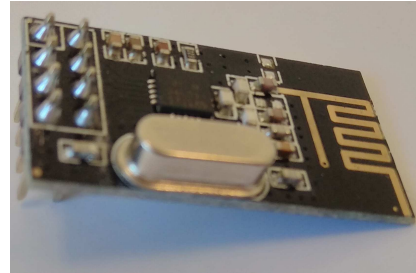


# Master Thesis

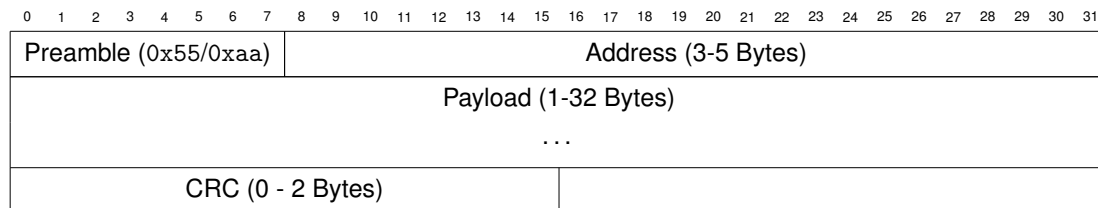
## Data Link Layer Fragmentation for nRF24L01/nRF24L01+ Transceivers

The nRF24L01/nRF24L01+ transceiver is widely used in the Arduino world because of its low power requirements and its low price. Both features make it an appealing choice of IoT scenarios. Still, connecting it to the IoT requires use of the Internet Protocol (IPv6), which in turn requires a minimum MTU (maximum transmission unit) of 1280 bytes. Sadly, ShockBurst, the data link layer used by nRF24L01(+) devices, only supports payloads of up to 32 Bytes. Thus, link layer fragmentation needs to be developed to allow the use of IP packets on top of nRF24L01/nRF24L01+ devices.



nRF24L01+ [4] transceiver that is unable to send more than the 32 B of payload

### Goals



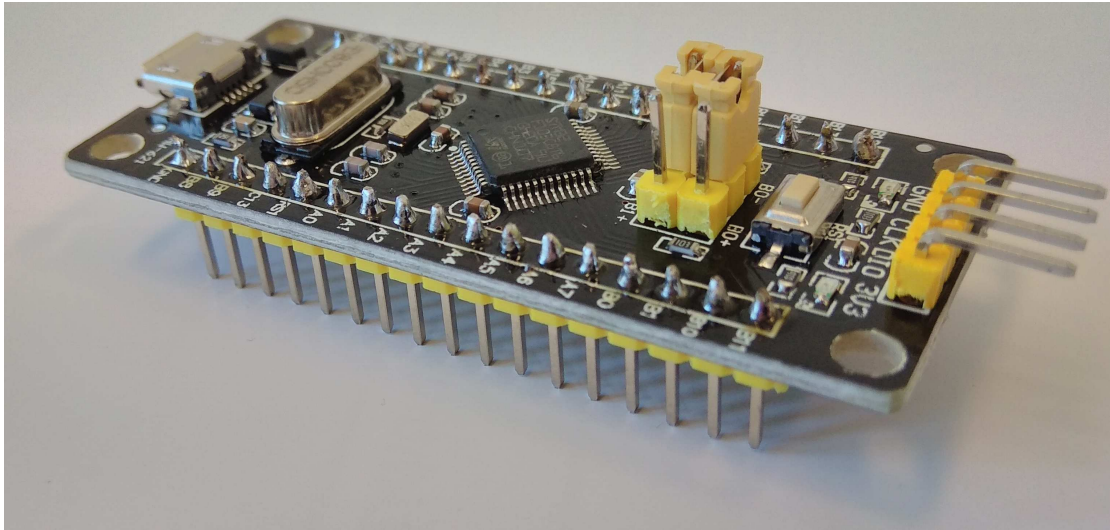
ShockBurst data link layer packet format

- Design a packet format that enables the following features on top ShockBurst data link layer:
  - Fragmentation of up to 1280 B of layer 3 payloads
  - Retransmissions (single hop) (for any number of endpoints, unlike Enhanced ShockBurst)
  - Duplicate detection
  - IPv6 and UDP header compression based on RFC 6282 [1]
- Implement the designed data link layer extensions in RIOT OS [2] using the GNRC [3] network stack
- Evaluate the performance of the implementation on the Blue Pill ARM board (see Figure 3)

**Project type** Master Thesis  
**Duration** 1 Term  
**Language(s)** English, German  
**Field** Computer Science

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## Requisites



Blue Pill board using an ARM Cortex-M3 (STM32F103C8) @72 MHz that should be used for the evaluation

- Excellent C99 programming skills
- Strong computer science background
- Experience in network programming
- Having attended at one of our software projects

## References

- [1] **J. Hui, P. Thubert.** Compression Format for IPv6 Datagrams over IEEE 802.15.4-Based Networks. <https://tools.ietf.org/html/rfc6282>
- [2] **Emmanuel Baccelli, Oliver Hahm, Mesut Güneş, Matthias Wählisch, Thomas C. Schmidt.** RIOT OS: Towards an OS for the Internet of Things. [riot-os.org](http://riot-os.org)
- [3] **Martine Lenders.** Analysis and Comparison of Embedded Network Stacks – Design and Evaluation of the GNRC Network Stack. [http://riot-os.org/api/group\\_\\_net\\_\\_gnrc.html](http://riot-os.org/api/group__net__gnrc.html)
- [4] **Nordic Semiconductor ASA.** nRF24L01+. <https://www.nordicsemi.com/eng/Products/2.4GHz-RF/nRF24L01P>

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