Linux NFC Subsystem

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openBossa
Software in a creative way

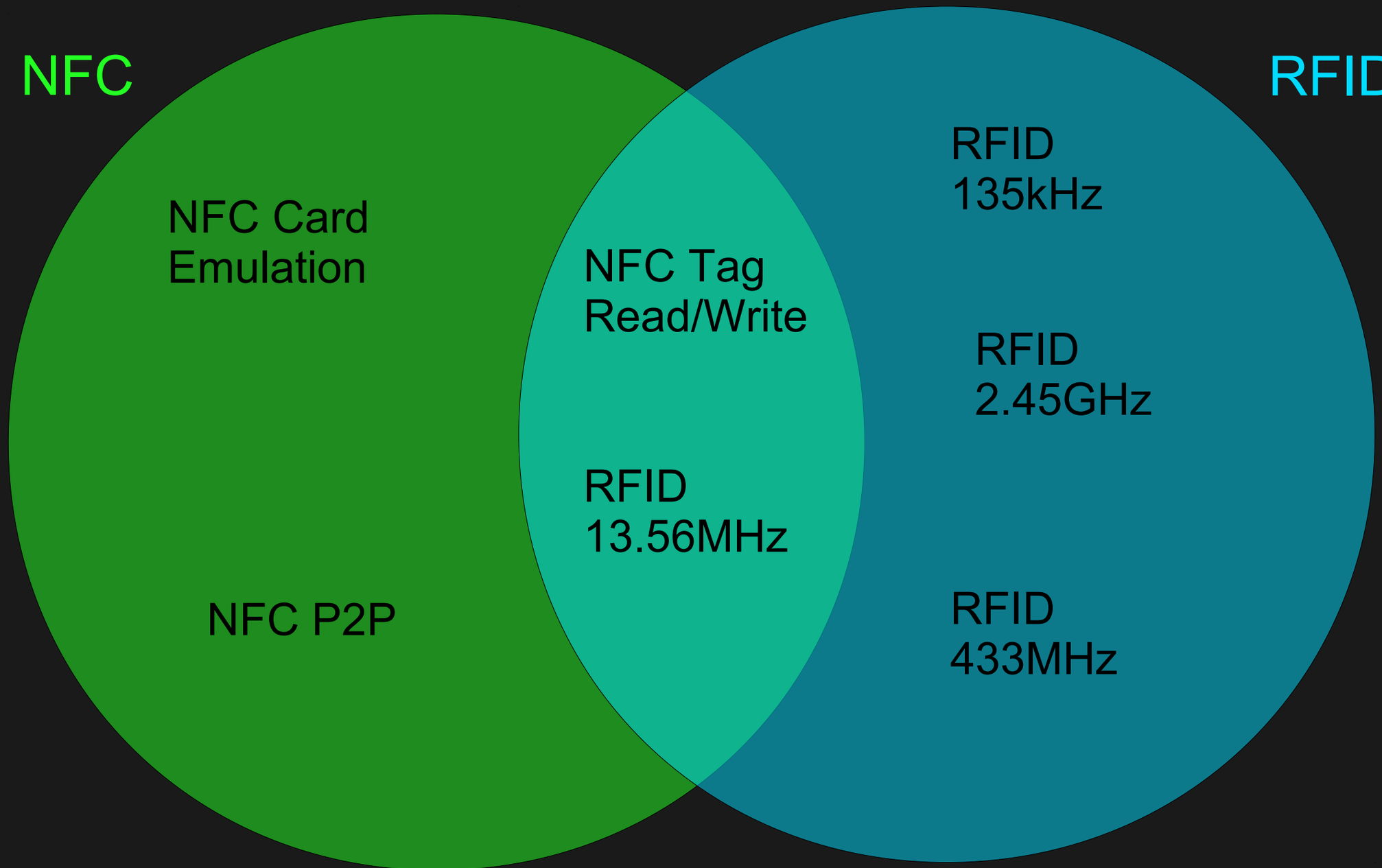
What is NFC?

- NFC means Near Field Communication
- It is a short-range wireless communication
- It operates at 13.56 MHz
- Data rates from 106 kbits/s to 424 kbits/s
- Range of about 4cm
- Modes:
  - Tag Read/Write
  - Card Emulation
  - Peer to Peer (LLCP)
    - OBEX over LLCP
    - IP over LLCP

What is the difference between NFC and RFID?

