Transmission of IPv6 Packets over Near Field Communication

draft-hong-6lo-ipv6-over-nfc-00.txt

Y. Hong, Y. Choi (ETRI),
J. Youn (DONG-EUI Univ.), D. Kim (KNU)
JH. Choi (Samsung)

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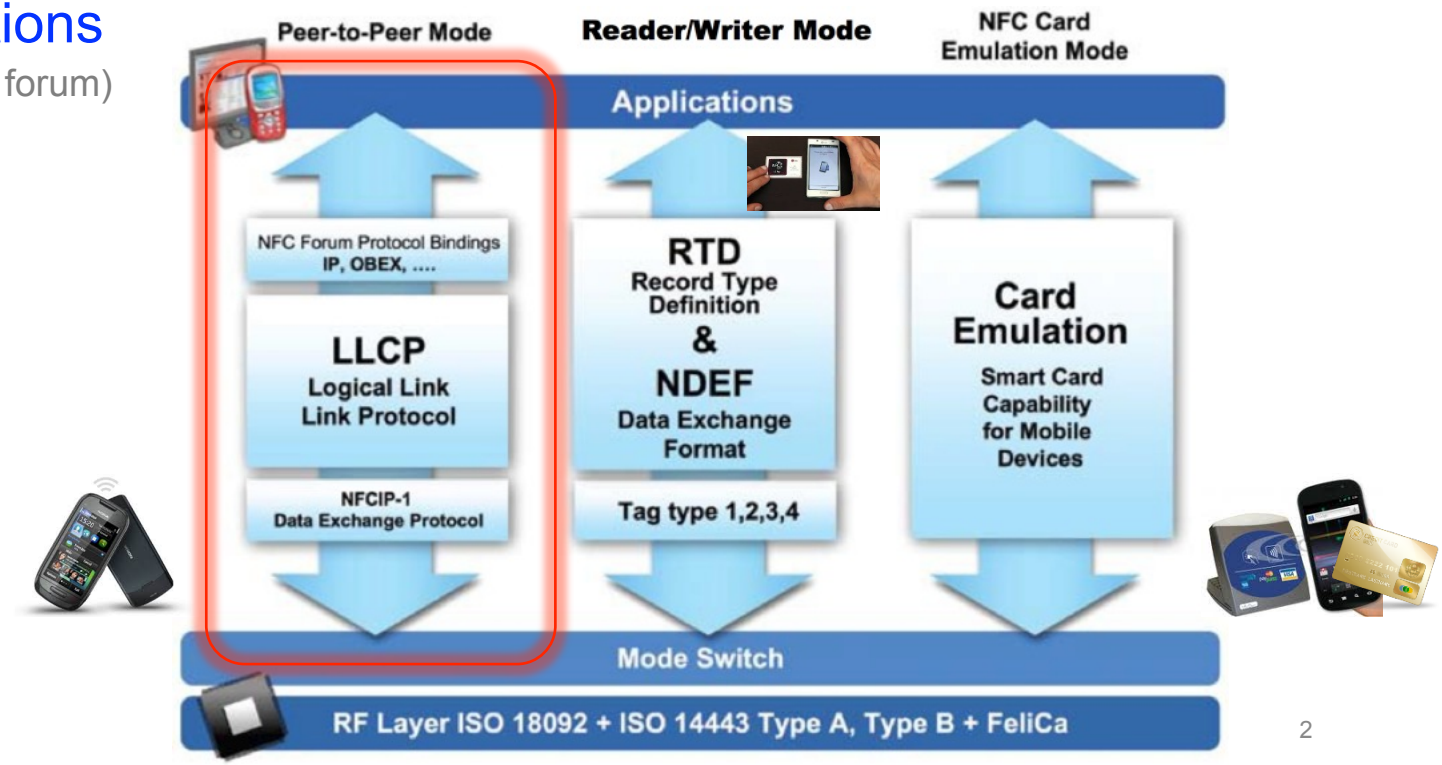
What is Near Field Communication (NFC) ?

