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PROJECT TYPE
Predictive maintenance IoT platform

TECHNOLOGIES
Microsoft Azure, React, .NET Core, PostgreSQL, UpKeep CMMS

DURATION
8 months

METHODOLOGY
Scrum

TEAM
2 Backend Engineers
1 Frontend Engineer
1 Data Scientist
1 DevOps Engineer
1 IoT Architect
1 Project Manager

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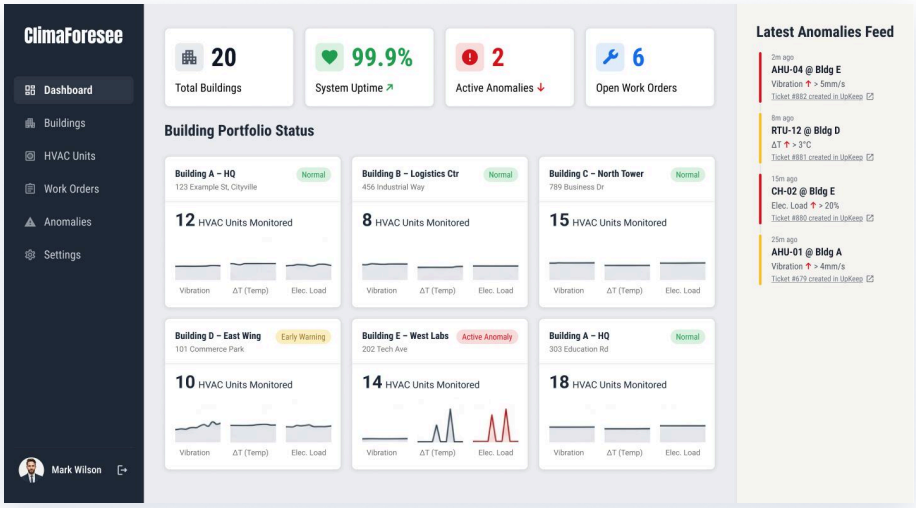
Industries: Real estate & facility management
Region: North Carolina

Predictive maintenance platform for HVAC systems

A cloud-based predictive maintenance solution for a U.S. real estate operator managing dozens of commercial buildings. The platform integrates IoT sensors, Azure Anomaly Detector, and the UpKeep CMMS system to forecast HVAC failures, reduce emergency repairs, and shift maintenance from reactive to predictive mode.



The Client is a U.S. property management company based in North Carolina that operates a network of approximately forty commercial and retail buildings. The company manages leasing, facility operations, and maintenance of outdated HVAC systems across all properties.

The company was losing 15% of its HVAC maintenance budget on urgent repairs of HVAC systems. Moreover, the Client got constant complaints from tenants, but a full upgrade was economically unfeasible.

Project Distinctive Features

- Integration of multiple sensor types: vibration, delta temperature, delta pressure, and electrical parameters (RMS, PF) on compressors and fans.
- Automated anomaly detection and failure prediction powered by Azure Anomaly Detector.
- Continuous telemetry streaming through Azure IoT Hub, Azure Stream Analytics.
- Automatic work order creation and status synchronization in UpKeep CMMS.

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- Network isolation, per-device certificates, TLS encryption, and egress-only traffic policy.
- Scalable modular architecture supporting additional buildings and sensor types.
- Unified web dashboard displaying equipment status, performance trends, and maintenance history.
- 2 months of operational trial on real data streams.

Business challenge

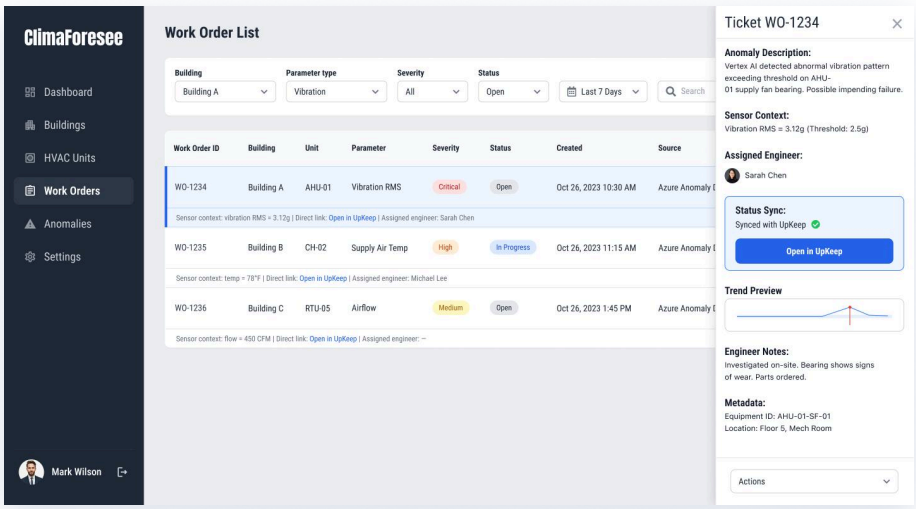
Reduce HVAC downtime and emergency repair costs through predictive maintenance.

How our AI model works:

- Coordinate with our HVAC-IoT partner responsible for sensor installation.
- Compliance with building-level network security policies.