- RFID uses many frequencies including 13.56 MHz
- NFC Tag read/write and some RFID 13.56 MHz are the same thing
- NFC Card Emulation and NFC P2P are not part of RFID
- Other RFID frequencies are not part of NFC
- So, NFC and RFID are not the same thing
- But there is an intersection between them

What is the difference between NFC and RFID?



NFC and Bluetooth

- Both are short-range communication technologies.
- NFC is much shorter range than Bluetooth.
- NFC setup is faster.
- NFC is partially compatible with RFID.
- NFC power consumption is lower.
- Bluetooth has a much higher throughput .
- Bluetooth has a lot of high level profiles defined.
- So, NFC and Bluetooth are meant for different use cases.
- NFC can be used to simplify the Bluetooth pairing.

NFC Use Cases

Area	STATION AIRPORT	VEHICLE	OFFICE	STORE RESTAURANT	THEATER STADIUM	ANYWHERE
Usage of NFC Mobile Phone	Pass gate Get information from smart poster Get information from information kiosk Pay bus/taxi fare	Adjust seat position Open door Pay parking fee	Enter/exit office Exchange business cards Log in to PC; Print using copier machine	Pay by credit card Get loyalty point Get and use coupon Share information and coupon among users	Pass entrance Get event information	Download and personalize application Check usage history Download ticket Lock phone remotely
Service Industries	Mass Transport Advertising	Public Transport	Security	Banking Retail Credit Card	Entertainment	Any

Source: nfc-forum.org

NFC today's importance

- File Sharing
- Mobile Payment
- NFC Smart Poster

Google

nfc payment

About 316 results (0.18 seconds)

Advanced search

Everything
Images
Videos
News
Shopping
More

Top Stories

All news
Images
Blogs

Any time
Past hour
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Past week
Past month
2011
2010
2008–2009
2007
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Archives
Custom range...

Sorted by relevance
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Carriers Cooperating on Big Investment in Isis for NFC Mobile Payments +1

ReadWriteWeb - Dan Rowinski - 6 days ago

That is apparently what AT&T, T-Mobile and Verizon are doing by jointly investing $100 million in Isis, an **NFC** mobile **payment** solution set to battle ...

Isis Finds Tech, Seeks Banks Bank Technology News

Isis May Get $100M, But What Is The Future Of Its Mobile Technology? paidContent.org

Isis Invests $100 Million for Mobile **Payments** Venture DailyTech

SlashGear - PC Magazine

all 80 news articles » ETR:DTE - GOOG - T

Social Barrel

Mobile payment security apps coming to NFC-ready smartphones +1

Computerworld - Matt Hamblen - 26 Aug 2011

Isis, comprised of Verizon Wireless, AT&T and T-Mobile USA, announced plans earlier this year to roll out contactless **payments** using **NFC**-ready smartphones ...

Stocks Cashing in on Mobile **Payments** Motley Fool

Visa vs.Google Wallet in mobile **payments** CNET

Pay me now, or pay me sooner Northern Colorado Business Report

ZDNet Asia

all 15 news articles » GOOG

Pay with mobile phone +1

Bangkok Post - 1 day ago

Many global players have started jumping on the NFC mobile payment ... "We believe mass-market adoption of **NFC payments** is at least four years away," Sandy ...

Bangkok Post

Will Visa's push for chip cards and mobile move the needle? +1

ABA Banking Journal - 4 days ago

"As **NFC** mobile **payments** and other chip-based emerging technologies are poised to take off in the coming years, we are taking steps today to create a ...

Datacard Group Announces Educational Seminar focused on EMV(R ... MarketWatch (press release)

EMV Training Academy founded in California SecureIDNews (press release) (blog)

Chip and PIN 101 American Banker (subscription)

Thewisemarketer.com (subscription)

all 26 news articles »

Subway launches NFC payments in US +1

NFCNews - 9 Aug 2011

Subway is preparing to launch **NFC payment** terminals in 24000 restaurants across the US, according to Mobile Commerce News. The terminals, which are slated ...

