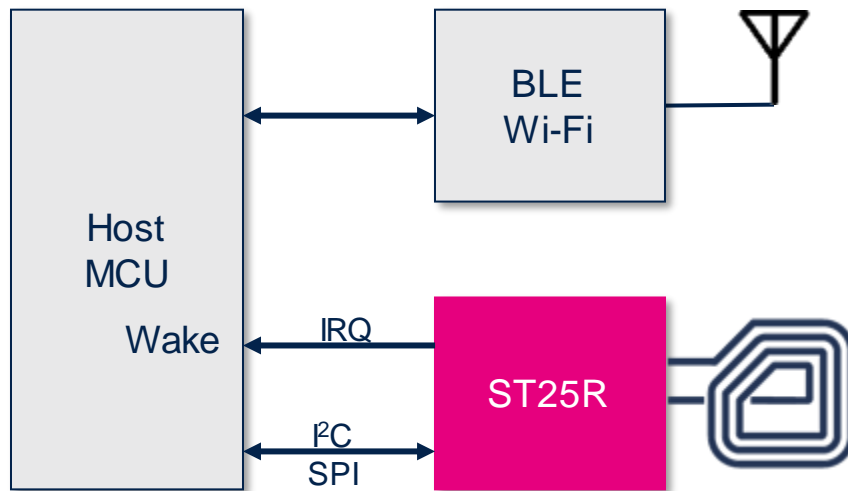
- Supports secure pairing since host MCU can update security info
- Tag can communicate current system state during pairing
- NFC Field detect function can be used to power a system 'on' from sleep

ST Offerings

- ST25DV
- M24SR



Readers for pairing



Highly Flexible

- Can receive as well as initiate pairing requests
- Supports secure pairing
- Low Power Card Detect interrupt can be used to wake system

ST Offerings

- ST25R95
- ST25R3911B
- ST25R3916

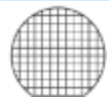
ST25 products and demos





NFC / RFID tag product family

	<u>ST25TB512</u> <u>ST25TB02K</u> <u>ST25TB04K</u>	<u>ST25TA512B</u> <u>ST25TA02KB</u> <u>ST25TA02KB-D</u> <u>ST25TA02KB-P</u>	<u>ST25TA16K</u> <u>ST25TA64K</u>	<u>ST25TV512</u> <u>ST25TV02K</u> <u>ST25TV02K-AD</u>	<u>ST25TV64K</u>
Contactless Interface	ISO14443B	ISO14443A NFC Forum Type 4	ISO14443A NFC Forum Type 4	ISO15693 NFC Forum Type 5	ISO15693 NFC Forum Type 5
RF range	Short range (up to 10cm)	Short range (up to 10cm)	Short range (up to 10cm)	Long range (up to 100cm)	Long range (up to 100cm)
RF speed	106kbps	106kbps	106kbps	26kbps (53kbps)	26kbps (53kbps)
Memory format	EEPROM data	EEPROM (preformatted NDEF)	EEPROM (preformatted NDEF)	EEPROM (preformatted NDEF)	EEPROM data
Memory size	512-bit & 2k / 4k-bit	512-bit / 2k-bit	16k / 64k-bit	512-bit / 2k-bit	64k-bit
Data protection	OTP bits	Password 128-bit Digital signature	Password 128-bit	Password 64-bit Digital signature	Password 32-bit
Digital output	NA	GPO Field detect -P: CMOS_P -D: Open-drain	NA	Tamper Detect	NA
Counter	32-bit (x2)	20-bit	NA	16-bit	NA
RF tuning capacitor	64pF	50pF	25pF	23.5pF & 97pF	28.5pF
Temperature range	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C	-40°C to +85°C
Package	SBN12 *	SBN12 * / SBN075 ² FPN5 (1.7x1.4mm)	SBN12 *	SBN12 * / SBN075 ²	SBN12 *



