Hello? Yes this is synth!

Making Hardware better with the Web

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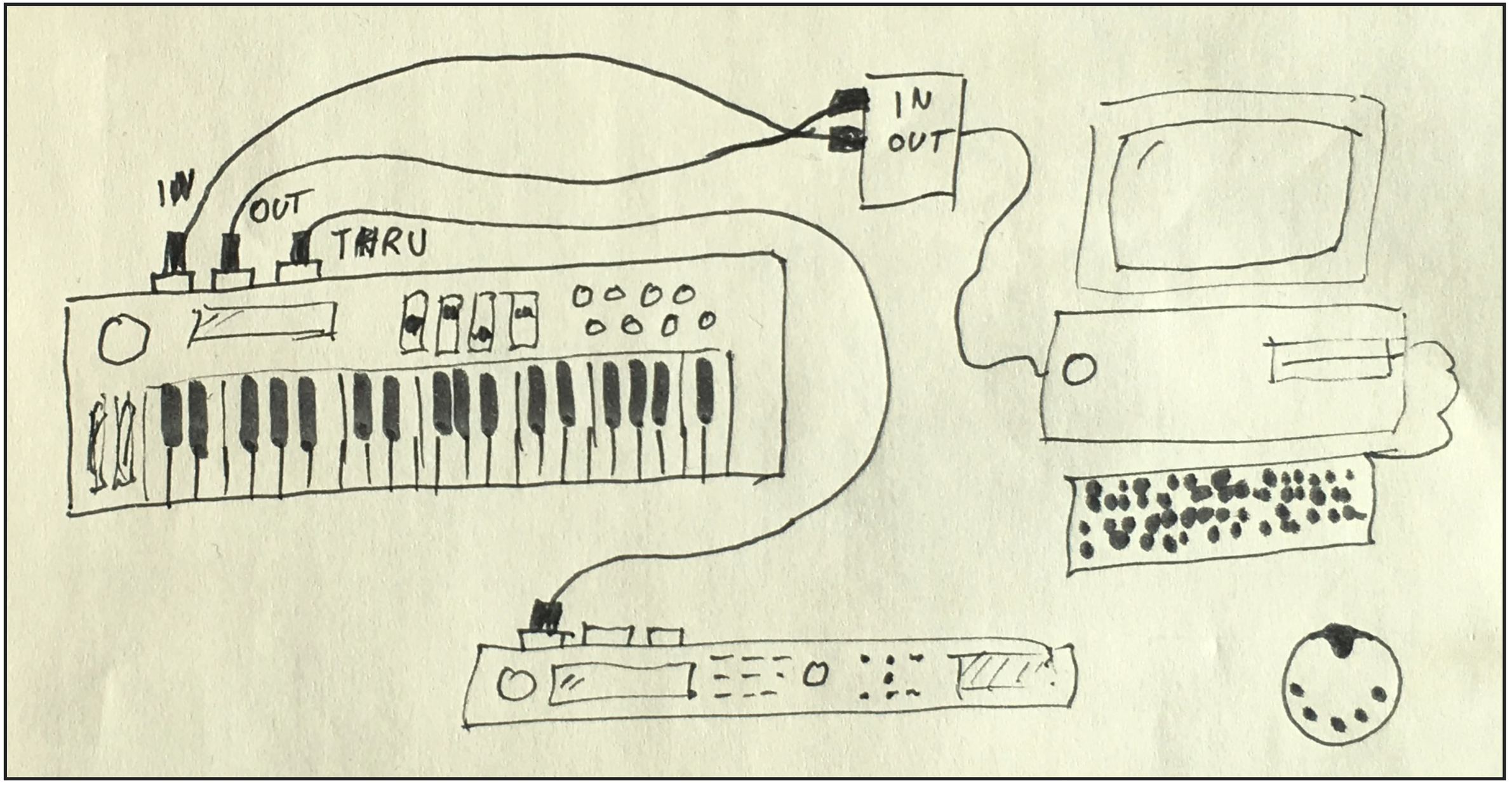
Demo

How do you talk to a synth?

