**ECE4095 Final Year Project 2018**   **Shikhar Gupta**
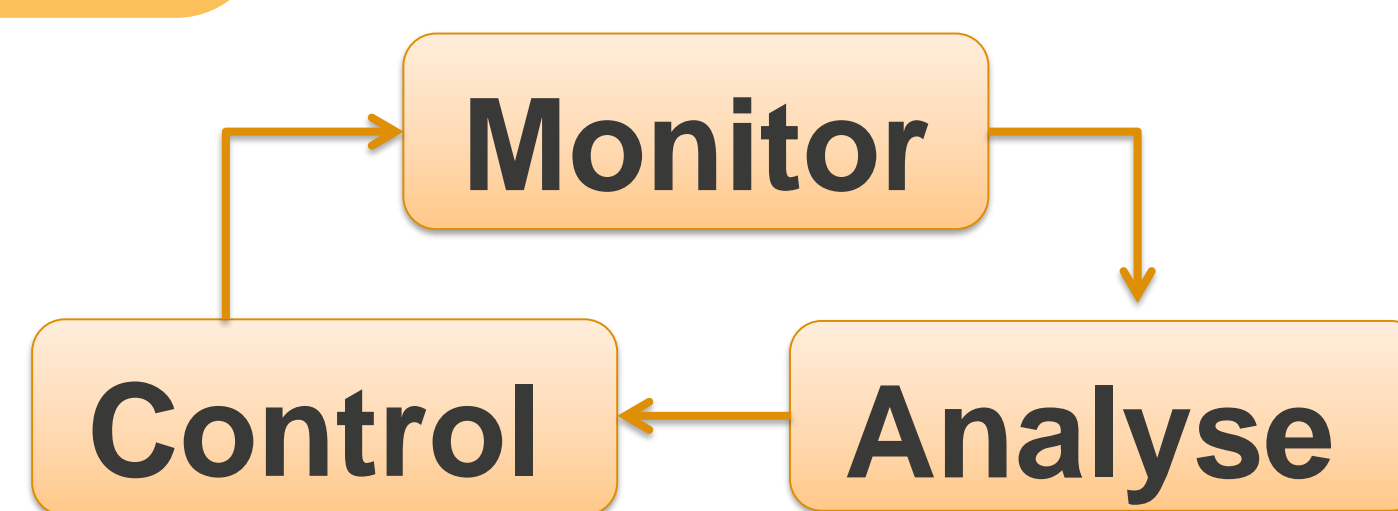