NFC on Linux

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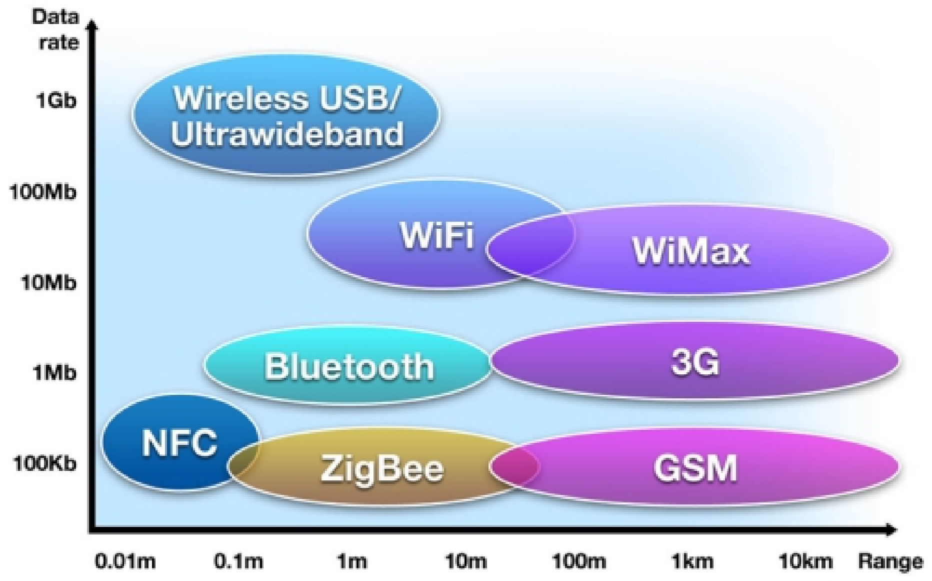
Agenda

- NFC basics
- NFC open source stacks
- The Linux NFC stack
- One example

NFC basics

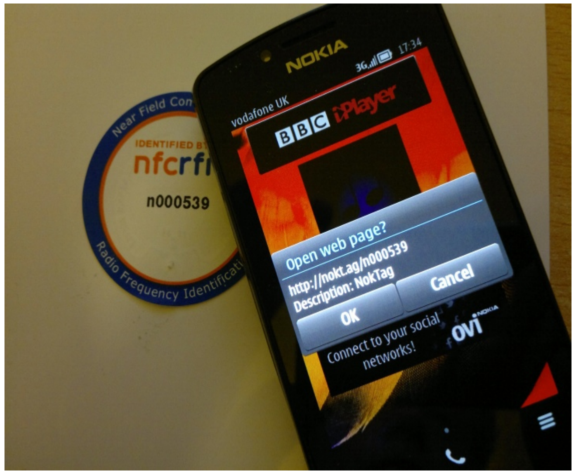
Near Field Communication

- 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 others
- 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

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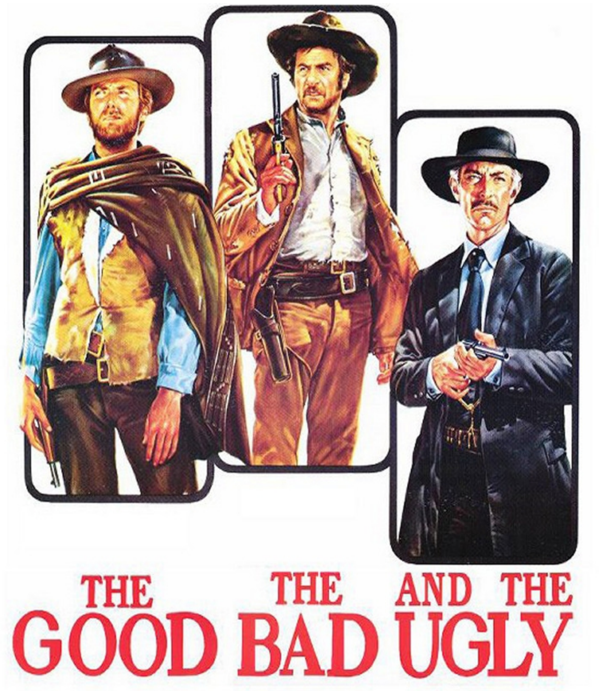
NFC Open Source Stacks