1983

MIDI

Musical Instruments Digital Interface


IN
OUT
THRU
IN
OUT

Serial

Bytes

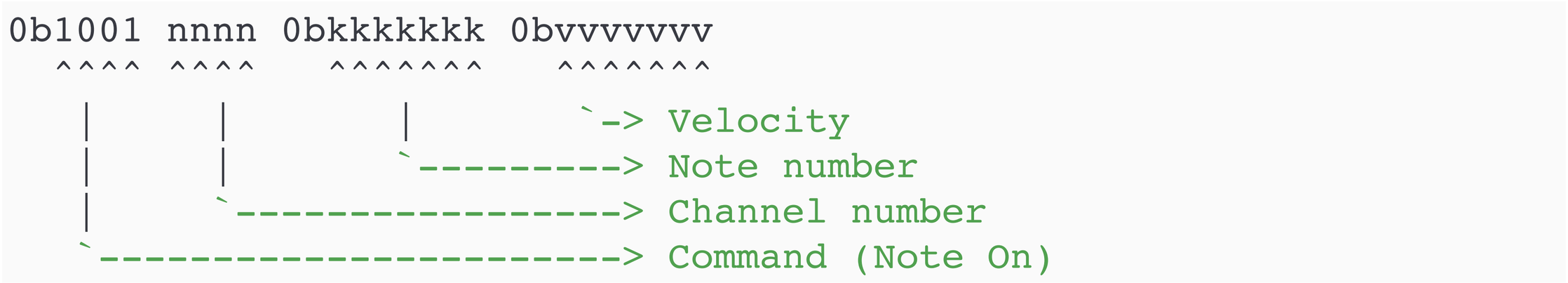
```
0b10000000 > command

0b00000000 > data
```

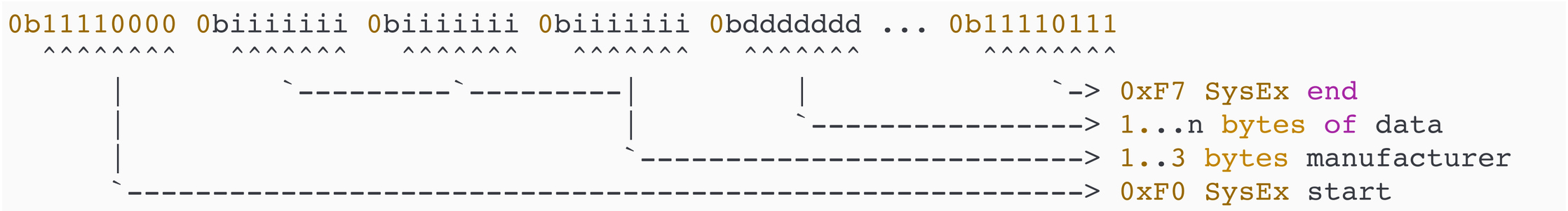
MIDI commands

- Channel Messages
- System Common
- System Realtime

Channel Messages



System Exclusive Messages



Native App

Cross platform

Yay, Web MIDI

The basics

- **Request access**
- **Enumerate devices**
- `output.send()`
- `input.onmidimessage = (event) => {}`

```
var notes = [0,3,7,12];
var delay = 500;
var output

function initMidi(midiAccess) {
  midiAccess.outputs.forEach(function(out) {
    if (out.name === 'Circuit') {
      output = out
    }
  });
}

function playNote() {
  if (!output) return;
  var now = performance.now()
  notes.forEach(function(note, i) {
    output.send([0x90, 36 + note, 0x64], now + (delay * i))
    output.send([0x80, 36 + note, 0x64], now + (delay * i) + 200)
  })
}

var button = document.getElementById('play')
button.addEventListener('click', function(e) {
  e.preventDefault()
  playNote()
})

navigator.requestMIDIAccess().then(initMidi)
```

```
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```

```
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    }
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}
```