* SBN12: Die form, sawn and Bumped wafer, 120µm thickness, inkless 8" wafer

² SBN075: Die form, sawn and Bumped wafer, 75µm thickness, inkless 8" wafer



NFC / RFID dynamic tag family

M24SR02

M24SR04

M24SR16

M24SR64

ST25DV04K


ST25DV16K

ST25DV64K

Contactless Interface	ISO14443A NFC Forum Type 4	ISO15693 NFC Forum Type 5
RF range	Short range (up to 10cm)	Long range (up to 100cm)
RF speed	106kbps	26kbps (53kbps Fast Read)
Memory format	EEPROM (preformatted NDEF)	EEPROM
Memory size	2k-bit / 64k-bit	4k-bit / 64k-bit
Data protection	Password 128-bit	Password 64-bit
Digital output	GPO Field detect (Open Drain)	GPO Field detect (Open Drain or CMOS)
Serial Interface	I ² C @ 1MHz	I ² C @ 1MHz
Fast Transfer Mode	No	Yes (256 byte SRAM buffer)
Energy Harvesting	No	Yes
Additional Features	RF Disable	RF Disable / Sleep / Low Power Down
RF tuning capacitor	25pF	28.5pF
Temperature range	-40°C to +85°C (RF)	-40°C to +105°C (RF)
Package	SO8 / TSSOP8 / UDFFPN8 SG121 Wafer	SO8 / TSSOP8 / UDFFPN12 (all) UDFPN12 / WLCSP10 / Wafer (04K only)



ST NFC/RFID frontend portfolio

	<u>ST25R95</u>	<u>ST25R3911B</u>	<u>ST25R3912</u>	<u>ST25R3916</u>	<u>ST25R3917</u>
Description	Entry-Level NFC Reader	High-Performance NFC Forum Reader	Mid-Range NFC Forum Reader	High-performance NFC Universal Device & EMVCo Reader	High-performance NFC & EMVCo Reader
Reader/Writer mode	ISO14443A/B ISO15693 Felica	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa	ISO14443A/B ISO15693 FeliCa
Card emulation mode	Yes	-	-	Yes	-
AP2P mode	-	Initiator & Target	Initiator & Target	Initiator & Target	Initiator & Target
PP2P mode	-	Initiator	Initiator	Initiator & Target	Initiator
RF speed	424kbps	6.8Mbps (VHBR)	848kbps	848kbps	848kbps
Market	Consumer	Payment EMVCo 2.6, Industrial	Access control, Metering, Consumer	Payment EMVCo 3.0, Industrial, Consumer	Payment EMVCo 3.0, Industrial, Consumer
Advanced features	IWU	AAT, DPO, CIWU	DPO, IWU	AAT, DPO, NSR, DSA, AWS, CIWU, EMD	DPO, NSR, DSA, AWS, IWU, EMD
HW interface	SPI 2Mbps	SPI 6Mbps	SPI 6Mbps	SPI 10Mbps	SPI 10Mbps
SW interface			Unified Software Library for Frontends		
Power supply	2.7V - 5.5V	2.4V – 5.5V	2.4V – 5.5V	2.4V – 5.5V	2.4V – 5.5V
Output power	0.23W	1.4W	1.0W	1.6W	1.6W
Temperature range	-25°C to +85°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C	-40°C to +125°C
Package	32-pin QFN	32-pin QFN / Wafer	32-pin QFN / WF 32-pin QFN / WLCSP-30	WF 32-pin QFN / WLCSP-36	WF 32-pin QFN



VHBR: Very High Baud Rate
P2P: Peer to Peer mode
AAT: Automatic Antenna Tuning
AWS: Active Wave Shaping


EMD: Automatic EMD suppression
VHBR: Very High Baud Rate
DPO: Dynamic Power Output
CIWU: Capacitive & Inductive Wakeup

DSA: Drive Slope Adjustment
* Peak Output Power
NSR: Noise Suppression Receiver
IWU: Inductive Wakeup