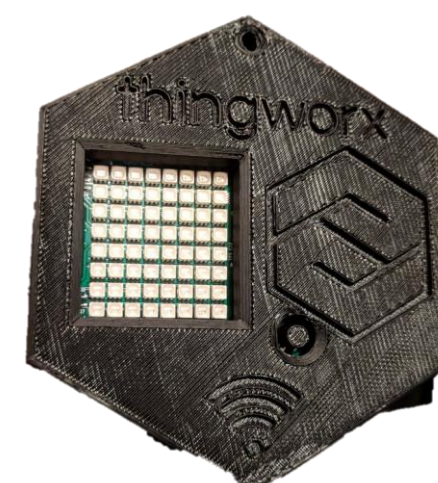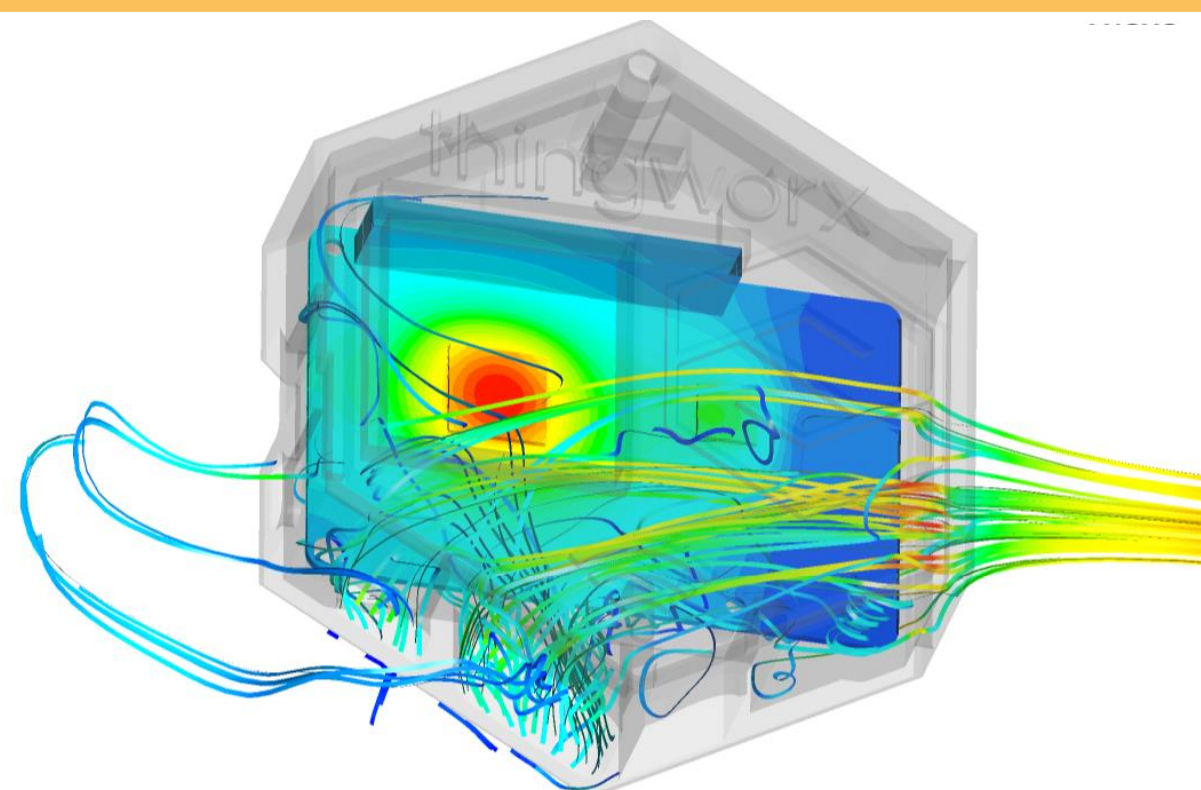
Digital Twin: Sensored Simulation

