

• THERMONITOR

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• Problem Statement

Handheld Thermometers

4 in. detection radius

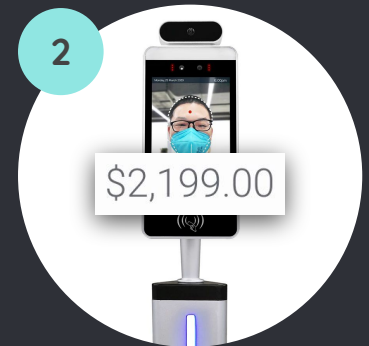
Does not conform with social distancing



Standalone Kiosks

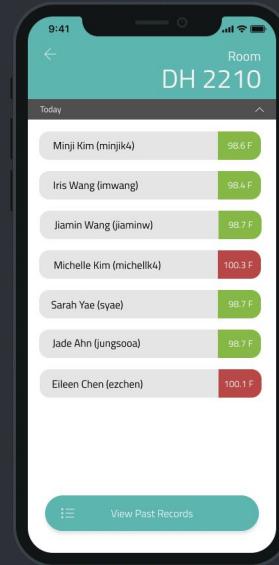
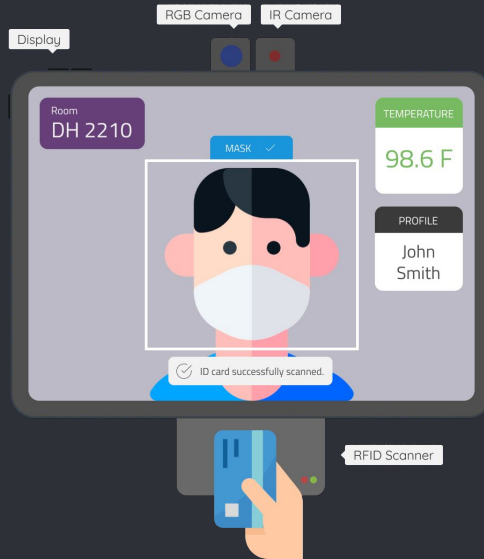
High price point

