NEAR FIELD COMMUNICATION SYSTEM (NFC)
Near Field Communication

– Easy to use wireless communication interface for the last few centimeters

– Easy to use target selection, by simply holding two devices close to each other

NFC is as easy as....
NFC - Technical Basics

- Wireless Short Range Communication Technology
  - Based on RFID technology at 13.56 MHz
  - Operating distance typical up to 10 cm
  - Compatible with today’s field proven contactless RFID technology.
  - Data exchange rate today up to 424 kilobits/s
# NFC v/s OTHER WIRELESS

<table>
<thead>
<tr>
<th></th>
<th>NFC</th>
<th>RFID</th>
<th>IrDa</th>
<th>Bluetooth</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Set-up time</strong></td>
<td>&lt;0.1ms</td>
<td>&lt;0.1ms</td>
<td>~0.5s</td>
<td>~6 sec</td>
</tr>
<tr>
<td><strong>Range</strong></td>
<td>Up to 10cm</td>
<td>Up to 3m</td>
<td>Up to 5m</td>
<td>Up to 30m</td>
</tr>
<tr>
<td><strong>Usability</strong></td>
<td>Human centric</td>
<td>Item centric</td>
<td>Data centric</td>
<td>Data centric</td>
</tr>
<tr>
<td></td>
<td>Easy, intuitive, fast</td>
<td>Easy</td>
<td>Easy</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Selectivity</strong></td>
<td>High, given, security</td>
<td>Partly given</td>
<td>Line of sight</td>
<td>Who are you?</td>
</tr>
<tr>
<td><strong>Use cases</strong></td>
<td>Pay, get access, share, initiate service, easy set up</td>
<td>Item tracking</td>
<td>Control &amp; exchange data</td>
<td>Network for data exchange, headset</td>
</tr>
<tr>
<td><strong>Consumer experience</strong></td>
<td>Touch, wave, simply connect</td>
<td>Get information</td>
<td>Easy</td>
<td>Configuration needed</td>
</tr>
</tbody>
</table>
WORKING OF NFC.

NFC ENABLED TAG.  

URL

NFC ENABLED CELL.

MICRO ANTENNA.

CONNECTS TO THE URL VIA A SERVER.
POSSIBLE COMBINATIONS OF ACTIVE /PASSIVE DEVICES AS INITIATOR & TARGET.

<table>
<thead>
<tr>
<th>INITIATOR</th>
<th>TARGET</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACTIVE</td>
<td>POSSIBLE</td>
</tr>
<tr>
<td>PASSIVE</td>
<td>NOT POSSIBLE</td>
</tr>
</tbody>
</table>

COMMUNICATION MODES OF NHC

READ/WRITE MODE

PEER TO PEER MODE

CARD EMULATION MODE
READER WRITER MODE

BUS SCHEDULE AND BUS TICKET USING NFC
Define how to read and write NDEF data from/to a tag
Types 1 and 2: Proprietary tags based on ISO 14443 Type A
Type 3: Proprietary tag based on FeliCa
Type 4: Open tag based on ISO 14443 Type A or B and ISO 7816-4

NDEF Reference Applications

Third party NDEF Applications

Non-NDEF Applications

Type 1-4 Tag Operation

Digital Protocol

Analogue
PEER TO PEER MODE

MULTIPLAYER GAMING
## Peer-to-Peer Mode

<table>
<thead>
<tr>
<th>Ref Apps</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simple NDEF</td>
<td>NFC Forum Registered Protocols</td>
</tr>
<tr>
<td>Exchange Protocol</td>
<td>Protocol Bindings</td>
</tr>
<tr>
<td></td>
<td>Other Protocols</td>
</tr>
<tr>
<td>Logical Link</td>
<td></td>
</tr>
<tr>
<td>Control Protocol</td>
<td></td>
</tr>
<tr>
<td>Digital Protocol</td>
<td></td>
</tr>
<tr>
<td>Analogue</td>
<td></td>
</tr>
</tbody>
</table>
Peer-to-Peer Mode

Protocol to allow the exchange of NDEF messages in Peer Mode
Analogous to tag operation specifications

Ref Apps
- Simple NDEF Exchange Protocol

Applications
- NFC Forum Registered Protocols
- Protocol Bindings

Other Protocols
- Logical Link Control Protocol
- Digital Protocol
- Analogue
CARD EMULATION MODE

NFC ENABLED CELLPHONE ACTS AS CREDIT CARD FOR ANY KIND OF PAYMENT
Card Emulation Mode

Proprietary contactless card applications
e.g., payment, ticketing, access control
Based on ISO 14443 A/B or FeliCa

Applications

Digital Protocol
Analogue
Near Field Communication Applications

Smart Key
- for mobile local payment

Peer to Peer communication, Virtual Connector
- either directly or by establishing wireless links

NFC enables a unique blend of valued applications

Low cost solution to distribute info / services
- e.g. by passive loops embedded in paper media
Security aspects of NFC

- Eavesdropping:
  A passive device, which does not generate its own RF field is much harder to eavesdrop on than an active device

- Data modification:
  In order to modify the transmitted data an intruder has to deal with the single bits of the RF signal.

- Relay attack:
  The adversary has to forward the request of the reader to the victim and relay back its answer to the reader in real time
Near Field Communication

Advantages:

Wireless short range communication technology

– NFC is designed for short distance wireless communication
– Allows intuitive initialization of wireless networks
– NFC is complementary to Bluetooth and 802.11 with their long distance capabilities
– NFC also works in dirty environment
– NFC does not require line of sight
– Easy and simple connection method
– Provides communication method to non-self powered devices
## Eleven Specifications Released to Date

<table>
<thead>
<tr>
<th>Specification</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>NFC Data Exchange Format (NDEF)</td>
<td>Common data format for devices and tags</td>
</tr>
<tr>
<td>NFC Record Type Definition (RTD)</td>
<td>Standard record types used in messages between devices/tags</td>
</tr>
<tr>
<td>Smart Poster RTD</td>
<td>For posters with tags with text, audio or other data</td>
</tr>
<tr>
<td>Text RTD</td>
<td>For records containing plain text</td>
</tr>
<tr>
<td>Uniform Resource Identifier (URI) RTD</td>
<td>For records that refer to an Internet resource</td>
</tr>
<tr>
<td>Generic Control RTD</td>
<td>Way to request an action</td>
</tr>
<tr>
<td>Connection Handover</td>
<td>How to establish a connection with other wireless technologies</td>
</tr>
<tr>
<td>NFC Tag Types 1-4 Operation</td>
<td>Defines R/W operation for NFC tags</td>
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</tbody>
</table>
JOURNEY TO A NEW FRONTIER

For more than a decade, the NFC had been a dream for many who have worked hard to bring it to completion. Turning this ambitious scientific plan into miracle in communication technology proved to be an immensely complex task. Finally through this presentation we retell the story of this journey, that has rightly contributed to avail every possible ‘Information at our finger tips….’