Our solution

We developed a cloud-based predictive maintenance platform for the HVAC. Sensors capture vibration, ΔT, pressure drop, and electrical load; data flows to Azure Anomaly Detector for anomaly detection and failure prediction. Detected issues automatically create tickets in UpKeep CMMS and notify engineers. A SumatoSoft web dashboard shows fleet health, trends, and work order status – closing the loop from data to action.



Sensor installation

To develop the entire system, we engaged our HVAC IoT partner to install sensors on the existing HVAC fleet. The partner installed vibration, air-temperature (ΔT), pressure (ΔP), and current (RMS, PF) sensors on compressors and fans across selected buildings. Data was aggregated by Raspberry Pi gateways and transmitted to Microsoft Azure (IoT Hub).

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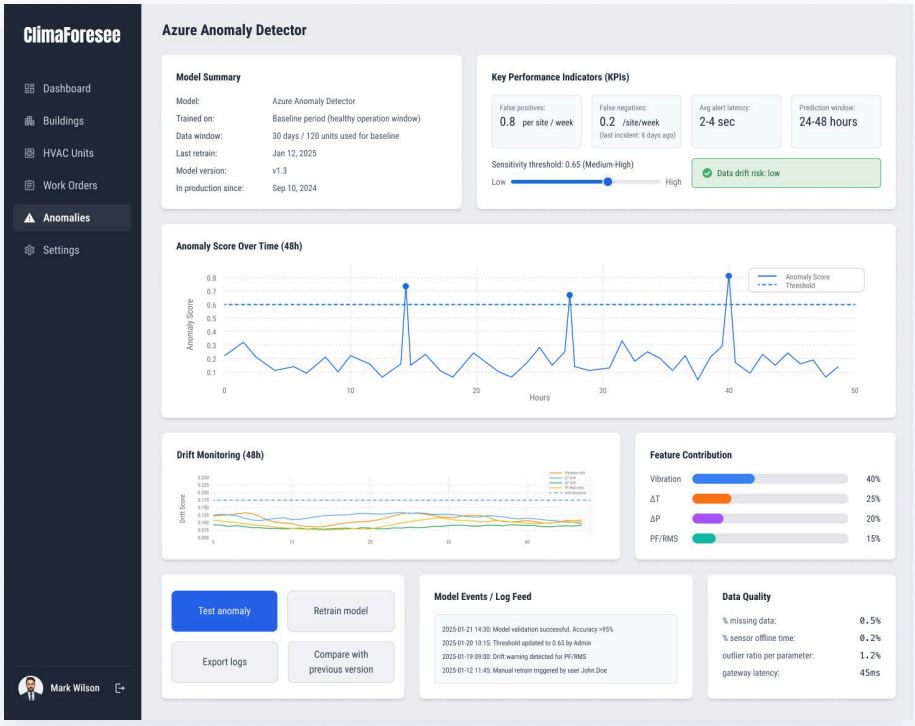
Essence of the system: analytics

SumatoSoft developed the software layer, which included:

- ✓ data preprocessing and aggregation into a time-series format;
- ✓ integration with Azure Anomaly Detector, trained on a baseline period of “healthy” equipment performance;
- ✓ development of a REST service that received anomaly signals from Azure Anomaly Detector, such as increased vibration, reduced ΔT, or changes in power factor.

All processed data was visualized in a SumatoSoft web dashboard, allowing users to monitor the condition of each building and HVAC unit in real time.



Integration with UpKeep

The Client used a cloud CMMS platform, UpKeep, so we leveraged its API to automatically create a maintenance ticket with detailed sensor context (device ID, parameter, severity) when the anomaly occurred. Engineers received notifications through UpKeep’s mobile app, and resolution feedback was synchronized back to the dashboard.

How we reached compliance with security policies

- ✓ **Network isolation:** Sensors/gateways used a segregated VLAN/VPN with TLS 1.2+; no access to tenant/enterprise LANs.
- ✓ **Device identity:** Per-device X.509 certificates and rotated keys; allowlist to Microsoft Azure regional service endpoints only.
- ✓ **Egress-only policy:** Gateways initiated outbound connections only; inbound traffic blocked by firewall/NAT.
- ✓ **IT alignment:** Ports, domains, and change windows pre-approved with building IT; logs audited in Azure Monitor / Log Analytics.

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Operational testing

After laboratory and pilot testing, the system underwent a 2-month operational trial on real data streams. It ran in full production mode across several buildings, collecting telemetry from dozens of HVAC units while our team fine-tuned Azure Anomaly Detector sensitivity and verified the end-to-end workflow.

We agreed with the Client on relatively strict acceptance criteria:

- ✓ alert latency under 5 seconds;
- ✓ failure prediction window of at least 24–48 hours;
- ✓ no more than one false positive per week per site;
- ✓ dashboard availability of ≥ 99.9%;
- ✓ no critical security incidents.

Following the trial, thresholds and averaging windows were refined, and the system demonstrated stable operation, ready for full-scale deployment.

Customer’s benefits

The solution was deployed across 20 buildings during the first rollout. The Client cut emergency repair costs by 45%, reduced HVAC downtime by 40%, and achieved ROI in under 12 months.

What’s happening with the project right now?

The platform is live across 20 facilities.

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