IoT Water Quality Monitoring System Architecture
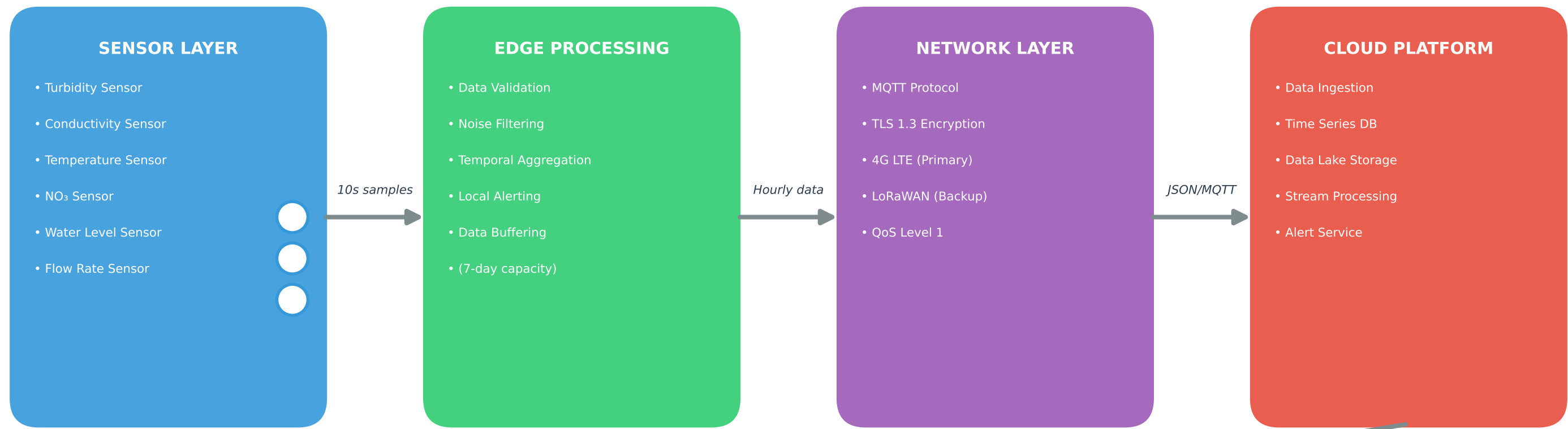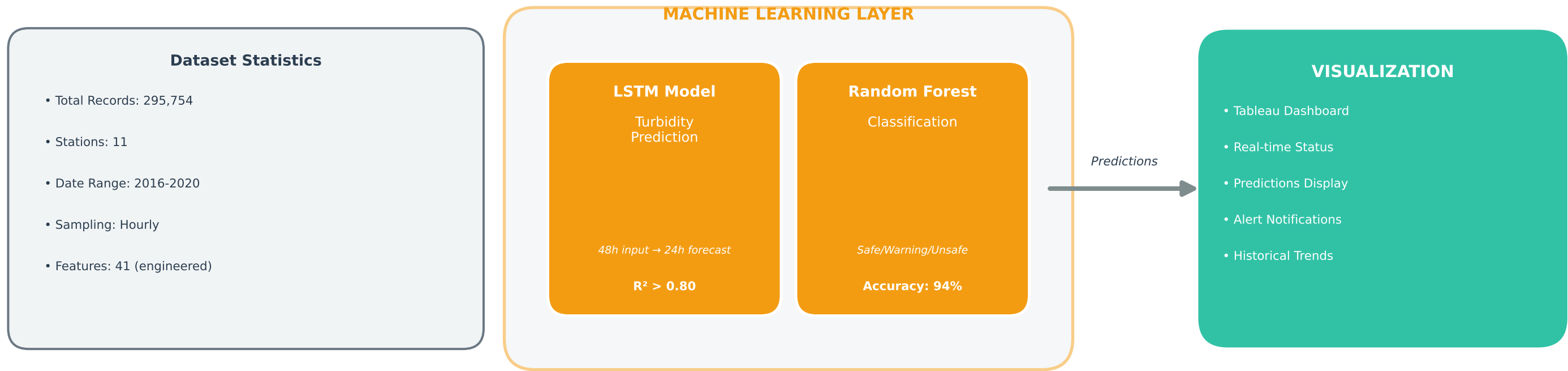
Smart Water Quality Monitoring Using IoT & Machine Learning

SENSOR LAYER

- Turbidity Sensor
- Conductivity Sensor
- Temperature Sensor
- NO_3 Sensor
- Water Level Sensor
- Flow Rate Sensor

11 Monitoring Stations
Queensland Rivers

10s samples →

EDGE PROCESSING

- Data Validation
- Noise Filtering
- Temporal Aggregation
- Local Alerting
- Data Buffering
- (7-day capacity)

Hourly data →

NETWORK LAYER

- MQTT Protocol
- TLS 1.3 Encryption
- 4G LTE (Primary)
- LoRaWAN (Backup)
- QoS Level 1

JSON/MQTT →

CLOUD PLATFORM

- Data Ingestion
- Time Series DB
- Data Lake Storage
- Stream Processing
- Alert Service

Dataset Statistics

- Total Records: 295,754
- Stations: 11
- Date Range: 2016-2020
- Sampling: Hourly
- Features: 41 (engineered)

MACHINE LEARNING LAYER

LSTM Model

Turbidity
Prediction

48h input → 24h forecast

R² > 0.80

Random Forest

Classification

Safe/Warning/Unsafe

Accuracy: 94%

Predictions →

VISUALIZATION

- Tableau Dashboard
- Real-time Status
- Predictions Display
- Alert Notifications
- Historical Trends

Water Quality Thresholds:

Safe	Turbidity < 5 NTU
Warning	Turbidity 5-50 NTU
Unsafe	Turbidity > 50 NTU

Communication Protocol:

- MQTT v3.1.1 + TLS 1.3
- Primary: 4G LTE Cellular
- Backup: LoRaWAN
- QoS Level 1 (at least once)

AAI-530 Final Project | Smart Water Quality Monitoring System | Queensland, Australia