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A Digital Twin is a digital model of a physical entity.

1. For live monitoring, sensors interfaced to a Raspberry Pi send a live stream of data to the cloud including Barometric Pressure, Humidity, Temperature and pose information (from an accelerometer and gyroscope)

Monitor

Control ← **Analyse**
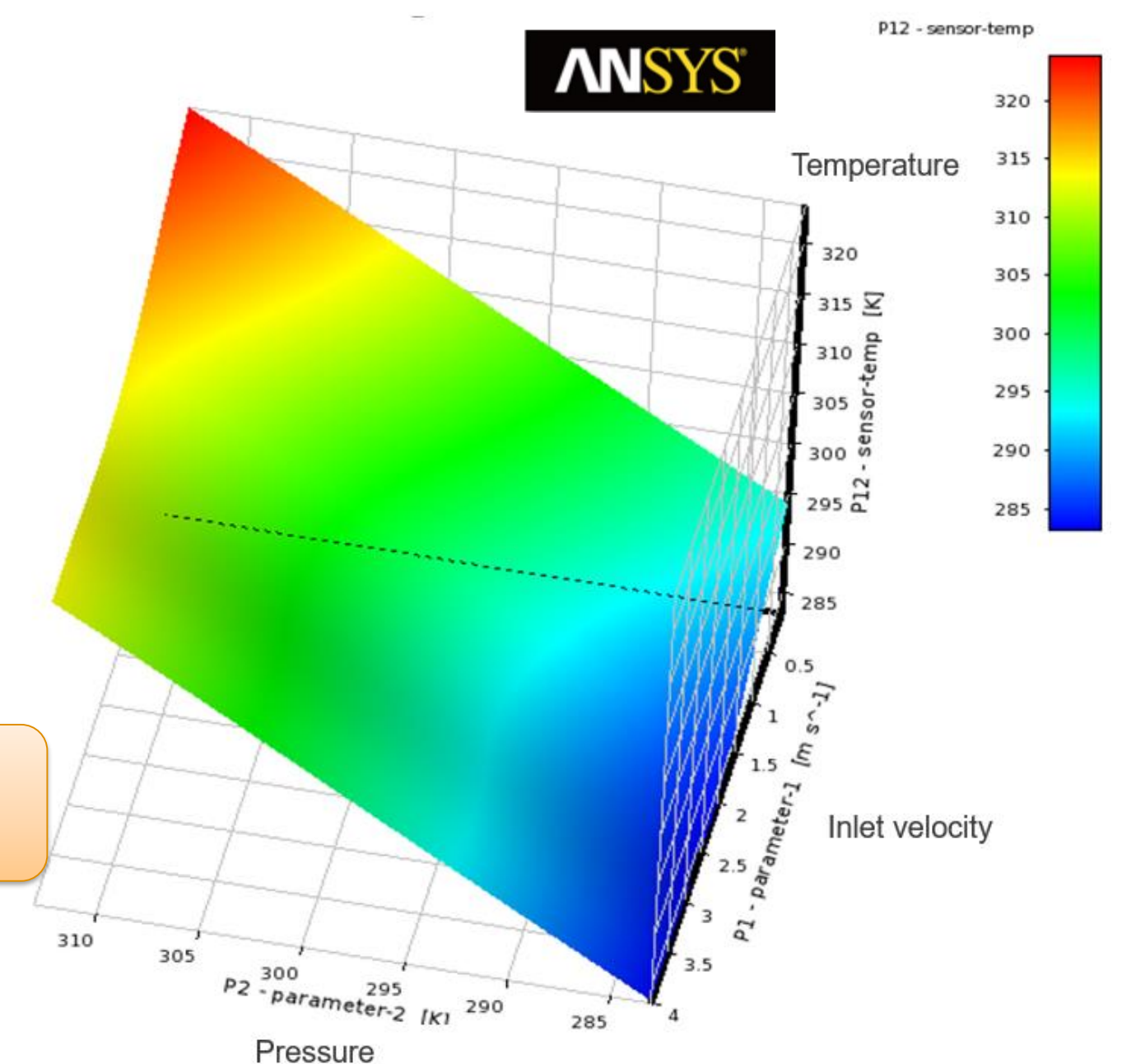
3. Fan-based Pulse Width Modulation (PWM) controlled cooling is based on sensor data and CFD results from ANSYS Fluent, ensuring components do not fail. This pushes processing from the edge to the cloud and allows for remote monitoring and control of assets in real-time.

Some critical points
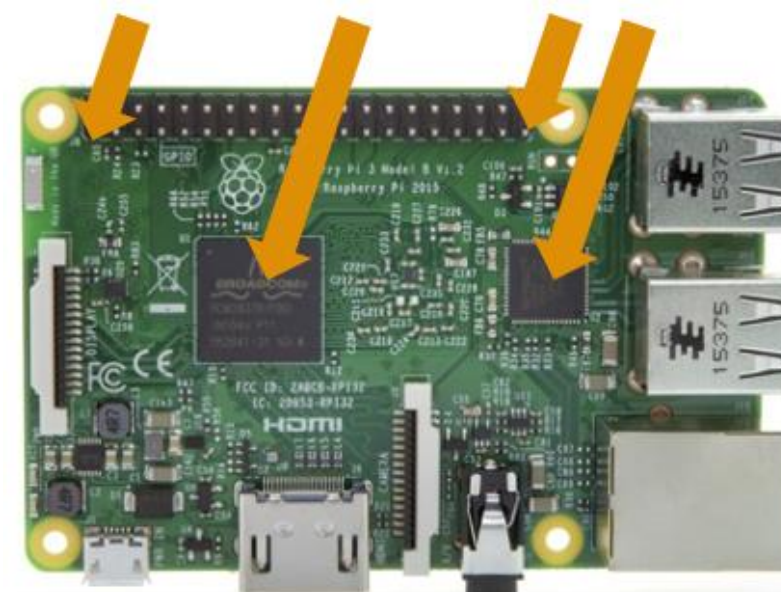
2. Computational Fluid Dynamics (CFD) simulations using ANSYS Fluent generate response surfaces relating ambient conditions to temperatures and pressures at critical points, such as the Broadcom BCM2835 CPU, mounting holes and the Ethernet controller.