- 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

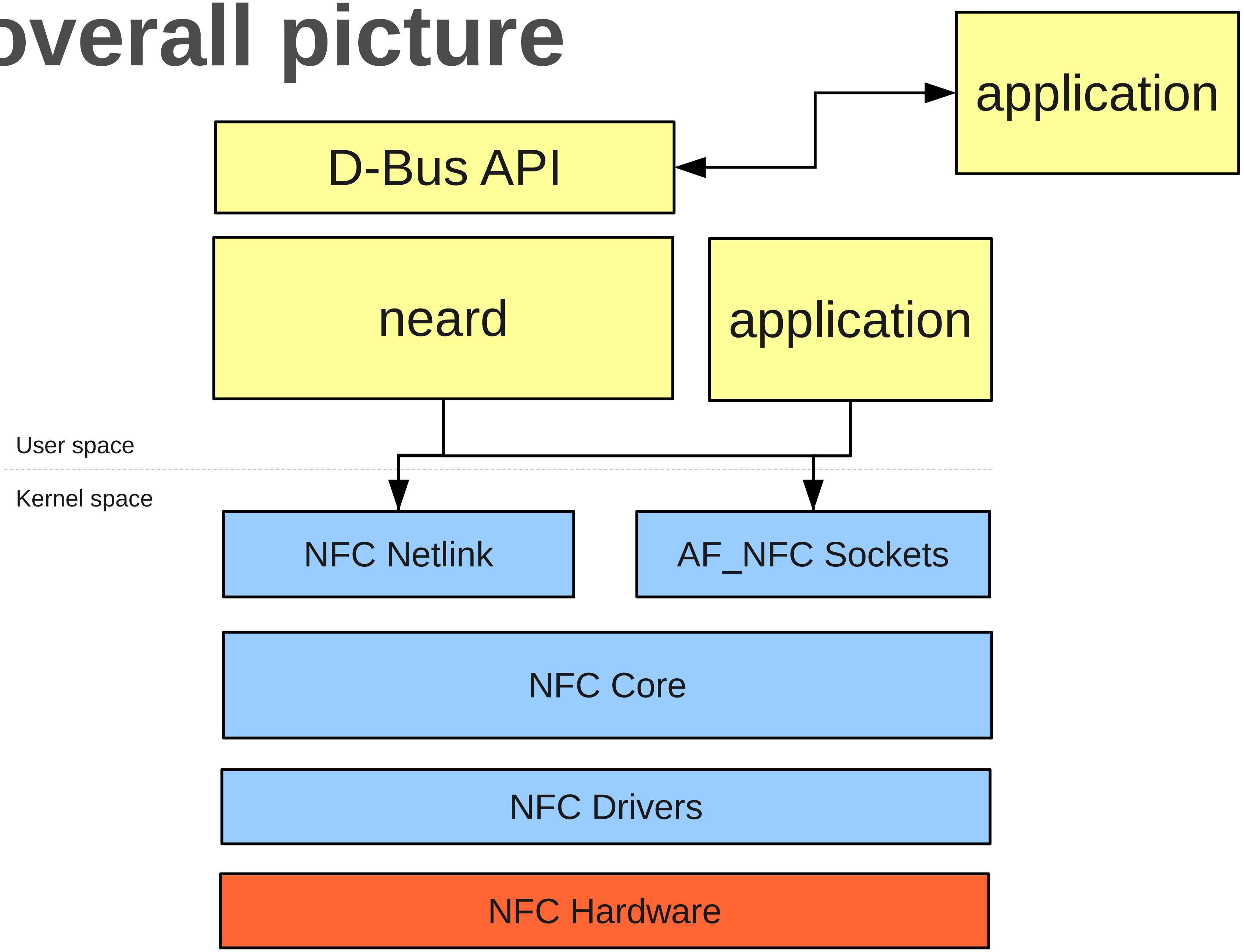
Yet another stack ?

