READOUT OF STORED SENSOR DATA

JANUARY 14, 2020

NXP

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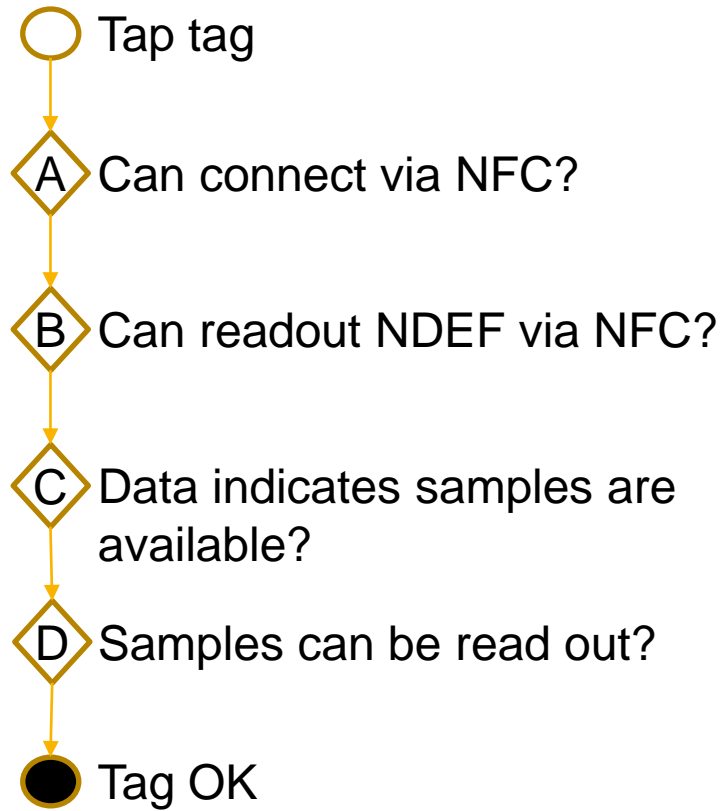FOR A SMARTER WORLD

Firmware assumptions

- Extensive use of the **SDK 12.3** or newer

- Firmware application similar to NHS3100 temperature logger demo
  - Use of `ndeft2t` module
    for generation of NDEF messages and bi-directional communication via NFC
  - Use of `msg` module
    for command/response exchange of information
  - Use of `storage` module
    for optimized data storage with recovery mechanisms after power failure and memory corruption
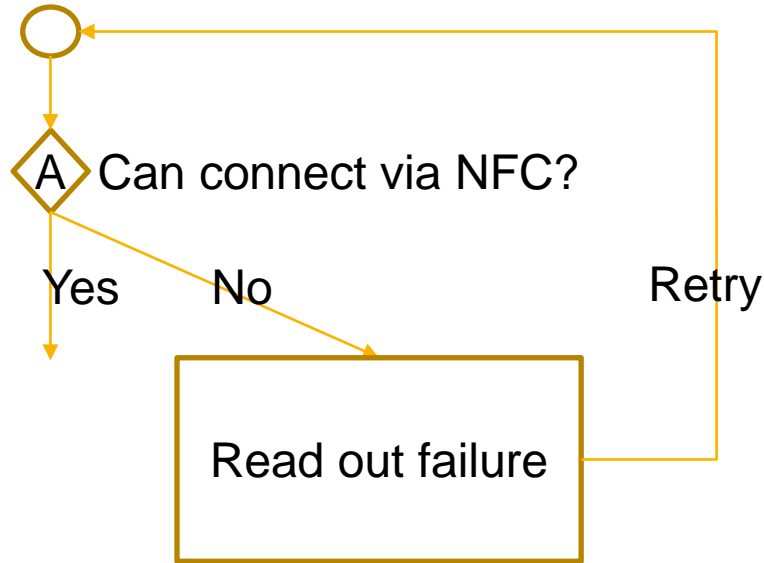
New storage features since SDK 12.3

- Reduced EEPROM writes
  - Using registers to group sensor data, writing multiple samples in a one write operation.
  - Improved caching reducing EEPROM writes in a single active session.
- Reduced impact of EEPROM corruption
  - Added EEPROM memory corruption detection mechanisms
  - Added internal recovery mechanisms
  - Customizable settings allowing application-specific trade-off between data recovery and 10k write endurance, minimizing data loss
- Reduced impact of FLASH corruption
  - Verification of contents after each FLASH write
  - Reduced storage capacity but no sample loss
- Backwards API compatible with SDK 12.1 and SDK 12.2 Straightforward upgrade from SDK 9.1 and up

READOUT

Different steps during readout

○ Tap tag

◇A Can connect via NFC?