Marketed towards businesses and companies

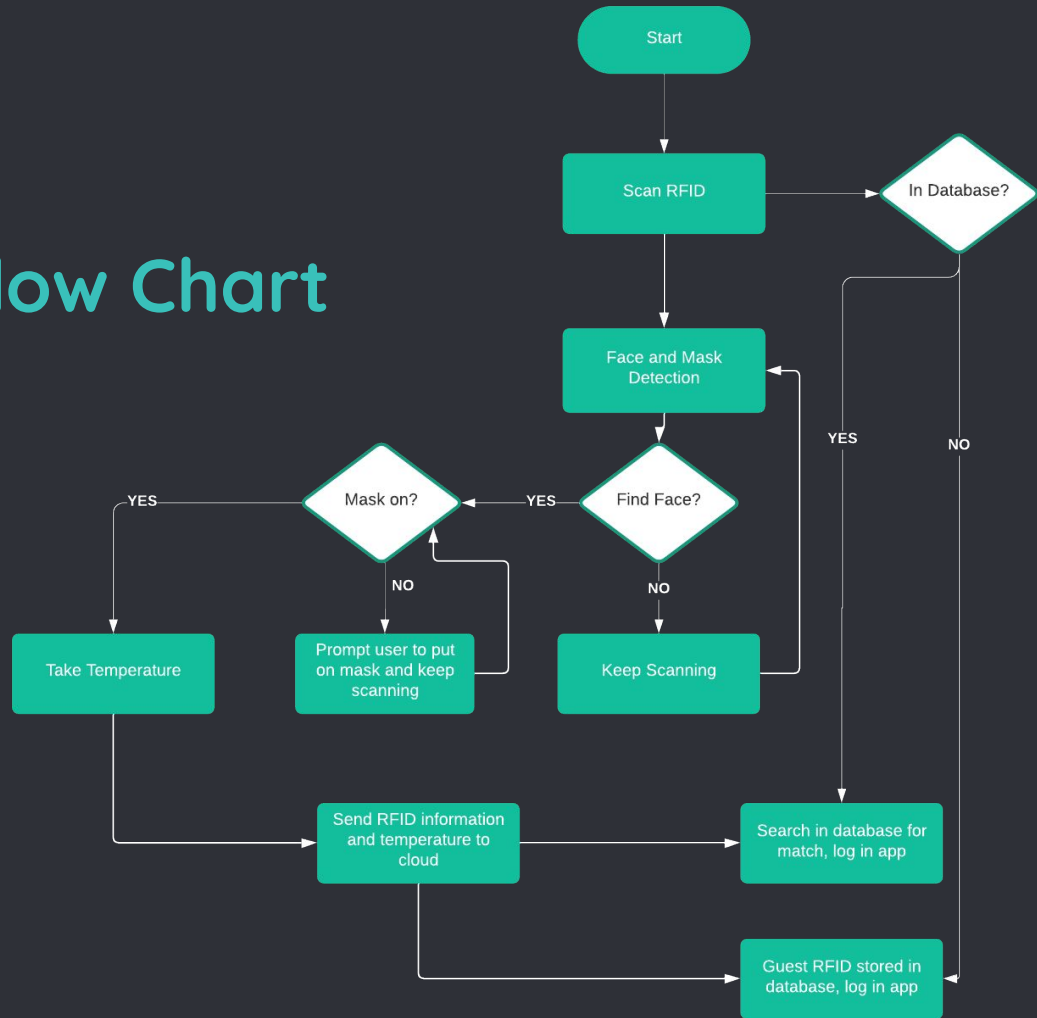


• Application Area

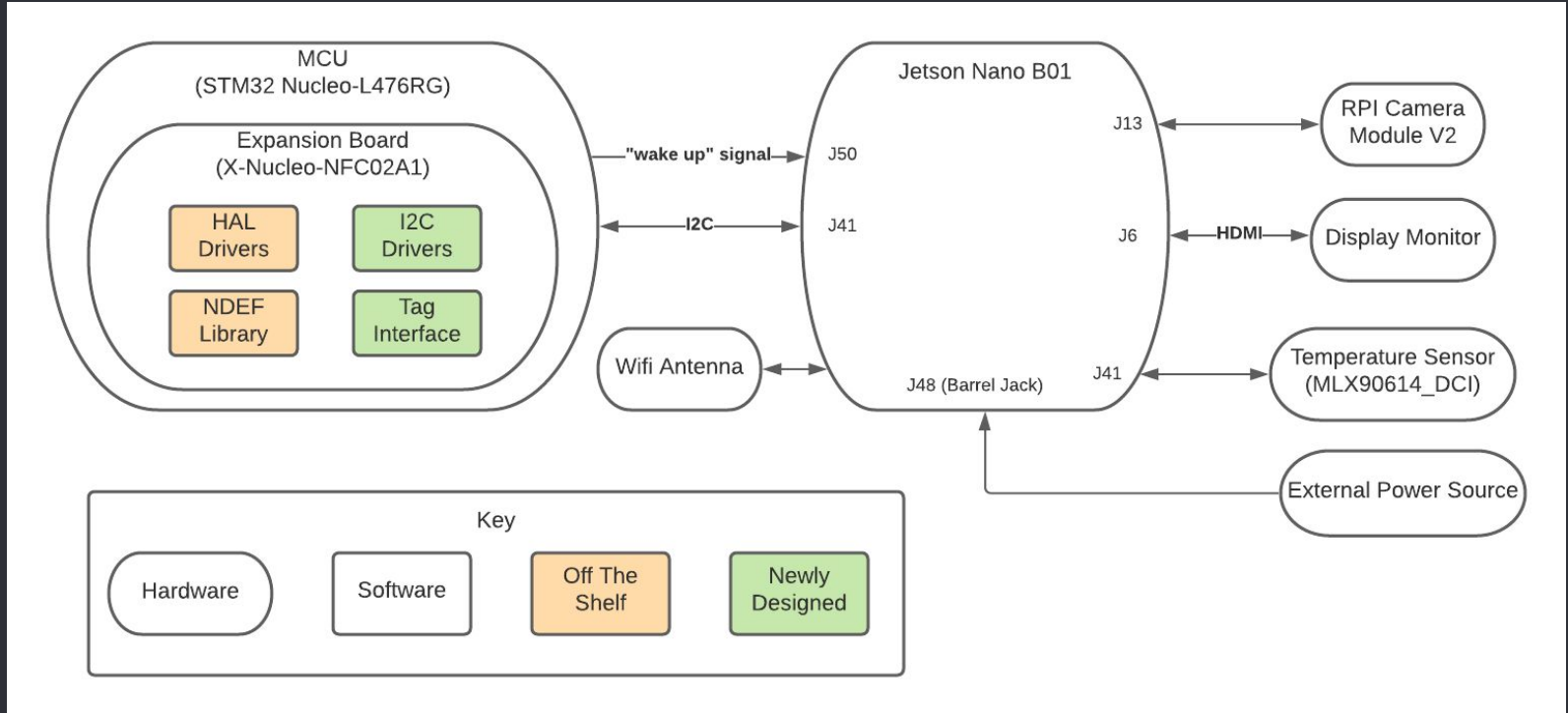
A safe and affordable way to provide temperature monitoring solution to large organizations with existing identification cards.



