IoT Data Collection Framework Patent

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Abstract

A system and method for collecting, processing, and analyzing Internet of Things (IoT) sensor data across distributed enterprise environments using a hierarchical data collection framework. The invention comprises an adaptive middleware layer that enables seamless integration of heterogeneous IoT devices, intelligent data aggregation protocols, and machine learning-enabled analytics processing.

Technical Field

[0001] The present invention relates generally to Internet of Things (IoT) data collection systems and specifically to an enterprise-grade framework for managing distributed sensor networks, data aggregation, and real-time analytics processing in complex operational environments.

Background

[0002] Traditional IoT data collection systems face significant challenges in enterprise environments, including:

- Heterogeneous device compatibility
- Network bandwidth constraints
- Data synchronization across distributed nodes
- Real-time processing requirements
- Security and access control

[0003] The present invention addresses these limitations through a novel architectural approach combining edge computing, adaptive protocols, and machine learning optimization.

Summary of the Invention

[0004] The invention provides a comprehensive framework for enterprise IoT data collection comprising:

a) A multi-layer architecture enabling:

- Device-level data capture
- Edge node processing
- Cloud-based aggregation
- Analytics distribution

b) Adaptive protocol management supporting:

- Dynamic bandwidth allocation
- Intelligent routing
- Automated failover
- Quality of service optimization

c) Machine learning capabilities including:

- Predictive maintenance
- Anomaly detection
- Pattern recognition
- Automated optimization

Detailed Description

[0005] The system architecture comprises the following core components:

Edge Layer

[0006] The edge layer includes:

- Sensor interface modules
- Local processing units
- Data buffering mechanisms
- Protocol translation services

Aggregation Layer

[0007] The aggregation layer provides:

- Data normalization
- Stream processing
- Quality validation

- Temporary storage

Analytics Layer

[0008] The analytics layer delivers:

- Real-time processing
- Historical analysis
- Predictive modeling
- Insight generation

Claims

A method for collecting and processing IoT sensor data comprising:

a) Receiving raw data streams from distributed sensors

b) Processing data at edge nodes using adaptive protocols

c) Aggregating normalized data in cloud storage

d) Applying machine learning analytics

e) Distributing insights to authorized endpoints

The method of claim 1 wherein the adaptive protocols include:

a) Dynamic bandwidth management

b) Automated failover routing

c) Quality of service optimization

d) Security enforcement

A system for implementing the method of claim 1 comprising:

a) Edge processing nodes

b) Aggregation servers

c) Analytics engines

d) Distribution networks

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Assignment

All rights, title and interest in this patent are assigned to Summit Digital Solutions, Inc., a Delaware corporation with offices at 2200 Innovation Drive, Suite 400, Boston, MA 02110.

Legal Representation

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Patent Prosecution History

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Maintenance Requirements

Maintenance fees due:

- 3.5 years: March 28, 2027
- 7.5 years: March 28, 2031
- 11.5 years: March 28, 2035

The assignee is responsible for timely payment of all maintenance fees to prevent patent expiration.

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