```
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    output.send([0x90, 36 + note, 0x64], now + (delay * i))
    output.send([0x80, 36 + note, 0x64], now + (delay * i) + 200)
  })
}
```
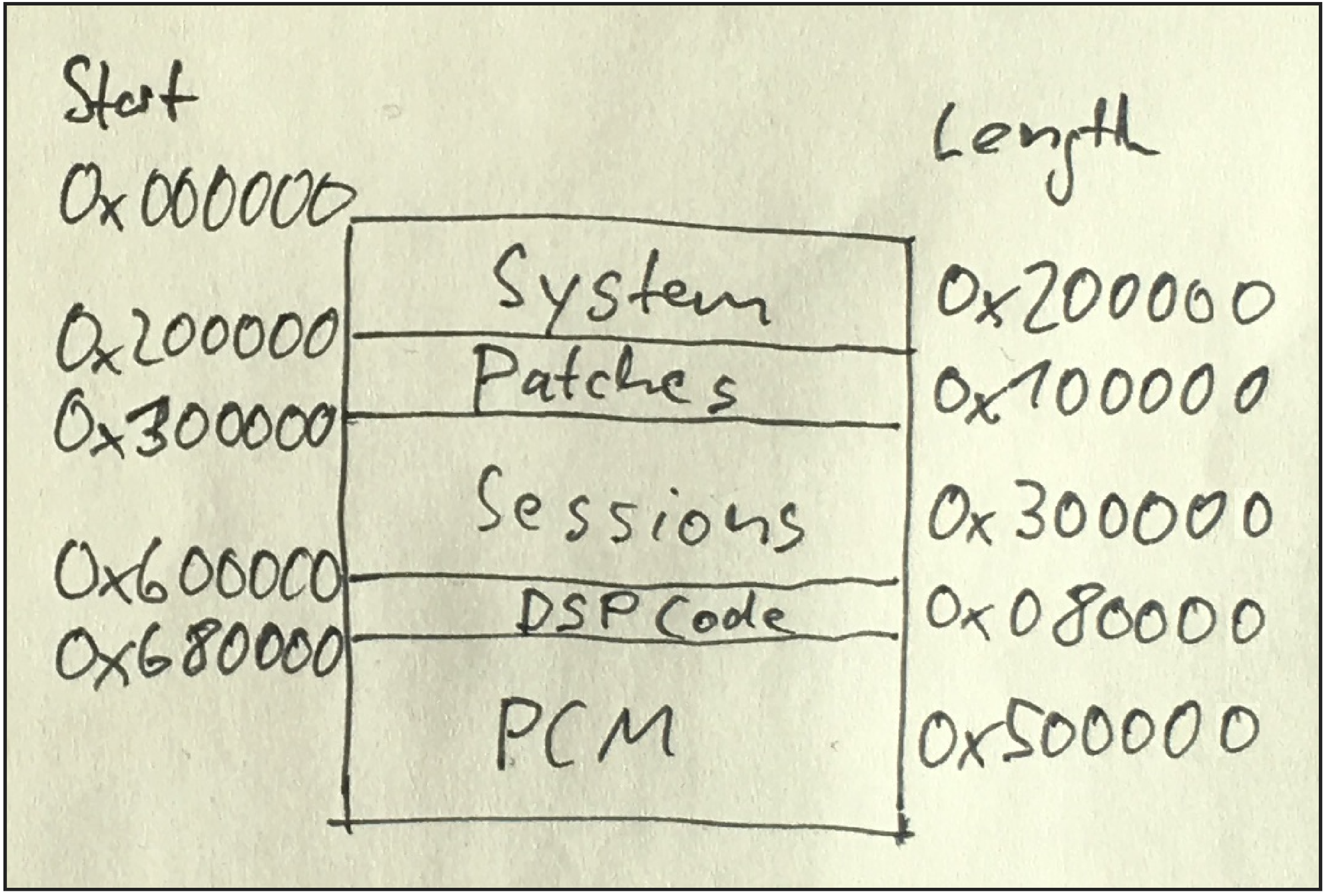

Backup Sessions

Request Data
Send Data Start
Data 1
Data 2
...
Data n
Checksum

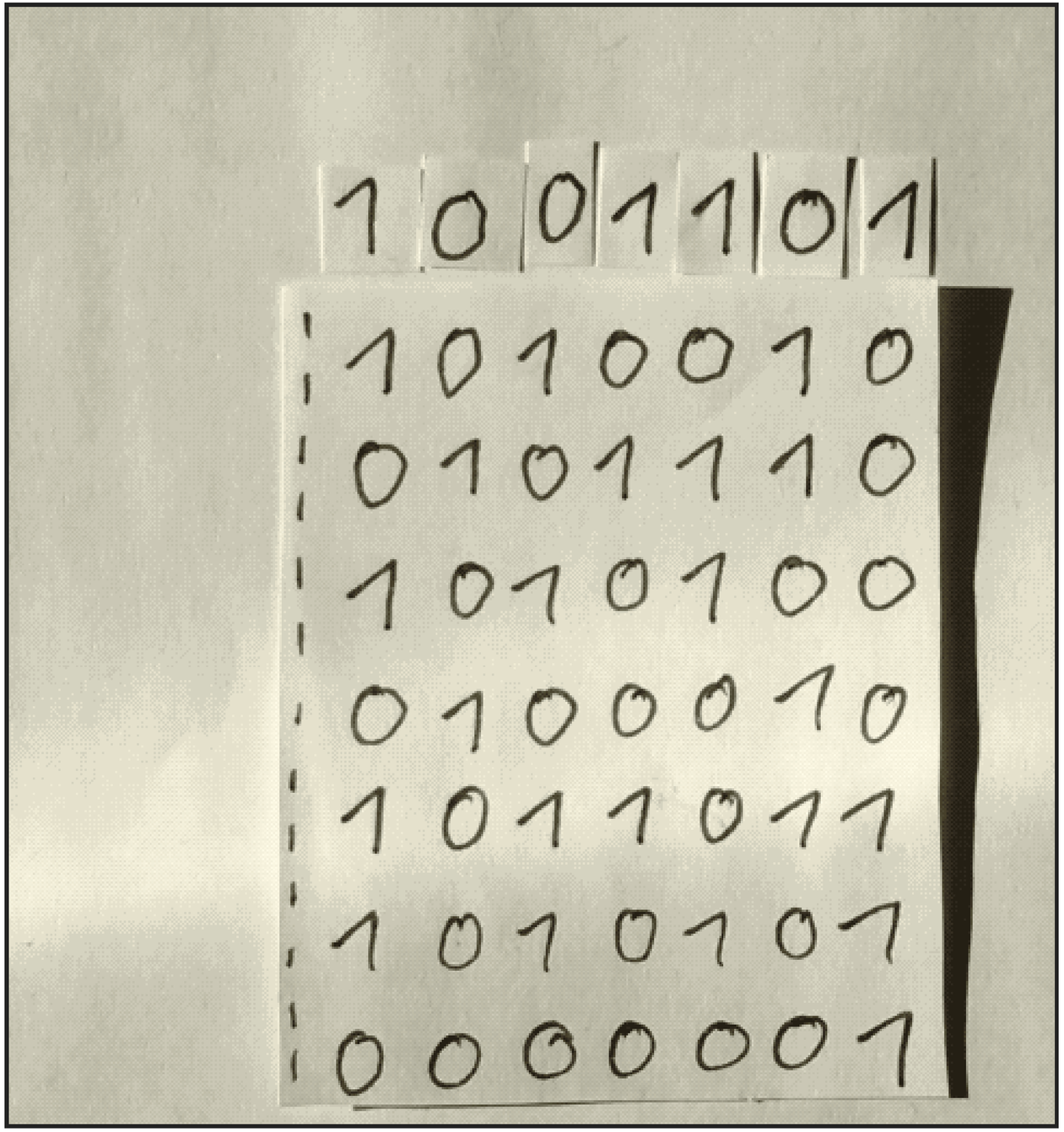

Start
Length
0x000000
System
0x200000
0x200000
Patches
0x100000
0x300000
Sessions
0x300000
0x600000
DSP Code
0x080000
0x680000
PCM
0x500000

Uhm, checksum, you say?

On Flash Content

MIDI is 7bits, remember?

8 Bit => 7 Bit


1 0 0 1 1 0 1
1 0 1 0 0 1 0
0 1 0 1 1 1 0
1 0 1 0 1 0 0
0 1 0 0 0 1 0
1 0 1 1 0 1 1
1 0 1 0 1 0 1
0 0 0 0 0 0 1

CRC-32

Choose right library

(Choose right polynomial)