ST25 eco-system DNA

Easy-to-use and customer-oriented




STM32Nucleo
hardware ecosystem




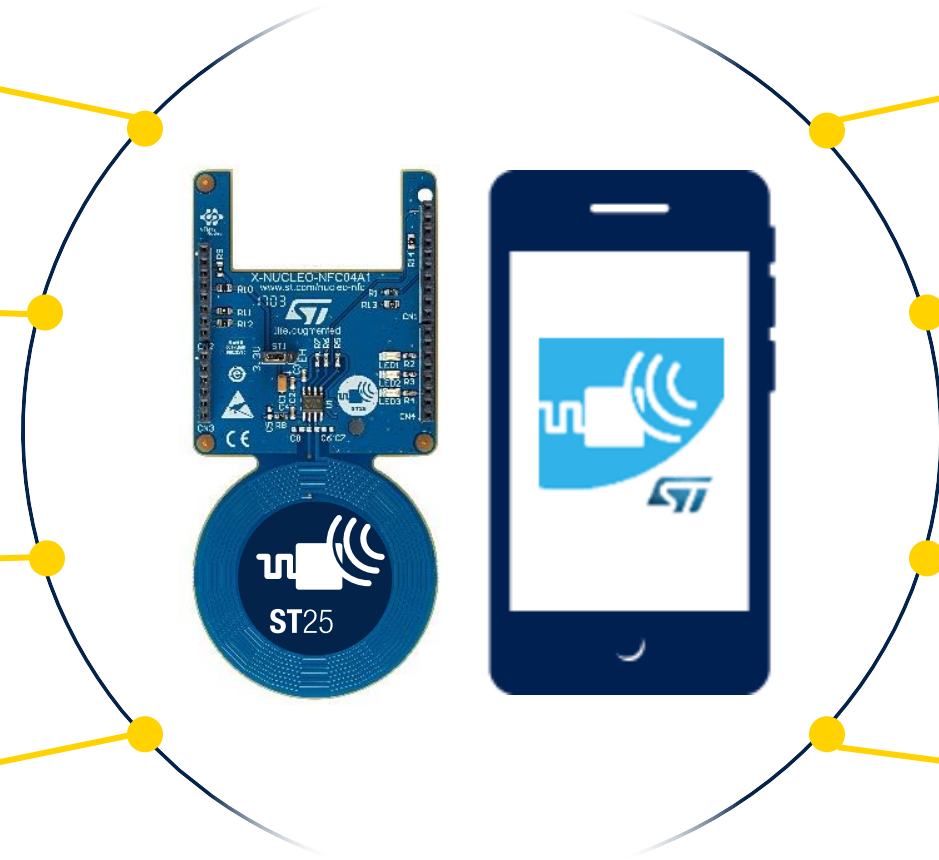
Discovery kit
STM32 based




Antenna
e-design tool




Schematic,
BOM, Gerber




Mobile Apps
ST25 SDK



STM32Cube
software ecosystem



PC software
Tool ST25 SDK



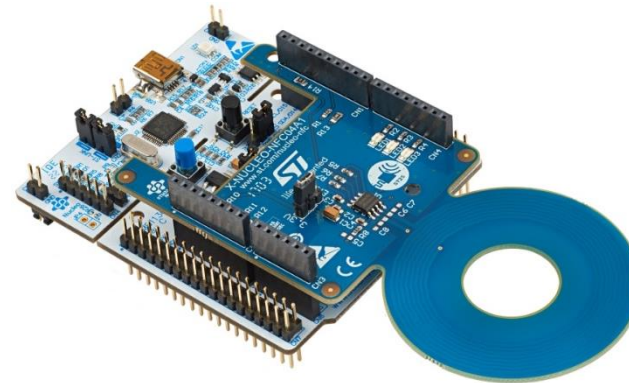
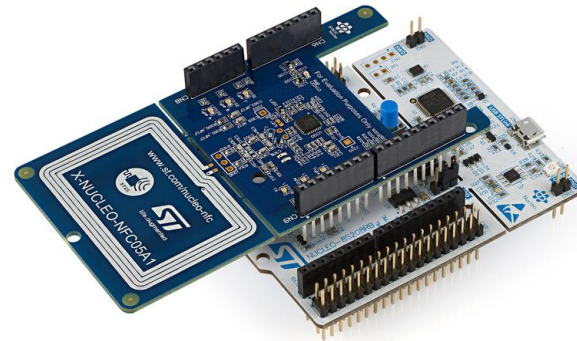
Documentation