◇B Can readout NDEF via NFC?

◇C Data indicates samples are available?

◇D Samples can be read out?

● Tag OK

Flowchart

- A — Can connect via NFC?
  - Yes
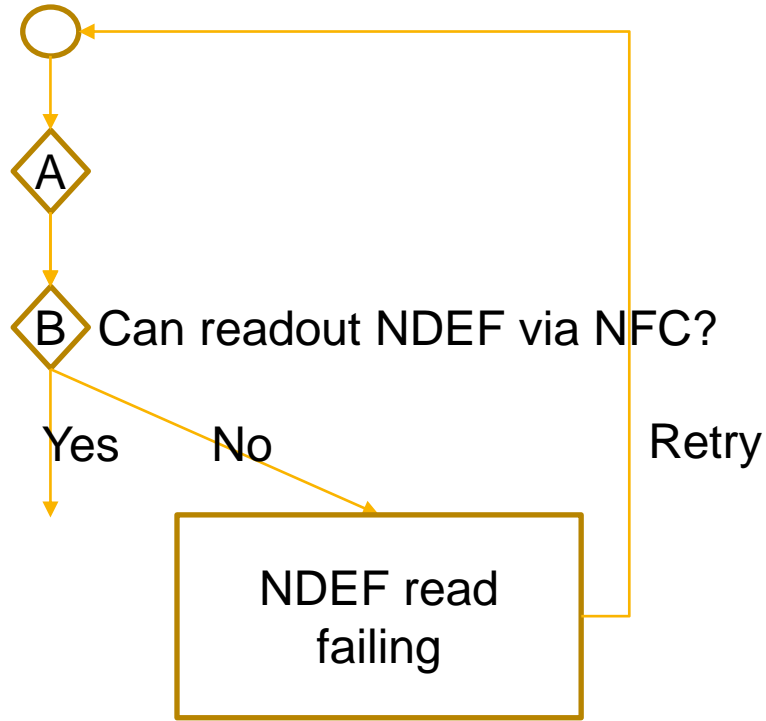 - No → Read out failure
  - Retry

Possible reasons

- Battery impedance too high *
  - Due to (freezing) temperature
  - Due to near end-of-life **
- Bad RFiD coupling

Mitigation actions

- Bring the tag to room temperature
- Disconnect the battery
  or cut the battery connection
- Check NFC antenna position
  on the phone

* Battery behavior is type and manufacturer specific. Consult your battery supplier for battery discharge profiles and battery impedance information, given the temperature range for your use case.

** When a battery is end-of-life, the NHS31xx IC will automatically switch to a fully passive operation, running on NFC harvested energy. The short period before that may cause reading failures: when a sufficiently high voltage can be provided when the load is low, but which cannot be maintained when the IC starts up.
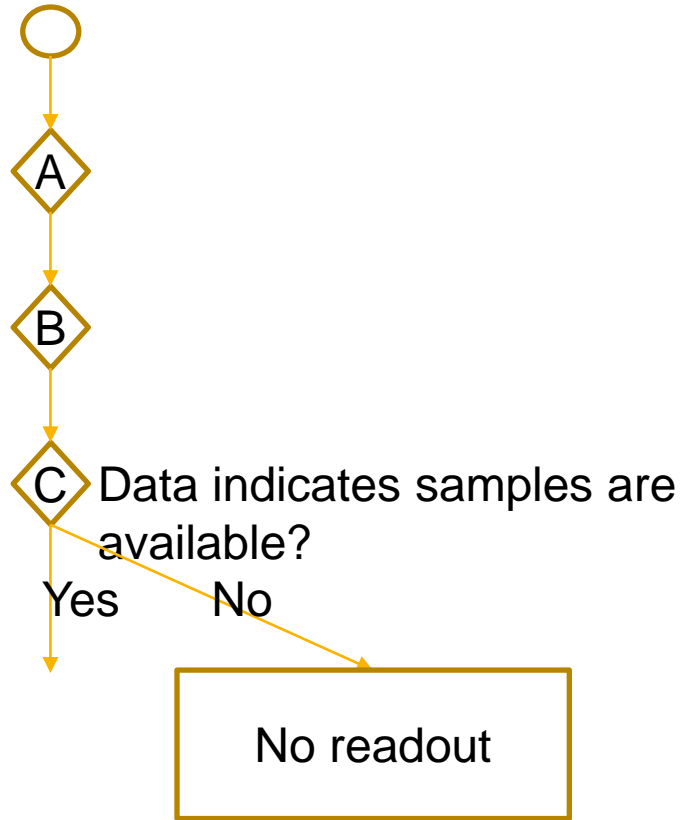
Possible reasons