- NFC technology enables (Source: NFC forum)
  - simple and safe two-way interactions between electronic devices, allow ing consumers to perform contactless transactions, access digital cont ent, and connect electronic devices with a single touch.
- NFC Functions

  (Source: NFC forum)



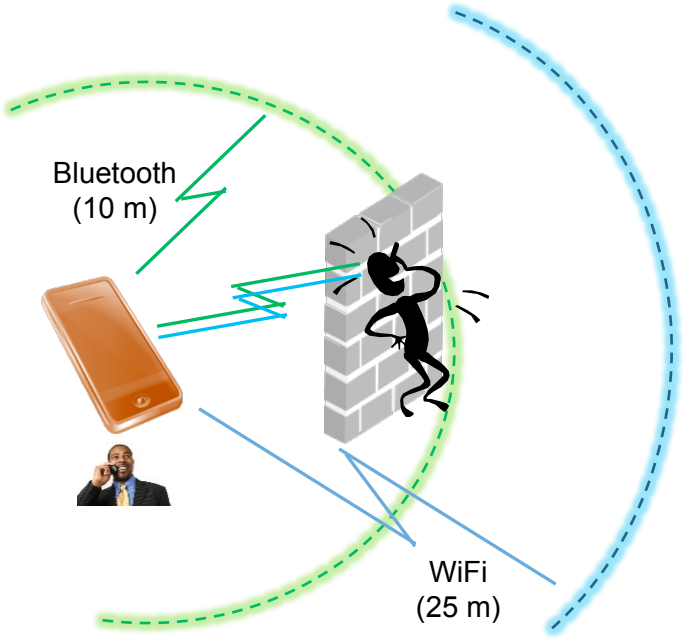
What Are Differences ?

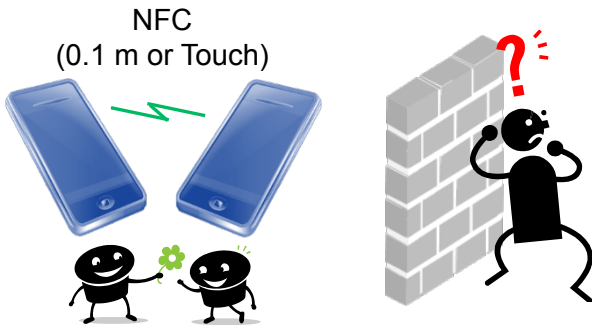
- Comparison with Bluetooth (Source: Wikipedia)

Aspect	**NFC**	Bluetooth	Bluetooth Low Energy
RFID compatible	ISO 18000-3	active	active
Standardisation body	ISO/IEC	Bluetooth SIG	Bluetooth SIG
Network Standard	ISO 13157 etc.	IEEE 802.15.1	IEEE 802.15.1
Network Type	**Point-to-point**	WPAN	WPAN
Cryptography	not with RFID	available	available
Range	**< 0.2 m**	~100 m (class 1)	~50 m
Frequency	13.56 MHz	2.4–2.5 GHz	2.4–2.5 GHz
Bit rate	**424 kbit/s**	2.1 Mbit/s	1 Mbit/s
Set-up time	**< 0.1 s**	< 6 s	< 0.006 s
Power consumption	**< 15mA (read)**	varies with class	< 15 mA (read and tran smit)

Why Possible and Useful ?