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

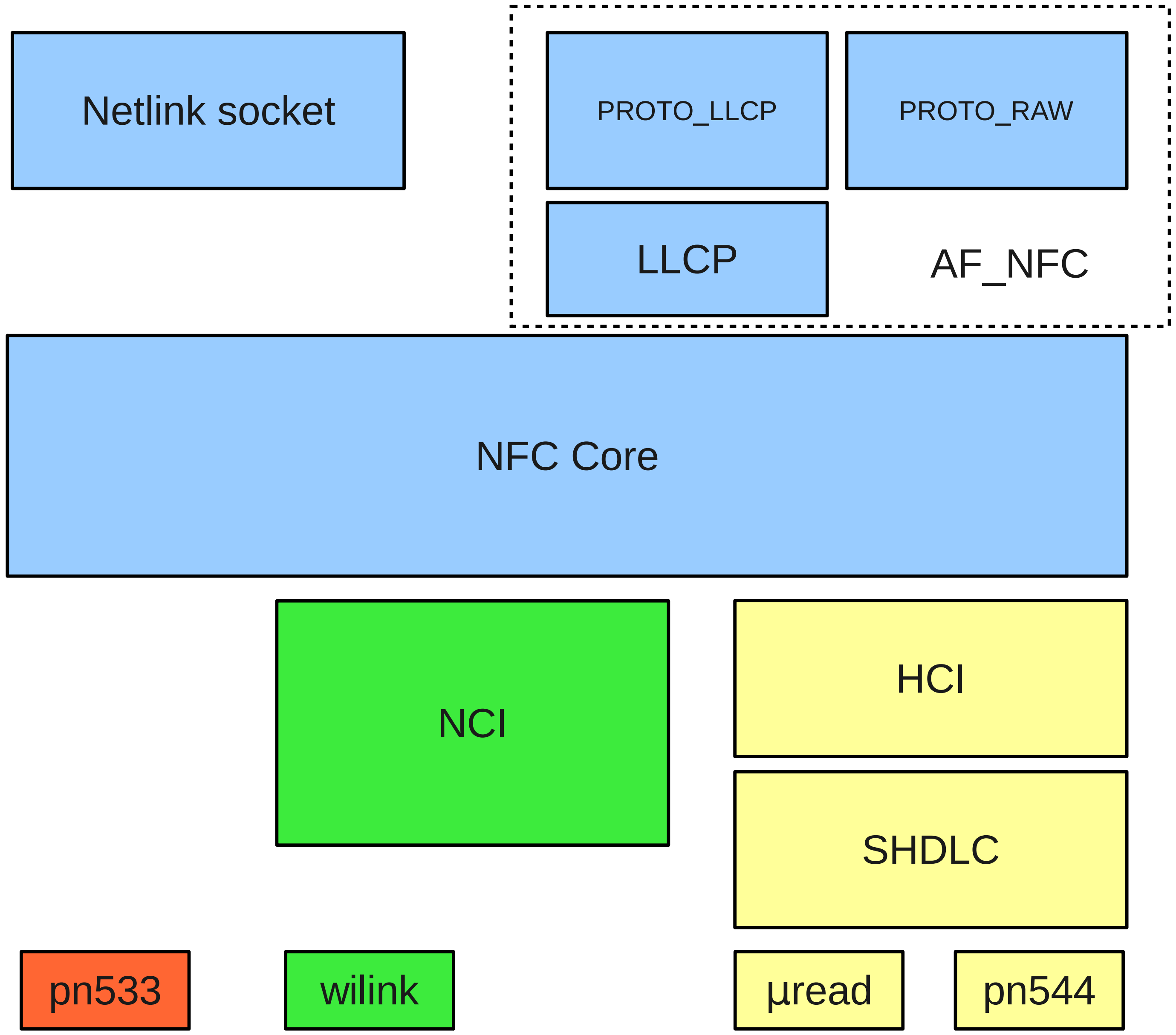
The Linux NFC stack

- 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

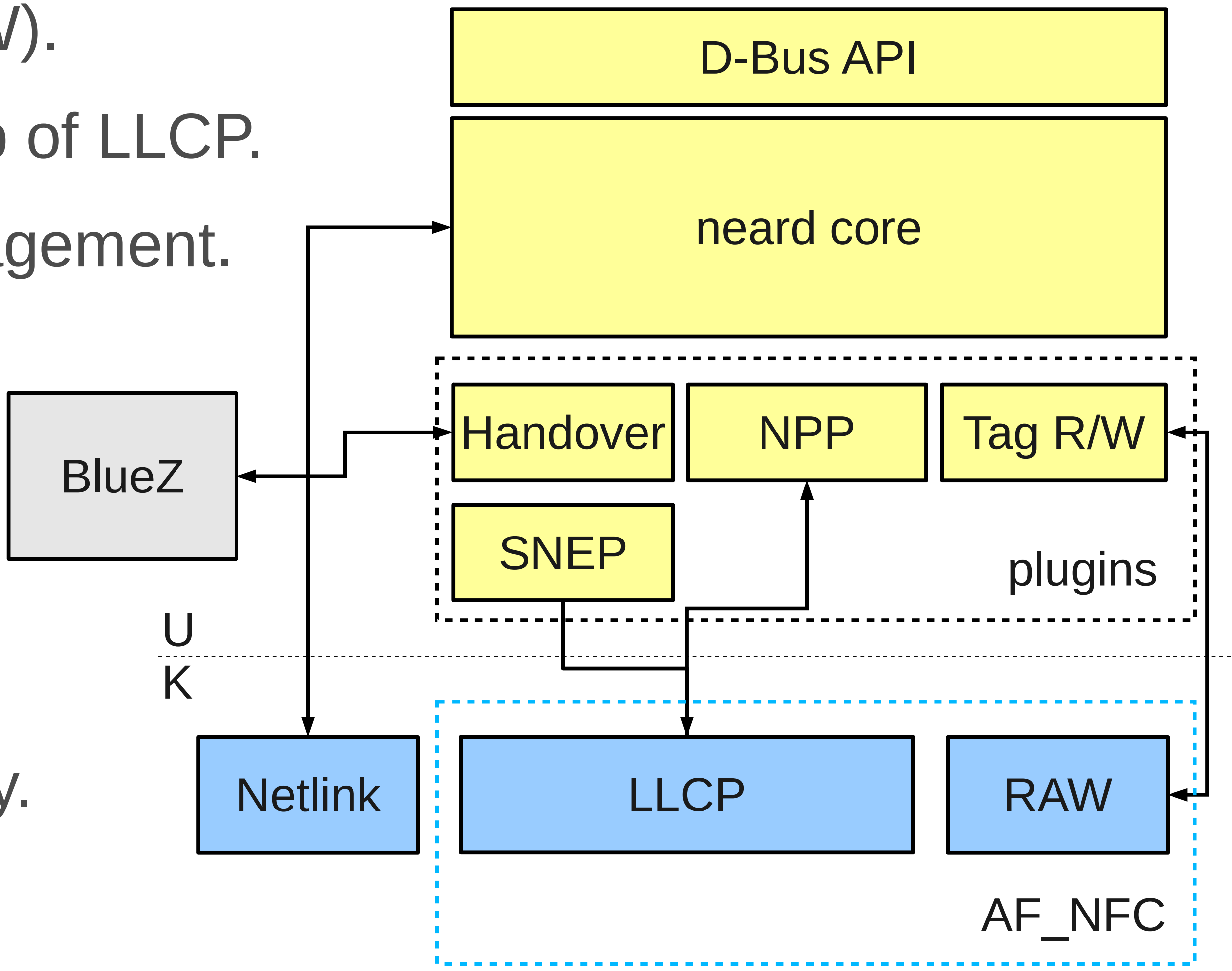


Kernel Architecture



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.
- GLib and libnl dependency.



Hardware and Features Support

	Supported Hardware
Linux	NXP pn544, NXP pn53x[1], TI nfcwilink
Android	NXP pn544
Inside Secure	Inside Secure microread
libnfc	NXP pn53x
nfcpy	NXP pn53x

	Interfaces	Tag R/W	LLCP	Handover	Card Emulation
Linux	HCI, NCI, USB	Yes	SNEP, NPP	Bluetooth	No
Android	HCI	Yes	SNEP, NPP	Bluetooth	Yes
Inside Secure	HCI	Yes	SNEP	Bluetooth, WiFi	Yes
libnfc	USB, UART	Yes	No	No	Yes
nfcpy	USB	Yes	SNEP	Bluetooth	No

[1] PN532 not supported yet

Plans

- Short term
  - Secure Element and card emulation netlink API.
  - Improve MIFARE support.
  - Inside Secure microread support.
- Long term
  - Wi-Fi Handover
  - OBEX and IP over NFC.
  - Personal Health Device Communication.
  - libneard.

One Example - PHDC

Personal Health Device Communication

- Medical and fitness devices.