User Story Flow Chart



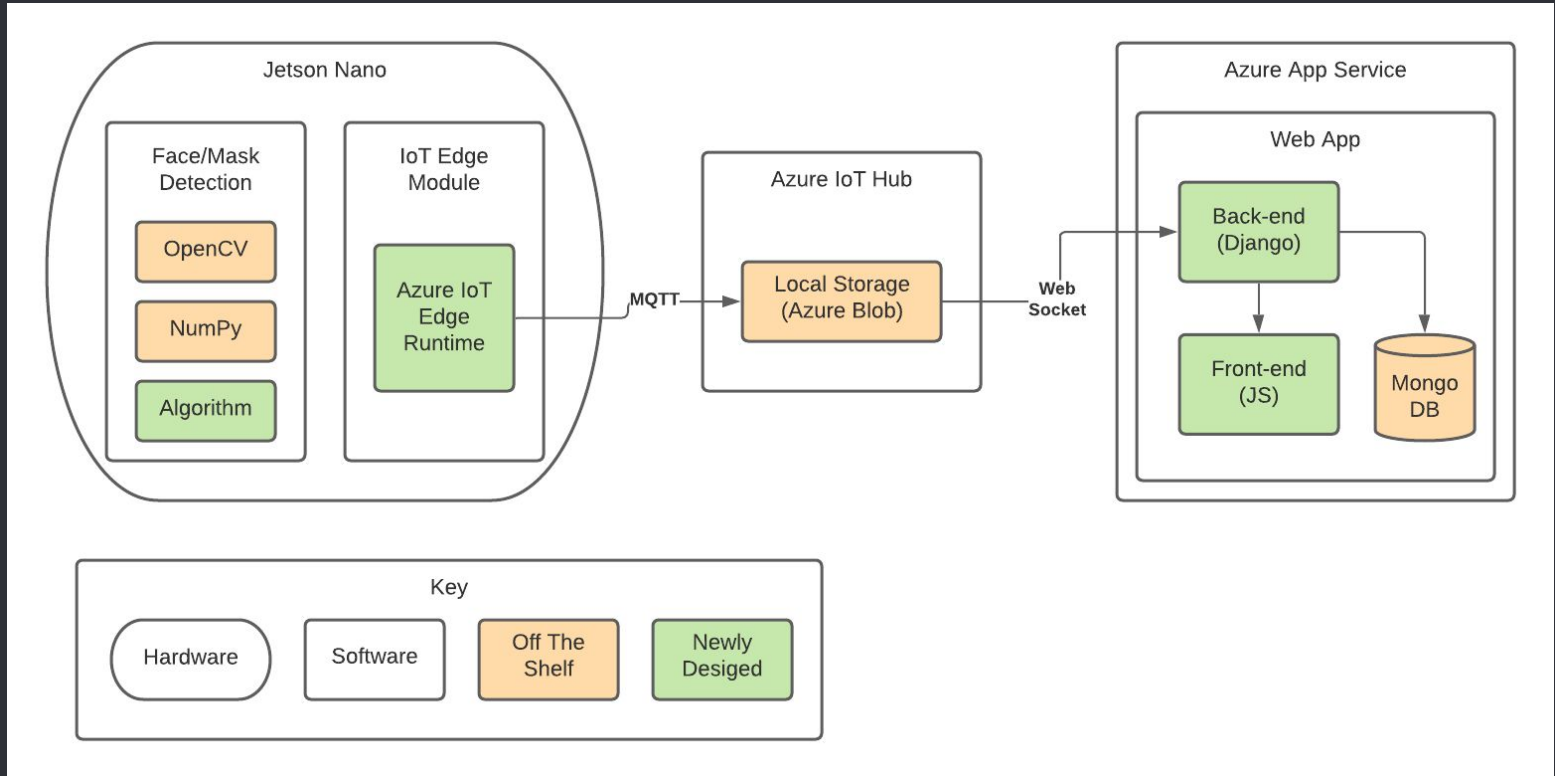
Block Diagram - Hardware



• Solution Approach - Hardware

Project Component	Purpose	Why?
Jetson Nano	Core Processor	Capability to handle CV, graphics, multimedia in parallel
IR Thermometer Sensor MLX90614_DCI	Measure temperature	Cheaper than an IR camera. Furthest distance measured.
Raspberry Pi Camera Module V2	Video for facial processing	Compatible with Jetson Nano
X-NUCLEO-NFC02A1 scanner	Scans NFC and RFID tags	Compatible with STM32 boards. Supports I2C
STM32 Nucleo-L476RG board	Processor for RFID	Ultra low power

