1 **What is tile?**

“A modular, programmable, smart tile. It can sense pressure, emit controllable light, and communicate with neighboring tiles and remote devices.”

**Open Platform**
Similar to Arduino, extensible and generalized.

**Designed for any environment**
Commercial, industrial, and private use.

2 **Mechanical**

**Material Choices**
Our main structural components include a polycarbonate cover piece, and structural blocks made of resin, which transfer load to strain gauges embedded in the tile base.

Additional components include strain gauge seats made of resin and the tile base made of PLA.

In a mass-produced product, potential materials may include injection molded plastic for the tile base, and aluminum for the structural blocks.

**Structural Performance**
When a pressure of 77 kPa (243 kg) is applied to the full area tile cover, a minimum safety factor of 1.7 is observed, with a maximum edge deflection of 1.42 mm.

The pressure applied corresponds to a 120 kg weight applied over an area equal to a US Women’s Size 5 foot.

3 **Electrical**

**Load Sensing**
Each tile uses 8 center-tap strain gauges to sense the magnitude and position of load on the tile surface.

Each load cell has a sensing range of up to 50kg, with the two cells in each corner forming a 4-element wheatstone bridge.

**Control & Communication**
At the heart of each tile is an Arduino Nano, communicating with the central ESP32 microcontroller over I2C.

Upon connection, tiles automatically determine their location and orientation within the network and report it to the central controller.

4 **Software**

**Web Application**
The React + TypeScript Frontend has 3 modes of operation.

1. Data Mode — For viewing and reception of data
2. Draw Mode — To draw patterns on the detected tile grid
3. Program Mode — For simple programming logic

**WebSocket Communication**
The web application communicates with the ESP32 via a NodeJS WebSocket server, which also serves to encode and decode messages between these two clients.

```
ACTUAL SHAPE m03000031200 -> decodeTileShape() -> [1][2][3]
```

5 **Applications**

Aside from drawing simple patterns and programming using simple states, the Data Mode exposes its stream of data, allowing an infinite number of applications. Some ideas:

Floor Piano Keys  Data Collection on Consumer Pathways  Responsive Floor Lighting  Interactive Art Installations
Foot Traffic Data Viz  Dance Dance Revolution  ... etc!