

# XYO Network Protocol v1.11

XYO

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## 1 Overview

The XYO Protocol is broken into three layers, Transport, Exchange, and Data.

## 2 Transport Layer

The transport layer determines how devices speak to each other via Bluetooth, TCP/IP, or other transport. All these will have a similar structures, but will have transport specific differences.

### 2.1 Bluetooth (BLE)

The Bluetooth transfer layer essentially abstracts GATT (Generic Attributes) characteristics to an input and output stream.

#### 2.1.1 Primary Service

This service contains 2 characteristics, a read characteristic and a write characteristic.

**XYO Primary Service UUID:** d684352e-df36-484e-bc98-2d5398c5593e

**Write Characteristic UUID:** 727a3639-0eb4-4525-b1bc-7fa456490b2d

**Read Characteristic UUID:** d96b6ad7-cbcb-4979-bf06-a1051edaecb4

#### 2.1.2 Sending Data

Transferring data between two XYO BLE devices consists of reading and writing to characteristics. All data is chunked into individual packets that

can be reconstructed by the client or the server. When the connection is established, the client must subscribe to the read characteristic, so it can be notified when to read the servers data.

#### Client Sending to Server

After the two parties have established a connection. A client client can send information to the server by writing the respected bytes to the write characteristic.

#### Server Sending to Client

After the two parties have established a connection. A server can send to the client by sending a BLE notification to the client to read from its read characteristic.

### 2.1.3 Advertising and Device Discovery

XYO Enabled BLE devices should be advertising the XYO Primary Service UUID to identify them as available for a connection session. If the device is not available for a connection, it should not be advertising the primary service. This means unless a device can support mutable XYO connections at once, it should stop advertising after a connection has been established.

Many modern BLE devices rotate MAC addresses in order to combat unwanted tracking of the device. Due to this, it is hard to identify a device sully off of its mac address over a long period of time. To solve this, a node can optionally advertise any series of random bytes as the manufacturer id.

### 2.1.4 Chunking Data

When sending any data between two devices, it is necessary to chunk all of the data wishing to be sent into smaller segments so large amounts of data can be written. To archive this,

|      |       |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|------|-------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
|      | 0     | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| Size | Value |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|      | ...   |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

## 2.2 TCP/IP

### 2.2.1 XYO TCP Packet

|       |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|-------|---|---|---|---|---|---|---|---|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0     | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| Value |   |   |   |   |   |   |   |   |   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

## 3 Exchange Layer

The exchange layer determines the packet sequencing expectations for an interaction between devices. This is consistent regardless of transport.

### 3.1 Sequence

Currently, the protocol only supports two party interactions. We have a goal of multiparty support in a future version. For clarity, we will refer to the parties as 0, 1, etc...

| Step | Party | Description    |
|------|-------|----------------|
| 1    | 0     | Version Header |
| 1    | 0     | Public Key     |
| 1    | 0     | Payload        |
| 2    | 1     | Public Key     |
| 2    | 1     | Payload        |
| 3    | 0     | Signature      |
| 4    | 1     | Signature      |

## 4 Data Layer

The data layer specifies how data blocks are interpreted by devices. All numbers are passed in Big Endien. There is no padding between items being passed.

### 4.1 Version Header

#### 4.1.1 Definition

| Length | Type     | Name    | Value              |
|--------|----------|---------|--------------------|
| 1      | Unsigned | Version | Always be set to 1 |

#### 4.1.2 Example

|      |   |   |   |   |   |   |   |
|------|---|---|---|---|---|---|---|
| 0    | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 0x01 |   |   |   |   |   |   |   |

### 4.2 Example Sequence

### 4.3 Public Key

#### 4.3.1 Definition

| Length | Type     | Name  | Value                       |
|--------|----------|-------|-----------------------------|
| 1      | Unsigned | Flags | See Object Flags            |
| 1      | Unsigned | Type  | Always set to 0x01          |
| N      | Bytes    | Value | The Bytes of the Public Key |

#### 4.3.2 Example

|       |   |   |   |   |   |   |   |      |   |    |    |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|-------|---|---|---|---|---|---|---|------|---|----|----|----|----|----|----|-------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 0     | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8    | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16    | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 |
| Flags |   |   |   |   |   |   |   | 0x01 |   |    |    |    |    |    |    | Value |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| ...   |   |   |   |   |   |   |   |      |   |    |    |    |    |    |    |       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

4.4 Example Sequence