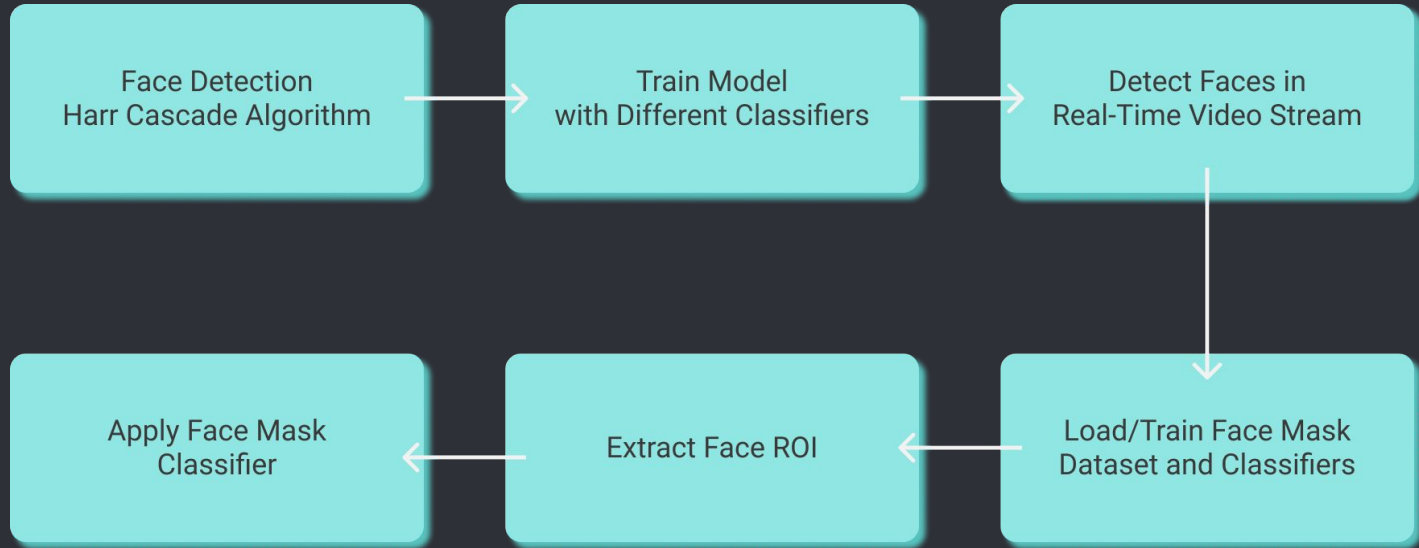
Block Diagram - Software



• Solution Approach - Software

Project Component	Purpose	Why?
NDEF Library	Decode NDEF Message Structures	Only library available on the X-CUBE-NFC. Can read type V tags.
Python/NumPy/OpenCV/TensorFlow	Facial and Mask Detection	Common library used for ML and object detection
Python/SciPy	Thermal Sensor Processing	Powerful scientific data processing library
Microsoft Azure IoT Edge	Cloud Solution	Widely used IOT solution; Compatibility with Jetson Nano
React.js / Django / MongoDB	Web Application Development	Compatibility with Azure IoT Edge

• Mask and Facial Detection Algorithm



• Metrics and Validation

Components	Validation Methods	Metrics	
RFID Scanner	Testbench with sample RFID/NFC tags	99% accuracy	
Facial Detection	ML facial test data with and without masks	85% face detection 5% false positive 1-2% false negative	95% mask detection 3% false positive 1-2% false negative
Temperature Sensing	Verify objects with different temperatures (cold/warm/hot)	±0.2 degrees of error	
IoT External Platform	Check if logs are accessible and mapped to correct RFID Test samples to ensure platform is easy to navigate	1% package drop rate User testing and feedback	

- **Risk factors**

- ● **Does not accurately identify masked faces**
 - Use more OpenCV training sets
- ● **Temperature not within the expected range of error**
 - Increase sample time and take the average of the samples
- ● **Packets dropped**
 - Locally store logged temperatures in Jetson and IoT Hub, and perform bulk update periodically

Gantt Chart