Supported evaluation tools



DISCOVERY Evaluation Boards



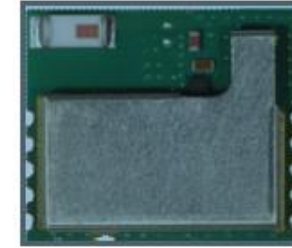
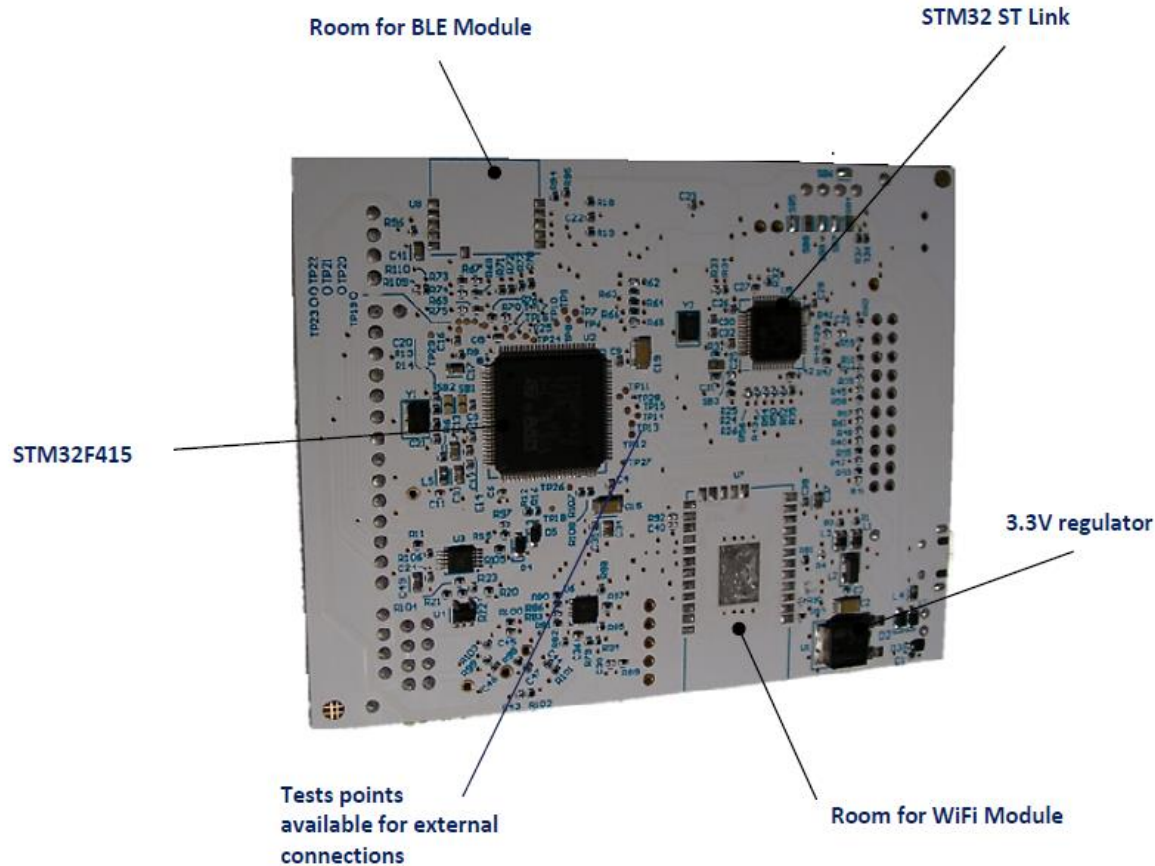
NUCLEO Development Board Stack



Function Specific Demonstration Kits



BT and Wi-Fi modules



BluNRG-M0
BT v4.2 Module



BluNRG-M2
BT v5.0 Module



SPWF01Sx
802.11b/g/n Module

Thank you



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