- Battery impedance too high *
  - Due to near end-of-life **
- Unstable RFiD coupling

Mitigation actions

- Maintain a good and stable position of the phone relative the tag
- Disconnect the battery or cut the battery connection

A

B Can readout NDEF via NFC?

Yes   No   Retry

NDEF read failing

* Battery behavior is type and manufacturer specific. Consult your battery supplier for battery discharge profiles and battery impedance information, given the temperature range for your use case.

** When a battery is end-of-life, the NHS31xx IC will automatically switch to a fully passive operation, running on NFC harvested energy. The short period before that may cause reading failures: when a sufficiently high voltage can be provided when the load is low, but which cannot be maintained when the IC has started up.

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Possible reasons

- Tag is not configured
- Battery was depleted from the start

A

B

C Data indicates samples are available?

Yes   No

No readout
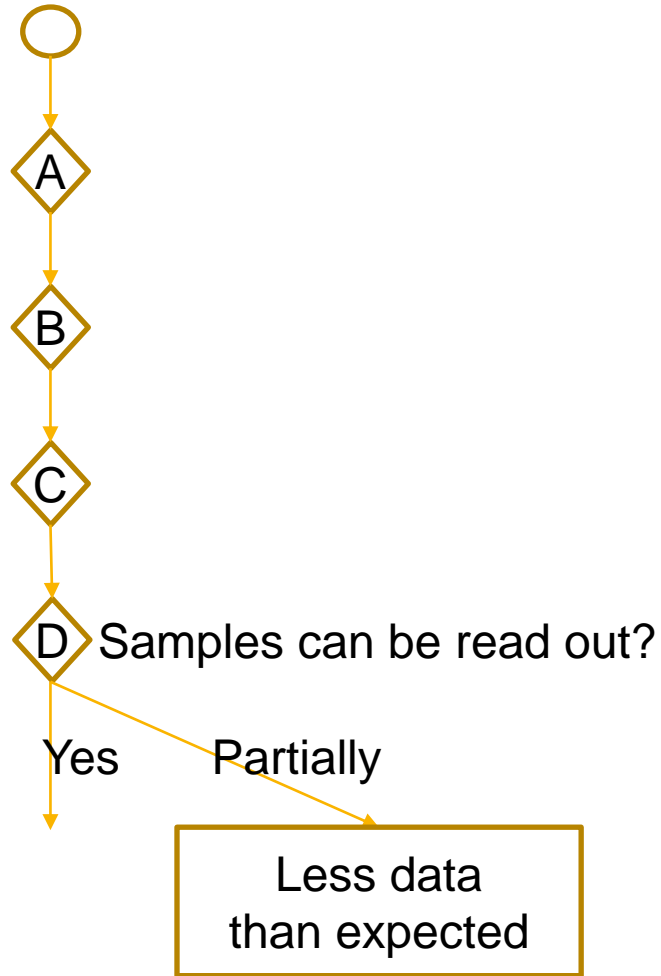
Possible reasons

- Reduced storage capacity due to FLASH memory corruption *
- Premature stop of monitoring after a battery failure **

A

B

C

D Samples can be read out?

Yes   Partially

Less data
than expected

* The storage module will never discard older measurements. When all available memory is completely filled or marked as corrupt, no more measurements can be made.

** An unexpected HW IC reset (e.g. due to a battery failure) can cause a few of the last measured data to be lost. The exact amount can be customized on an application basis. After a reset, no new measurements will be made (as is the choice made in the firmware application of the NHS3100 temperature logger demo).

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