Visa To Ramp Up Chip Migration To Support **NFC** And Mobile **Payments** TechCrunch

Visa Vies For Top Spot In Mobile **Payments** Arena Vending Times

Visa chip card push could spur mobile **payments** but raise web fraud ... InternetRetailer.com

USA Today

What is NDEF?

- It means NFC Data Exchange Format
- “NDEF is a lightweight, binary message format that can be used to encapsulate one or more application-defined payloads of arbitrary type and size into a single message construct.”
- “Each payload is described by a type, a length, and an optional identifier.”
- “NDEF is strictly a message format, which provides no concept of a connection or of a logical circuit ...”
- It is possible to exchange a NDEF using NFC Tag Read/Write or P2P (LLCP)

The current NFC support for Linux

Android support

- Libnfc-nxp library, provided by NXP to Google.
- 70000 lines of code.
- Strongly tied to the NXP hardware (pn544, pn65n).
- HCI support only.
- No community, exclusively maintained by NXP and Google.
- 100% userspace, complete frames are sent to /dev/pn544.
- Feature rich (target and reader mode, LLCP and SE support).

The current NFC support for Linux

Open NFC

- opennfc library, provided by Inside Secure.
- Targeted for Android, although not the default Android stack.
- 100000 lines of code.
- Strongly tied to the Inside Secure hardware.
- Slightly better architecture for additional HW support.
- No community, no mailing list, rare tarballs release only.
- 100% userspace, complete frames are sent to a device entry.
- Feature rich as well.

The current NFC support for Linux

libnfc

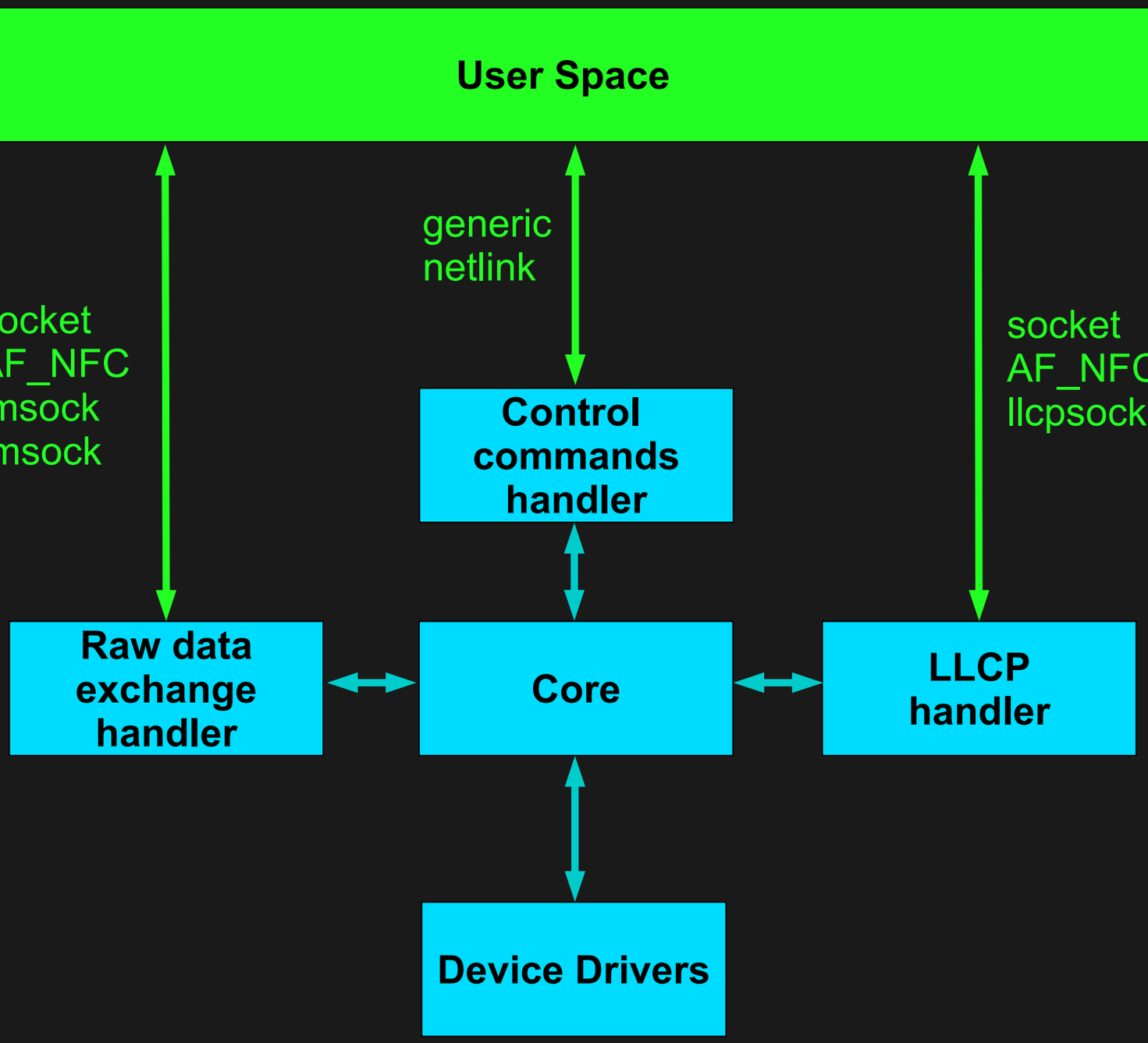
- Libnfc library, about 10000 lines of code.
- More community oriented, although sponsored by il4p.fr.
- Forums, SVN repo, documented website.
- Userspace implementation.
- Work in progress, missing features.