```
2448471757 !== -40501201203
```

Or are they?

>>>

Random JavaScript Fact #134020204020

All binary operators return (signed) Int32

Random JavaScript Fact #134020204020

~~All~~ binary operators return (signed) Int32

```
2448471757 === (-40501201203 >>> 0)
```

Sample Upload

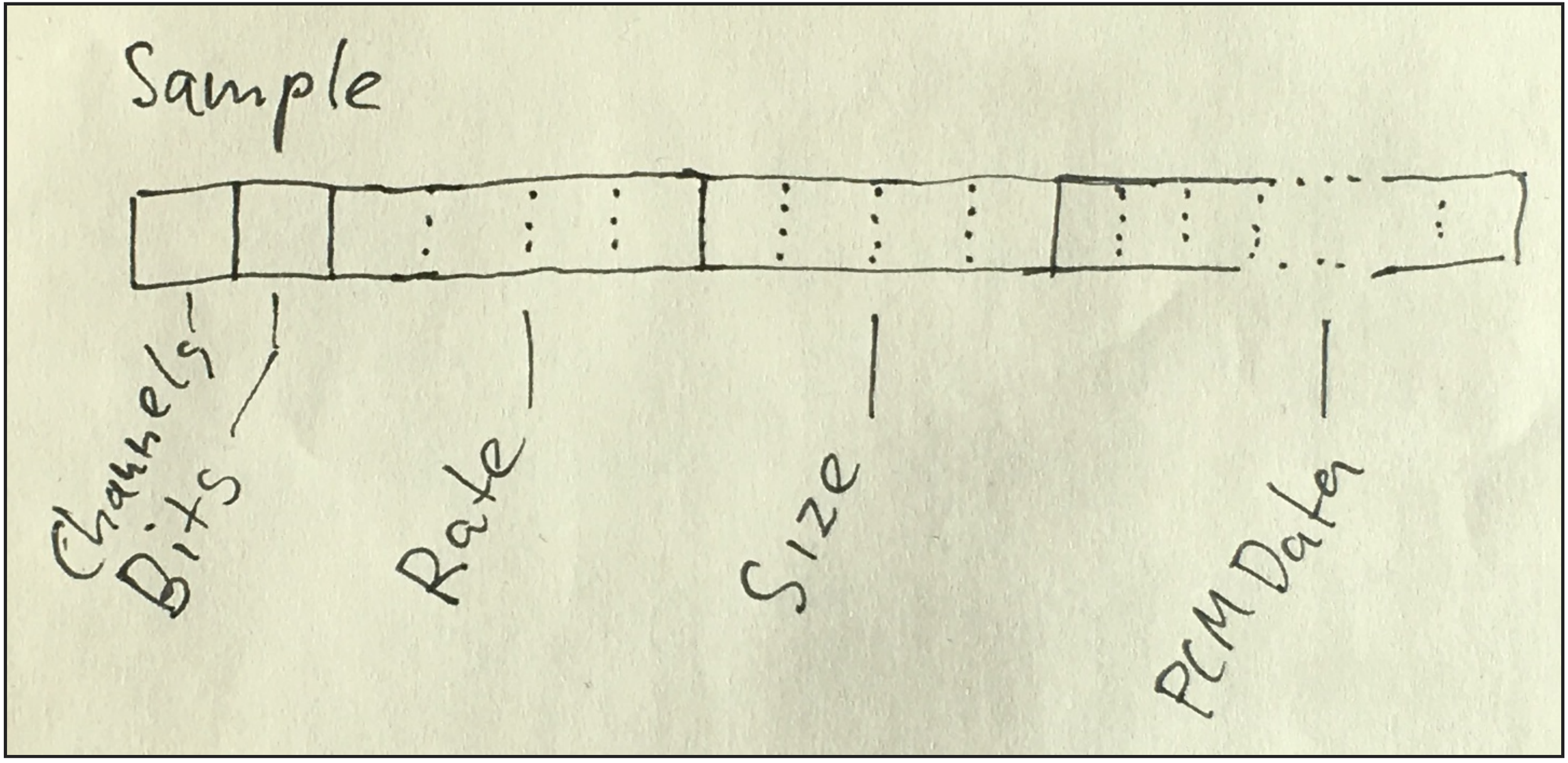
Sample conversion

1. Sample rate
2. Sample depth
3. Channels

1. Sample rate = 48kHz
2. Sample depth = 16 bits
3. Channels = 1

Web Audio to the rescue!

- `decodeAudioData()`
- **OfflineAudioContext**
- **BufferSource**
- **=> AudioBuffer**


Sample
Channels
Bits
Rate
Size
PCM Data

DataView

Original Value	Big Endian	Little Endian
`0xAFFE (45054)`	`0xAF 0xFE`	`0xFE 0xAF`

```
var buffer = new ArrayBuffer(1024)
var view = new DataView(buffer)
view.setUint32(0, 12345678)
```

```
var buffer = new ArrayBuffer(1024)
var view = new DataView(buffer)
view.setUint32(0, 12345678) // bigEndian
```

```
var buffer = new ArrayBuffer(1024)
var view = new DataView(buffer)
view.setUint32(0, 12345678, true) // littleEndian
```

```
var buffer = new ArrayBuffer(1024)
var view = new Uint32Array(buffer)
view[0] = 12345678;
```

```
var buffer = new ArrayBuffer(1024)
var view = new Uint32Array(buffer)
view[0] = 12345678;
```

Metadata

User feedback

A lot to be done

One last thing


Depfu

Thank you!