# EEX5362 Performance Modelling

## Deliverable 01

### ****Performance Analysis of a Smart Farming IoT Monitoring System****

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### ****1. Introduction****

Agricultural productivity heavily depends on real-time monitoring of environmental conditions such as soil moisture, temperature, and humidity. Smart Farming IoT system collects, processes, and analyzes this data using network of IoT sensors connected to cloud-based analytics platforms.

However, as number of sensors and data points increases, system performance issues such as high latency, reduced throughput, and inefficient resource utilization can occur. Therefore, evaluating and improving system performance is crucial for timely decision-making and optimal crop management.

### ****2. System Description****

The Smart Farming IoT System consists of:

**IoT Sensors**: Measure soil moisture, temperature, and humidity in real-time.

**Gateway Device**: Aggregates sensor data and transmits it to cloud.

**Cloud Services**: Handle data storage, processing, and analytics (AWS IoT Core, AWS Lambda, DynamoDB).

**User Interface**: Web dashboard for farmers to monitor environmental parameters and receive alerts.

**System Flow-**

Sensors → Gateway → Cloud

Cloud → Analytics → Dashboard/Alerts

### ****3. Dataset****

**Name:** IoT\_SmartFarm\_Performance.csv  
**Description:** Collected performance data of IoT system under varying loads.  
**Fields-**

|  |  |  |
| --- | --- | --- |
| **Field Name** | **Description** |  |
| Timestamp | Data collection time | 27.10.2025 9.00am |
| Sensor\_ID | Unique ID of each IoT node | S102 |
| Temperature | Recorded temperature (°C) | 28.6 |
| Humidity | Recorded humidity (%) | 63 |
| Soil\_Moisture | Moisture content (%) | 45 |
| Network\_Latency | Delay between data generation & receipt(ms) | 250 |
| Throughput | Packets processed per second | 150 |
| CPU\_Usage | Edge gateway CPU utilization(%) | 67 |
| Memory\_Usage | Edge gateway memory utilization (%) | |  | | --- | | 72 | |

1. **Performance Objectives**

|  |  |  |
| --- | --- | --- |
| **Objective** | **Description** | **Measurement Metric** |
| Minimize Network Latency | Reduce data transmission delay between IoT nodes and cloud | Latency (ms) |
| Maximize Throughput | Increase number of sensor data packets processed per second | Packets/sec |
| Optimize Resource Utilization | Balance CPU and memory usage to avoid overload | % utilization |
| Ensure Scalability | Maintain consistent performance as sensors increase | System response time |
| Identify Bottlenecks | Detect modules (sensor, network, or cloud) causing performance drops | Diagnostic logs |

### ****5. Expected Outcomes****

Improved data transmission efficiency through optimized communication protocols.

Balanced resource allocation in gateway node.

Scalable architecture capable of handling increased IoT data load.

Identification of latency hotspots and performance improvement opportunities.