The current NFC support for Linux

What is missing?

- Vendor neutrality.
- HW independent support.
- Open development process.
- A proper kernel/user space split.
- A proper POSIX API.

The new NFC subsystem



Main Architecture points

- Hardware Independent
- New Hardware requires a new device driver
- POSIX API
- Generic netlink for control commands
- Sockets for data exchange

NFC control commands and events

- NFC_CMD_GET_DEVICE
- NFC_EVENT_DEVICE_ADDED
- NFC_EVENT_DEVICE_REMOVED
- NFC_CMD_START_POLL
- NFC_CMD_STOP_POLL
- NFC_EVENT_IM_TARGETS_FOUND
- NFC_CMD_IM_GET_TARGET
- NFC_EVENT_TM_ACTIVATED
- NFC_EVENT_TM_DEACTIVATED

NFC Sockets - AF_NFC

- Initiator mode socket
  - connect – select and activate a target
  - write – send commands
  - read – receive responses
- Target mode socket
  - bind – bind the socket to an NFC adapter
  - listen – wait for being activated by an initiator
  - read – read initiator commands
  - write – answer initiator commands
- LLCP socket
  - Similar to TCP sockets

Current Status

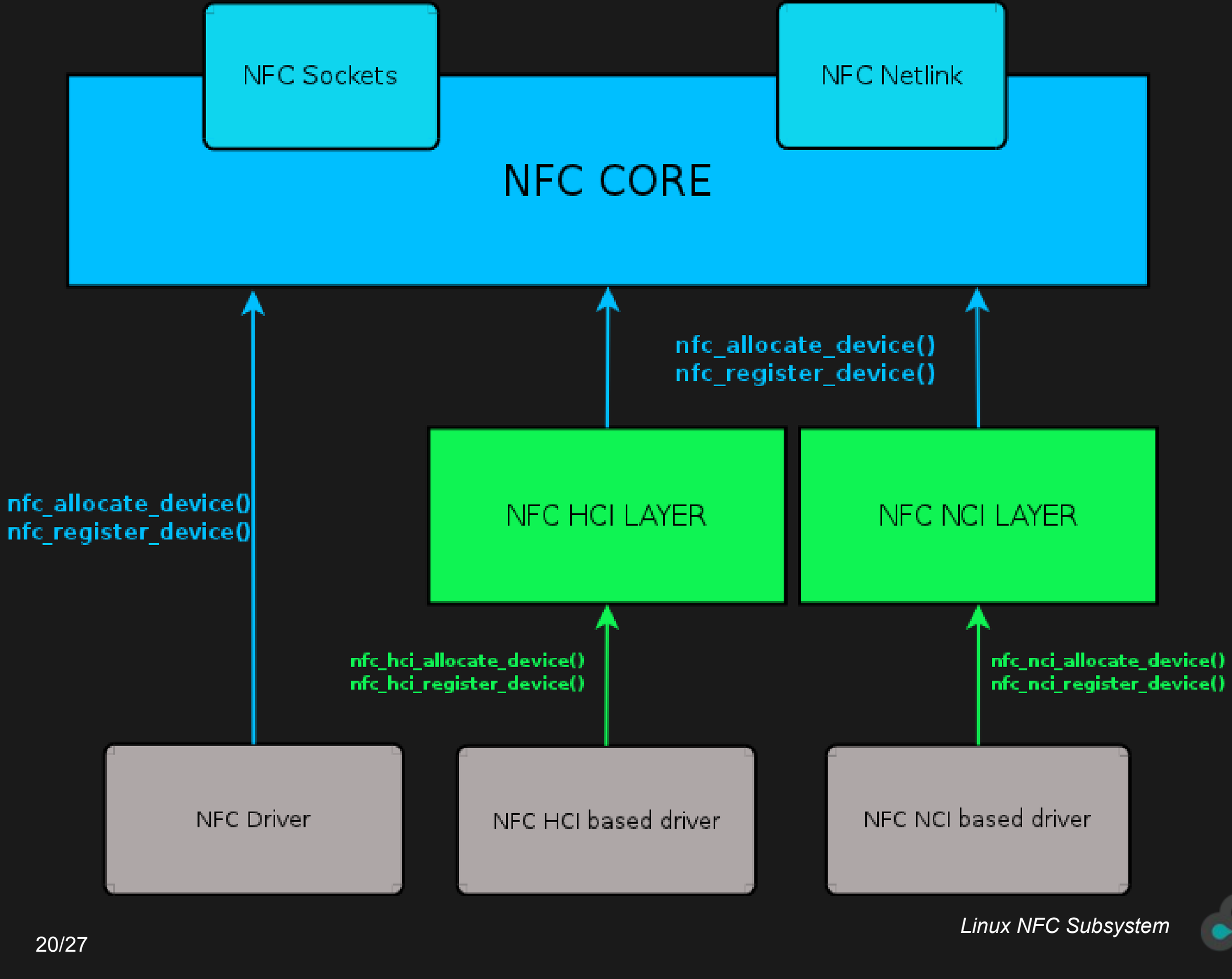
- Reader mode supported
- Card emulation WIP
- NXP PN533 device driver
- HCI support WIP
- NCI patches being reviewed (contributed by Ilan Elias from TI)
- HCI and NCI support means NXP and TI hardware support

What's next for the NFC subsystem ?

HCI and NCI support

- HCI is an ETSI defined spec.
  - Mostly defined to help smartcards integration.
  - Lots of vendor specific extensions.

- NCI is the NFC Forum answer.
  - Currently a draft.
  - Much more generic and NFC oriented.


NFC Sockets
NFC Netlink
NFC CORE
nfc_allocate_device()
nfc_register_device()
nfc_allocate_device()
nfc_register_device()
NFC HCI LAYER
NFC NCI LAYER
nfc_hci_allocate_device()
nfc_hci_register_device()
nfc_nci_allocate_device()
nfc_nci_register_device()
NFC Driver
NFC HCI based driver
NFC NCI based driver

What's next for the NFC subsystem ?

Card emulation mode

- POSIX API, card emulation is NFC's server side.
- One sock_addr_nfc structure for both modes.
- Add card emulation mode to the polling loop.
- Which RF technology do we want to poll?
- bind, listen, accept, recv, poll: Your typical networking API.

What's next for the NFC subsystem?