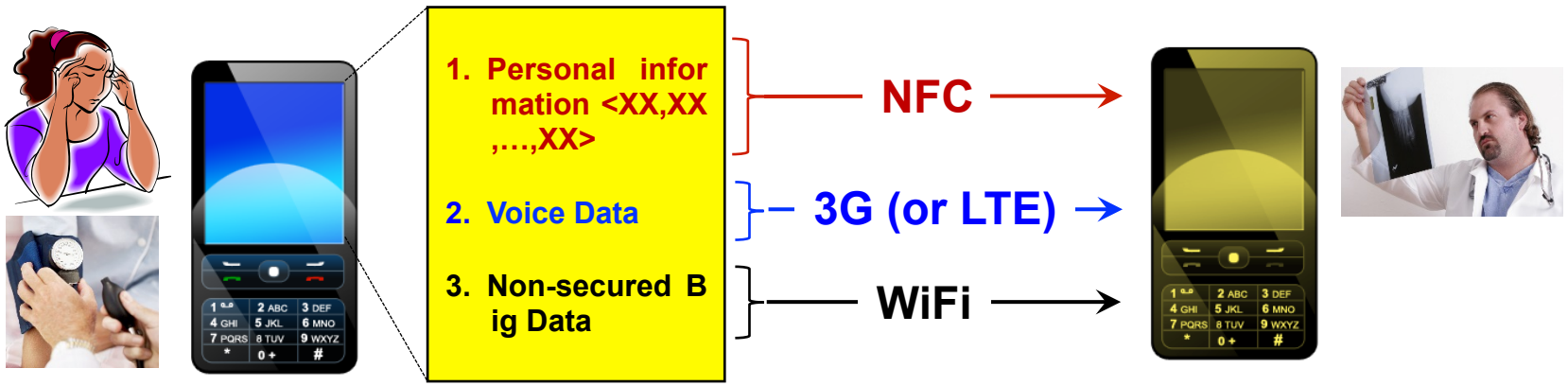
- Private Devices (especially, mobile phones)
  - have a lot of personal information (secured and private)
  - should be protected from hidden hackers
- NFC can be the one of the best solutions for Security
  - Due to short range communication (< 20 cm)
  - WiFi or Bluetooth cannot be safe from hidden hackers tha n NFC when we provide our personal information becaus e of a long range.
- In addition, 271 NFC Phones Available Now (source: ww w.nfcworld.com)
  - made by Samsung, LG, Acer, Amazon, Asus, BlackBerry, HTC, Huawei, Nokia, Sony, ZTE, etc.
    (Rumoured NFC devices: iPhone 6)
  - NFC technology would be widely used with WiFi and Blue tooth in IoT environments.





With a Possible Example for NFC Use

- Scenario
  - A User wants to securely provide his personal information (e.g., certificate or results of blood pressure measurement, etc.) to his doctor via an app. in a mobile phone.
  - The app usually sends non-secured big data through WiFi, but it can securely send the personal information to his doctor by using only NF.
  - Then the personal information can be secured from hidden hackers.



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Key Issues 1: Connectivity

- NFC-enabled device connected to the Internet

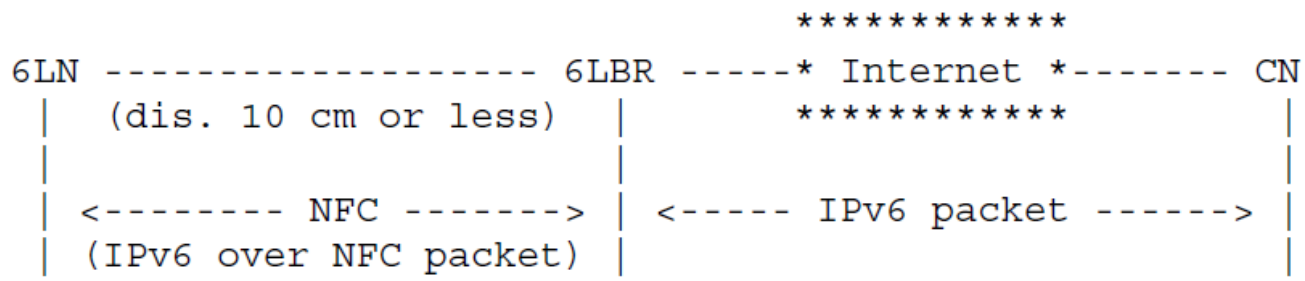


Figure 5: NFC-enabled device network connected to the Internet

- Isolated NFC-enabled device network

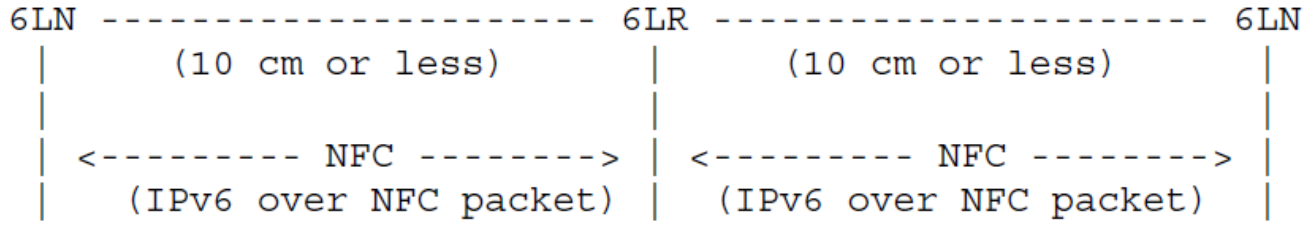


Figure 6: Isolated NFC-enabled device network

Key Issue 2: Address configuration

- Stateless address auto configuration
  - A 64-bit IID for a NFC interface MAY be formed by utilizing the 6-bit NFC LLCP address

