Near Field Communication (NFC) and UEFI

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Agenda

• Introduction
• NFC Technology
• UEFI NFC Stack
• Conclusions
Introduction
Introduction

• Approximately two billion smartphones in the world read NFC Tags anytime, anywhere.
• Consumers will see an explosion of uses in IoT, retail, automotive and public transportation
• NFC is a horizontal technology like Bluetooth, Wi-Fi, etc.
NFC Technology
What is NFC

- Near Field Communication (NFC) is a short-range wireless connectivity technology that are used in contactless payment systems, similar to those used in credit cards and electronic ticket smartcards and allow mobile payment to replace/supplement these systems.

- NFC complements many popular consumer level wireless technologies, by utilizing the key elements in existing standards for contactless card technology (ISO/IEC 14443 A&B and JIS-X 6319-4).

- NFC enables devices to share information at a distance that is less than 4 centimeters with a maximum communication speed of 424 kbps.
NFC Modes and Compatibilities

NFC Operates in Three Modes

1. Tag Reader/Writer
   Connect the world of apps with the physical world

2. Peer to Peer
   Connect devices through physical proximity

3. Card Emulation
   Connect to a common infrastructure

NFC is Compatible with Global Communications Standards

- **NFC-A**
  ISO/IEC 1443/18092

- **NFC-B**
  ISO/IEC 1443

- **NFC-F**
  ISO/IEC 18092

- **NFC-V**
  ISO/IEC 15693

Form Factor Free

Global Interoperability

Card
(ID-1)

Device
Mobile, Terminals

NFC Tag
(Type 1-5)

ToDo: These two charts will be refined.
NFC Technical Specification
5 NFC Tag Types

- MIFARE Ultralight®
- MIFARE® DESFire®
- MIFARE® Classic®
UEFI NFC Stack

- NFC Reader/Writer Chip
- Antenna
- UEFI NFC Chip Driver
- UEFI NFC Host Controller Protocol
- NFC Applications
  - UEFI NFC Protocol
  - NFC Management
  - NFC Tag
  - MIFARE ULTRALIGHT
  - MIFARE_CLASS IC_1K
  - NFC Applications
- RF communication
Blocks Description

• NFC Reader/Writer Chip
  – *The physical hardware to support NFC operation.*

• UEFI NFC Chip Driver
  – *The UEFI driver initializes the NFC Reader/Writer chip and produces the UEFI NFC Host Controller Protocol for sending NFC commands to the NFC chip.*

• UEFI NFC Host Controller Protocol
  – *The UEFI NFC Host Controller Protocol is for sending commands to NFC chip or read/write the NFC tag data from/to the NFC chip.*
Blocks Description

• NFC Management
  – *This driver manages the NFC chip and sensed NFC Tag. The UEFI NFC protocol is produced by this driver.*

• NFC Tag
  – *This part supports the NFC MIFARE Tag standard.*

• UEFI NFC Protocol
  – *The UEFI NFC Protocol provides the NFC Tag Read/Write function and NFC operation mode change.*
UEFI NFC Protocol

• Protocol Interface Structure

```c
typedef struct _EFI_NFC_PROTOCOL {
    EFI_NFC_PROTOCOL_GET_CAPABILITY GetCapability;
    EFI_NFC_PROTOCOL_IS_TAG_SENSED IsTagSensed;
    EFI_NFC_PROTOCOL_READ_BYTE ReadByte;
    EFI_NFC_PROTOCOL_WRITE_BYTE WriteByte;
    EFI_NFC_PROTOCOL_READ_BLOCK ReadBlock;
    EFI_NFC_PROTOCOL_WRITE_BLOCK WriteBlock;
    EFI_NFC_PROTOCOL_CARD_EMULATION CardEmulation;
} EFI_NFC_PROTOCOL;
```
UEFI NFC HC Protocol

- Protocol Interface Structure

```c
typedef struct _EFI_NFC_HC_PROTOCOL {
    EFI_NFC_HC_PROTOCOL_CHIP_INFO ChipInfo;
    EFI_NFC_HC_PROTOCOL_IS_TAG_SENSED IsTagSensed;
    EFI_NFC_HC_PROTOCOL_READ_DATA ReadData;
    EFI_NFC_HC_PROTOCOL_WRITE_DATA WriteData;
    EFI_NFC_HC_PROTOCOL_CARD_EMULATION CardEmulation;
} EFI_NFC_HC_PROTOCOL;
```
UseCase: Power On Password Check

Get password from NFC tag and consume it for system power on password check.
Summary

• The NFC is a popular contactless technology for information sharing and identification.

• There are various NFC based applications can be implemented in UEFI if the UEFI NFC stack is available.
References

• NFC Forum [https://nfc-forum.org/](https://nfc-forum.org/)
Call to Action

• Review the proposed UEFI NFC STACK and contribute the discussion for adding the NFC support to specification.

• Invite NFC Reader/Writer Chip vendor to join the discussion.
Thanks for attending the Fall 2017 UEFI Seminar and Plugfest

For more information on the Unified EFI Forum and UEFI Specifications, visit http://www.uefi.org

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