- IEEE 11073 APDUs.
- NFC as a carrier.
- LLCP
  - APDUs over LLCP.
- Reader/Writer
  - PHD NDEFs.

PHDC over LLCP with neard

Implemented as plugins/phdc.c

```
struct near_p2p_driver phdc_driver = {
   .name = ”PHDC”,
   .service_name = “urn:nfc:sn:phds”,
   .read = phdc_read,
   .push = NULL,
   .close = phdc_close,
};

near_p2p_register(&phdc_driver);
```

health-api.txt: org.neard.Health for fd passing.

PHDC raw implementation: Device

```
struct sockaddr_nfc_llcp addr;

fd = socket(AF_NFC, SOCK_STREAM, NFC_SOCKPROTO_LLCP);

addr.sa_family = AF_NFC;
addr.dev_idx = adapter_idx;
addr.nfc_protocol = NFC_PROTO_NFC_DEP;
addr.service_name = “urn:nfc:sn:phds”

bind(fd, (struct sockaddr *) &addr, sizeof(addr));
```

PHDC raw implementation: Manager

```
struct sockaddr_nfc_llcp addr;

fd = socket(AF_NFC, SOCK_STREAM, NFC_SOCKPROTO_LLCP);

addr.sa_family = AF_NFC;
addr.dev_idx = adapter_idx;
addr.target_idx = target_idx;
addr.nfc_protocol = NFC_PROTO_NFC_DEP;
addr.service_name = “urn:nfc:sn:phds”

connect(fd, (struct sockaddr *) &addr, sizeof(addr));
```

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