6LoCAN

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Why do we want IPv6 on a CANbus?

- Technology/Vendor independent
- Lots of application-layer protocols
- Transport Layer Security (TLS)
- Routing and access to the internet

Why do we want to use CAN for IPv6?

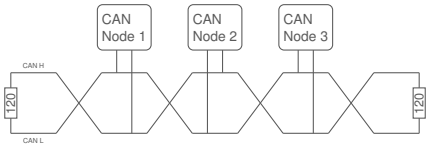
- Broad availability on small and large MCUs
- Cheap and low hardware footprint
- Very robust
- Simple wiring
- Widely used

CAN Bus

- Multi-Master with CSMA/CR
- Line topology
- Two-wire bus

[3]

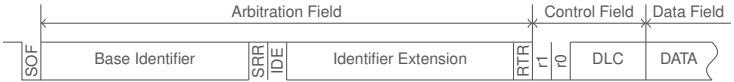
Bus Lenght [m]	Max. Speed [Kbps]
40	1000
100	500
200	250
500	100
1000	50



CAN Frame

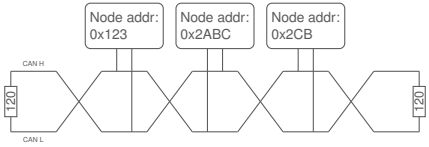
[1] [2]

- 11-bit or 29-bit Identifier
- Up to 8 bytes payload for Classical CAN
- Up to 64 bytes payload for CAN-FD



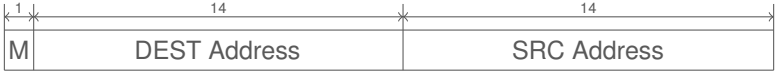
Node-Address

- 14 bits wide
- Randomly or statically assigned
- Must be unique on the bus



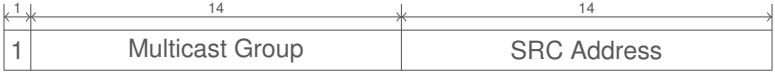
Node-Address to Identifier

- Bit 28 is a Multicast-flag
- Bit 27 down to bit 14 are the Destination Node-Address
- Bit 13 down to bit 0 are the Source Node-Address



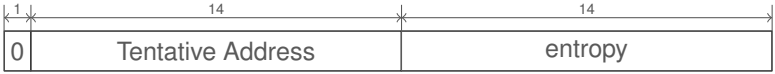
Multicast Identifier

- Multicast-flag is 1
- Destination is the lower 14 bits of the Multicast-group

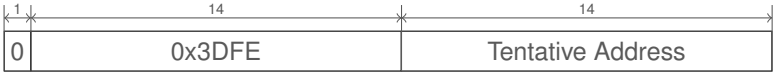


Link-Layer DAD

- Send a Remote Transmission Request Frame (RTR).



- Wait at least 100ms for a response.



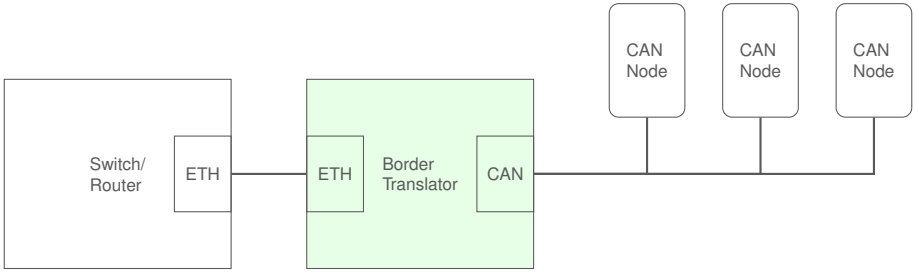
Fragmentation and Reassembly

- The minimal MTU for IPv6 is 1280 bytes
- CAN has 8/64 bytes
- 6LoWPAN Fragmentation is to bulky
- ISO-TP (ISO 15765-2)
- Fragmentation and Reassembly
- Flow-Control (Unicast only)

6lo IPHC

- IPv6 header has 40 bytes (six CAN frames)
- 6lo IPHC for Header Compression

Border Translator



Reference Implementation

- Zephyr RTOS (zephyrproject.org)
- Since version 2.0

Thank you.
Questions?

Please provide feedback.

https://tools.ietf.org/html/draft-wachter-6lo-can-00
https://www.zephyrproject.org/

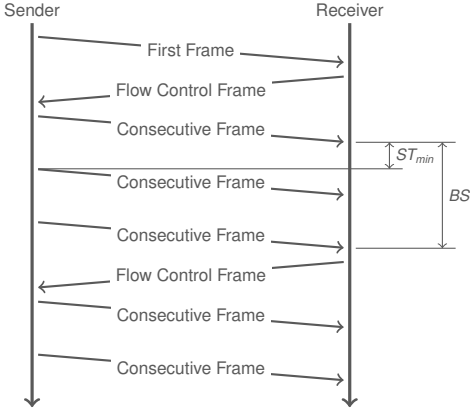
References

[1] CAN Specification 2.0. Specification. Stuttgart, DE: Robert Bosch GmbH, Sept. 1991 (cit. on p. 5).

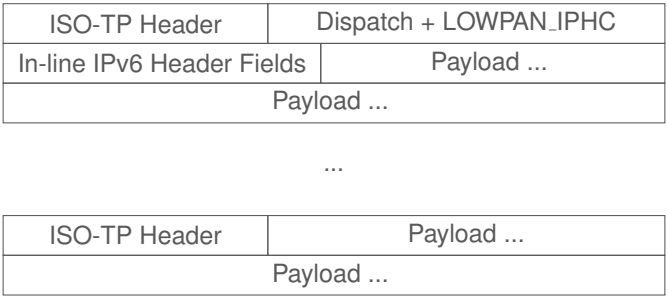
[2] CAN with Flexible Data-Rate. Specification. Gerlingen, DE: Robert Bosch GmbH, Apr. 2011 (cit. on p. 5).

[3] Controller Area Network Physical Layer Requirements. Application Report. Texas Instruments, Jan. 2008 (cit. on p. 4).

- First Frame (FF)
  - Data Length
- Flow-Control Frame
  - Flow State (CTS, WAIT, OVFLW)
  - Separation Time Min(ST_{min})
  - Block Size (BS)
- Consecutive Frame
  - Sequence Number
  - Data

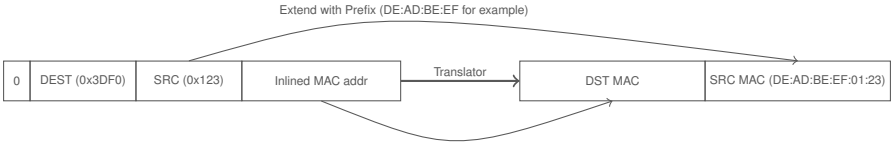


Frame Format



Border Translator

- Fixed Node-Address (0x3DF0)
- Ethernet MAC-Address is inlined



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