LLCP (Logical Link Control Protocol) sockets

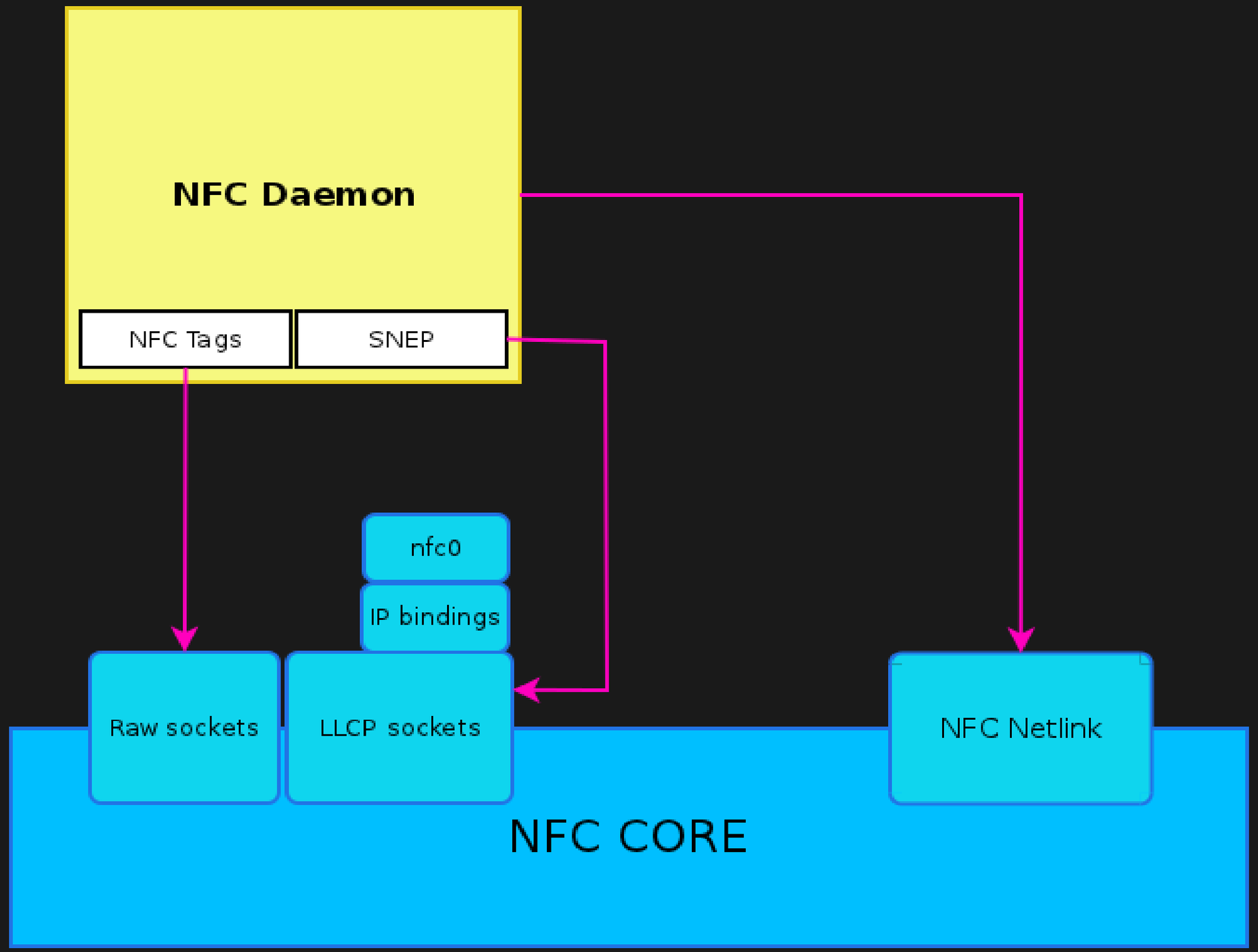
- Asynchronous Balanced Communication using a symmetry mechanism.
- Protocol multiplexing.
- Connectionless and Connection oriented data transport.
- Simple NDEF Exchange Protocol (SNEP) on top of LLCP.
- No more manufacturer specific tag commands.
- All NFC advantages without the manufacturer's legacy.
- IP and OBEX bindings.

What's next for the NFC subsystem?

User space daemon

- NFC events and properties exported through D-Bus.
- Adapters, targets and tags objects.
- Tags reader and emulation support.
- Many similarities with BlueZ
- Going through legal approval from Intel at the moment.

What's next for the NFC subsystem?



What's next for the NFC subsystem?

Secure Elements

- NFC adapter and secure element communication.
- Transaction entirely handled by the SE itself:
  - Smartcard applets
  - Proprietary protocol for the APDUs (not NFC defined).
- New simple netlink API:
  - Enabling and disabling the SWP link.
  - HCI events reports, new netlink events.
- Several potential user interaction media:
  - SIM Application Toolkit (STK), link with telephony stack.

Thanks!

#linux-nfc at freenode

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