NFC on Linux IVI systems

Samuel Ortiz
Intel Open Source Technology Center

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Agenda

- NFC basics
- NFC open source stacks
- The Linux NFC stack
- NFC Bluetooth Handover and IVI
NFC basics
Near Field Communication

- A short range (< 5cm) wireless technology.
- Low throughput (< 500 kbps).
- Low cost.
- Not Bluetooth, not RFID.
- Partly standardized by the NFC Forum.
- “Tap-to-share” NDEFs.
- NFC tags and NFC devices.
Three NFC modes

- Reader
  - One device reads a tag.
- Peer to peer
  - Two devices talk to each other
- Card emulation
  - One device pretends to be a tag
Use cases

- Very wide...
- Data exchange.
  - Playlists, URLs, business cards...
- Connection Handover.
  - Simplified Bluetooth pairing
- Payments, loyalty cards.
- Ticketing.
- Security, access control.
  - Key-less rental cars
NFC Open Source Stacks
• The Android bounty.
• Android as the single supported platform.
• No kernel support for NFC.
• No standard Linux distribution support.
Two stacks, same issues

- Two Android stacks.
  - libnfc-nxp, opennfc.
- 100% userspace, ad hoc kernel interface.
- Exclusive HW support.
  - NXP pn544, INSIDE microread: HCI only.
- No community, no source code repositories.
- Exclusive support, no visibility.
  - Google, INSIDE.
Other stacks

- nfcpy
  - Nice implementation, 100% python.
  - Sony sponsored.
  - No HCI or NCI support.
- libnfc
  - Academic project, LGPL licensed.
  - Only USB and UART devices supported.
  - Missing features.
  - SVN repository, community.
The Linux NFC stack
Yet another stack?

- HW independence.
- NFC for non Android platforms.
- POSIX NFC APIs.
- Kernel/User space split.
- Consistent behavior and APIs.
- Open development process.
The Linux NFC stack

- The official NFC Linux kernel stack.
- Maintained by Intel.
- Hosted on git.kernel.org.
- GPLv2 licensed.
- 1.5 year old.
- Split between kernel and user spaces.
- Open development.
The overall picture

Kernel space

User space

NFC Hardware

NFC Drivers

NFC Core

AF_NFC Sockets

NFC Netlink

neard

D-Bus API

application

application
Kernel Architecture

Netlink socket

PROTO_LLCP

LLCP

PROTO_RAW

AF_NFC

NFC Core

NCI

HCI

SHDLC

μread

pn544

pn533

wilink
The NFC daemon

- Tag specific handling (R/W).
- Transport protocols on top of LLCP.
- Adapter and targets management.
- NDEF parsing.
- Handover.
- D-Bus APIs.
- Plugin based.
# Hardware and Features Support

<table>
<thead>
<tr>
<th></th>
<th>Interfaces</th>
<th>Tag R/W</th>
<th>LLCP</th>
<th>Handover</th>
<th>Card Emulation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supported Hardware</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linux</td>
<td>HCI, NCI, USB</td>
<td>Yes</td>
<td>SNEP, NPP</td>
<td>Bluetooth</td>
<td>No</td>
</tr>
<tr>
<td>Android</td>
<td>HCI</td>
<td>Yes</td>
<td>SNEP, NPP</td>
<td>No²</td>
<td>Yes</td>
</tr>
<tr>
<td>Inside Secure</td>
<td>HCI</td>
<td>Yes</td>
<td>SNEP</td>
<td>Bluetooth, WiFi</td>
<td>Yes</td>
</tr>
<tr>
<td>libnfc</td>
<td>USB, UART</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>nfcpy</td>
<td>USB</td>
<td>Yes</td>
<td>SNEP</td>
<td>Bluetooth</td>
<td>No</td>
</tr>
</tbody>
</table>

1 PN532 not supported yet

2 Bluetooth handover supported with Jelly Bean
Plans

• Short term
  • Improve MIFARE support.
  • Secure Element and card emulation netlink API.
  • Service Discovery Protocol.
  • Wi-Fi Handover.

• Long term
  • Inside Secure microread support.
  • NFC monitor.
  • OBEX and IP over NFC.
NFC Connection Handover
NFC Connection Handover

- Switching to an alternative carrier via NFC.
  - NFC is the credentials carrier.
- Static or Dynamic.
- Bluetooth or Wi-Fi.
- Requester or selector.

![Diagram showing NFC connection handover process]
Bluetooth Handover and IVI

- Bluetooth Secure Simple Pairing.
- Simplified User Experience.
  1. Press a button
  2. Touch your dashboard
- No user input, no extra menus.
- Fully supported by neard 0.6.
  - “Press a button” ↔ Start a Handover request
  - BlueZ dependency
Questions?

- NFC daemon
  
  http://git.kernel.org/?p=network/nfc/neard.git;a=summary

- NFC kernel
  
  http://git.kernel.org/pub/scm/linux/kernel/git/sameo/nfc-3.0.git

- Web site
  
  - https://www.01.org/linux-nfc

- Mailing list
  
  https://lists.01.org/mailman/listinfo/linux-nfc

- sameo@linux.intel.com