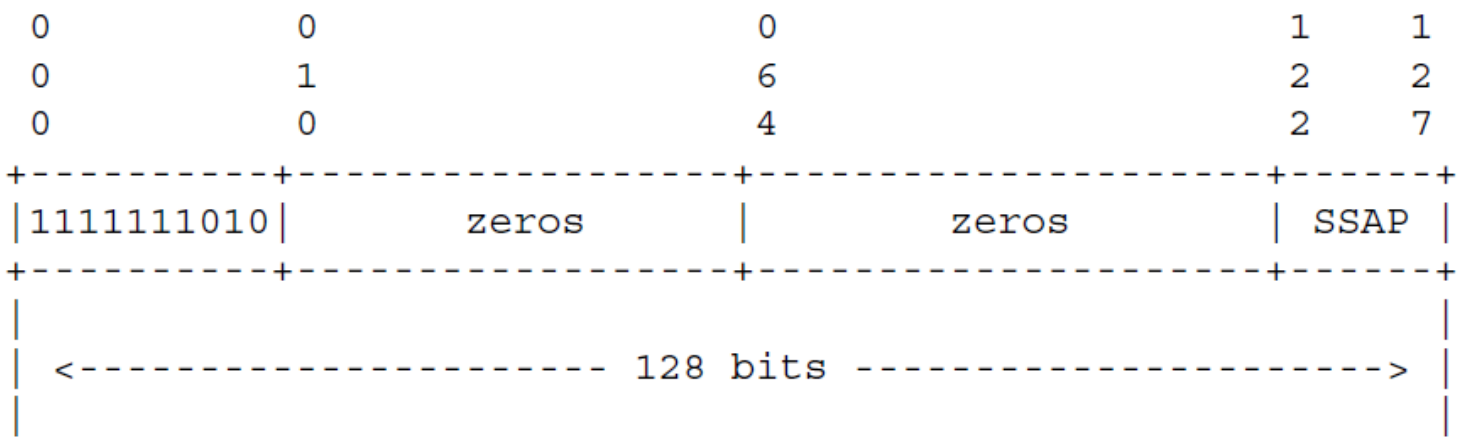


Figure 4: IPv6 link-local address in NFC

Key Issue 3: Header Compression

- Header compression as defined in RFC 6282 [5], which specifies the compression format for IPv6 datagrams on top of IEEE 802.15.4, is REQUIRED in this document as the basis for IPv6 header compression on top of NFC. All headers MUST be compressed according to RFC 6282 encoding formats.

- (TBD) Two Approaches According to Connectivity Pattern
  - When a NFC-enabled device is connected to the Internet ?
    -> possibly more compressible
  - When a Isolated NFC-enabled device network ?

Key Issue 4: Fragmentation and Reassembly (FAR)

- Fragmentation and reassembly (FAR) as defined in RFC 4944, which specifies the fragmentation methods for IPv6 datagrams on top of IEEE 802.15.4, is REQUIRED in this document as the basis for IPv6 datagram FAR on top of NFC.

- All headers MUST be compressed according to RFC 4944 encoding formats.

- Considerations
  - Default MTU of NFC is 128 bytes.
  - NFC Link Local Layer does not support Fragmentation and Reassembly.
  - FAR SHOULD be conducted while NFC devices are single-touched