Visualise

Popup warning

Sensor data in context

Animated service instructions
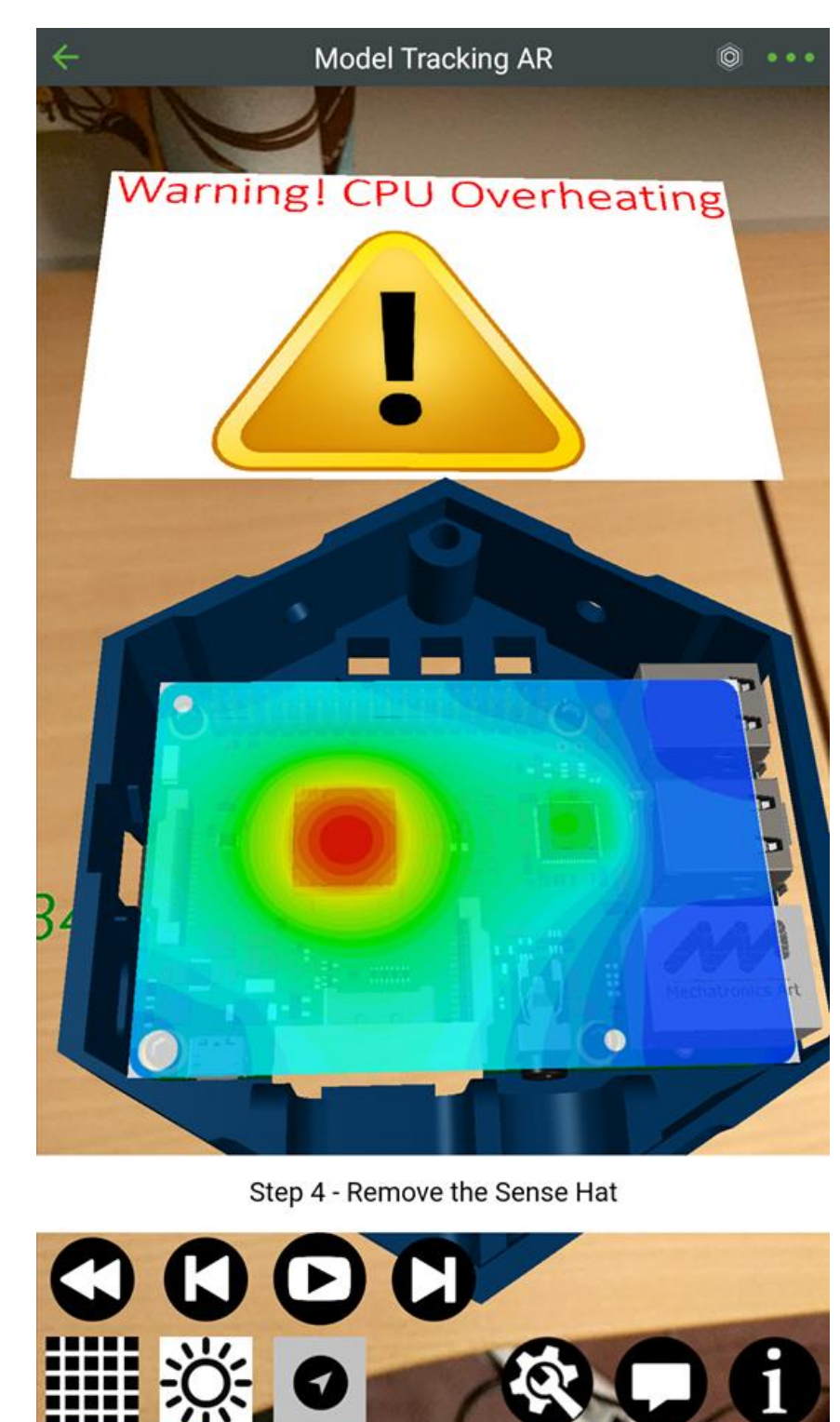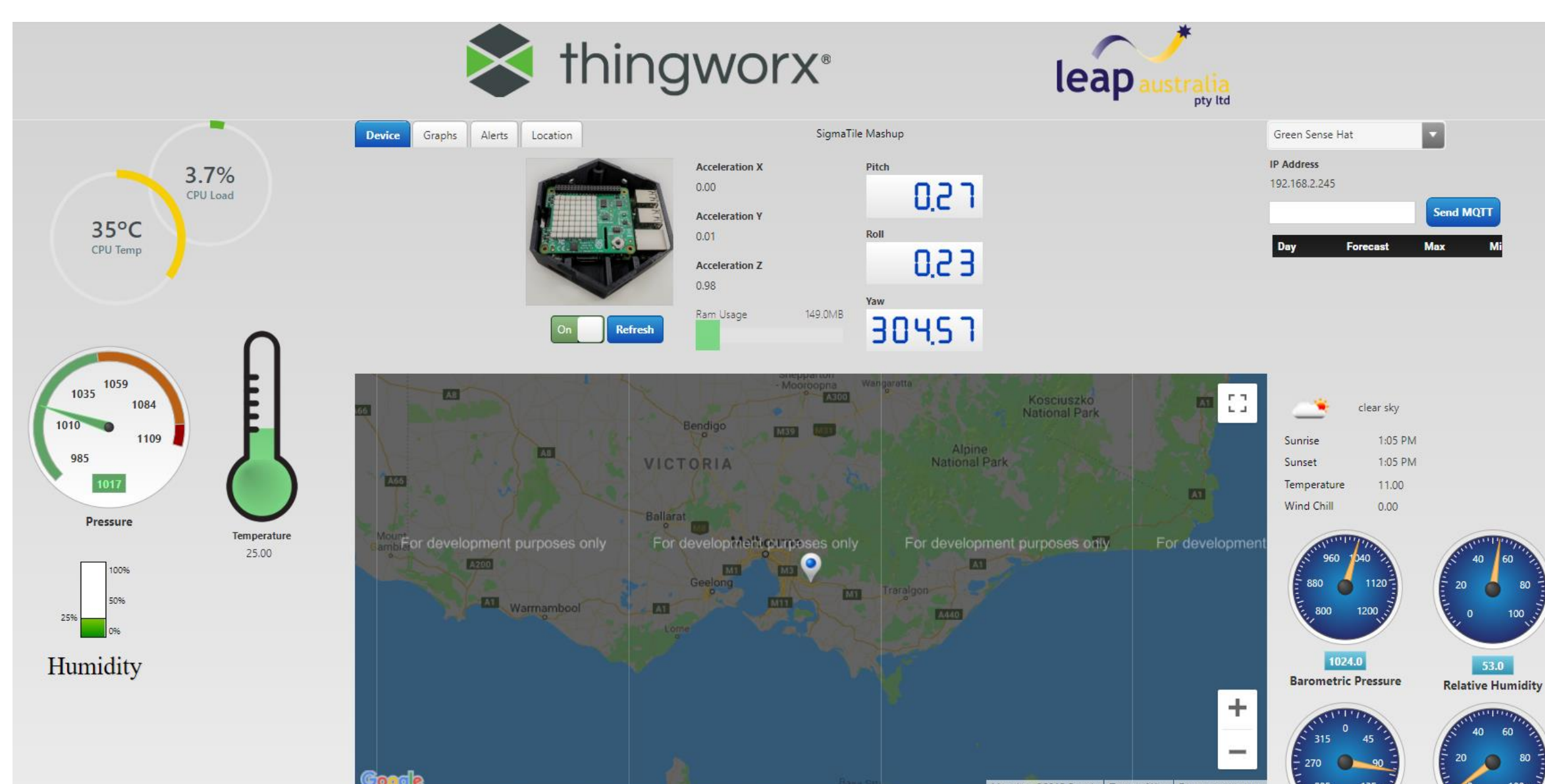
4(a) An interactive Augmented Reality Experience shows a 3D model of the device with live sensor data and simulation results overlaid as temperature contours. Anomalies cause popup 'alerts' when components may be overheating and at risk of failure, prompting viewers to consult 3D Physics simulations for deeper fault analysis.

4(b) A web application developed using PTC Thingworx Studio assists remote monitoring of assets.

Download the Vuforia View App and scan the QR code to view the Augmented Reality Experience!