Technical Sheet: BLE Communication Protocol for DMX512 Control

Versión: 1.0
Author: Guillermo Morancho Vela
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General Description

This protocol enables DMX512 signal control via BLE, using one service and two specific characteristics. It is designed to be implemented in mobile or desktop applications, allowing configuration of professional lighting systems through structured commands.
Key feature: The device accepts commands up to 512 bytes via BLE and automatically fragments them into 32-byte packets for transmission over NRF24L01, adapting to this module's limitations.

BLE Configuration

Service UUID: B74F0000-8D4A-4C78-B601-7B2BA11022E3

Characteristics:

- **Individual Command (Write without response)**
  UUID: B74F0001-8D4A-4C78-B601-7B2BA11022E3
  Purpose: Send specific commands to control channels or system actions.
- **Full DMX Buffer (Read/Write)**
  UUID: B74F0002-8D4A-4C78-B601-7B2BA11022E3
  Purpose: Read or write the full 512 DMX channels.
  Note: The device automatically divides the 512 bytes into 32-byte packets for the NRF24L01 and sends them with the CMD_SYNC command to the slave devices.

Command Strucutre

Data is sent as byte arrays (uint8_t[]). The first byte defines the command type (cmdType).

CMD_CONTROL (0x00)

Purpose: Start or stop DMX transmission.
Structure: [0x00][state]

- state = 0: Stop transmission
- state = 1: Start transmission
  Example: {0x00, 0x01} to start transmission

CMD_SET_MULTIPLE_VALUES (0x01)

Purpose: Set multiple channels with individual values.
Structure: [0x01][channel count][value 1][channel 1 (2 bytes)][value 2][channel 2 (2 bytes)]…

- **Value**: 1 byte (0–255)
- **Channel**: 2 bytes (range 1–512) in little-endian format
  Example: {0x01, 0x02, 0xFF, 0x00, 0x0A, 0xFF, 0x00, 0x0B} sets channels 10 and 11 to 255

CMD_SYNC (0x10)

Recommended Use: Only for NRF24L01 (not optimized for BLE).
Structure: [0x10][packet number][values (30 bytes or 2 bytes for packet number 17)]

- **Packet number**: Index to divide the buffer into 30-value blocks
- **Values**: Sequence of DMX values starting from channel (packet_num * 30 + 1)

CMD_RESET (0xFF)

Purpose: Reset the DMX buffer to zero.
Structure: [0xFF]

Full Buffer Characteristic

Purpose: Read or write the complete 512 DMX channels.

- **Write Structure**: [Channels 1–512 (512 bytes)]
- **Read Structure**: Returns the current buffer: [Channels 1–512 (512 bytes)]

Usage Recommendations

- Prefer characteristic B74F0002 for full updates:
  Advantage: Direct sending of all 512 channels without fragmentation.
- **CMD_SYNC only for NRF24L01**:
  This command is optimized for sending the 512 channels via NRF24, which is limited to 32 bytes per transmission. It is used for synchronizing slave devices.
- **Channel Validation**:
  Channels must be in the range 1–512. Values outside this range are ignored.