On-going works

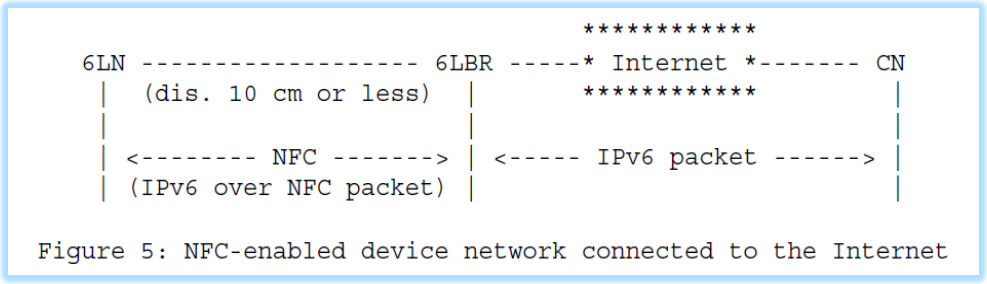
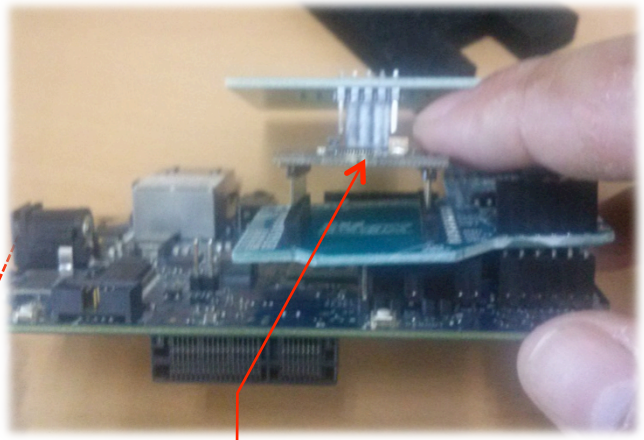
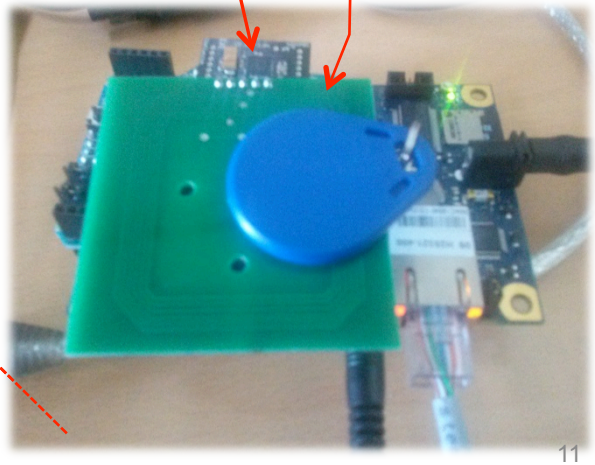


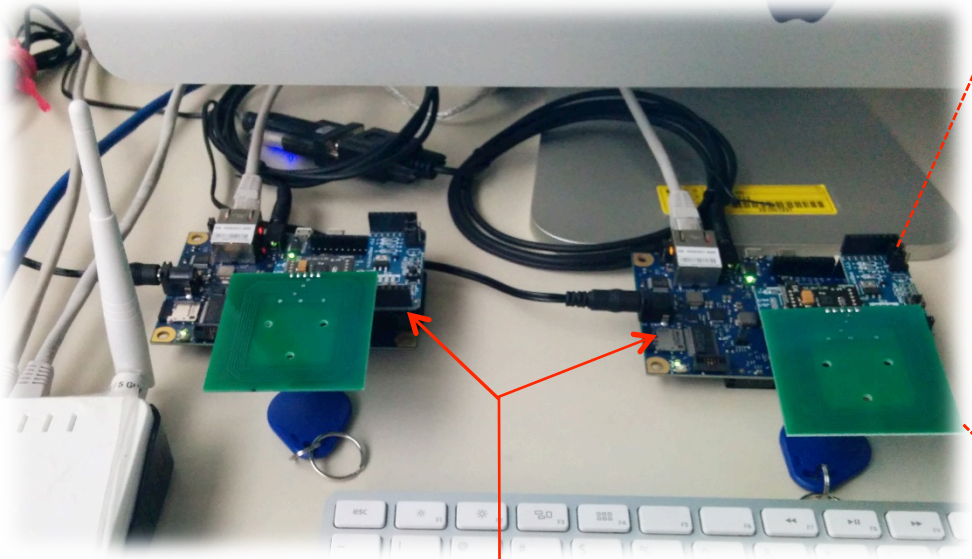
Figure 5: NFC-enabled device network connected to the Internet



NFC Shield

NFC Antenna





Test-bed

Intel Galileo board with
Debian Linux OS

Conclusions

- IPv6 over NFC
  - IPv6-over-foo adaptation layer specifications using 6LoWPAN
- Key issues of IPv6 over NFC
  - Key Issue 1: Connectivity
  - Key Issue 2: Address configuration
  - Key Issue 3: Header Compression
  - Key Issue 4: Fragmentation and Reassembly (FAR)
- Next step
  - Welcome feedback !
  - Moving forward ?