SWARUP SOFTECH

WEATHER MONITORING SOLUTIONS

TECHNICAL WHITEPAPER

Weather Monitoring + SCADA + Cloud Integration Guide

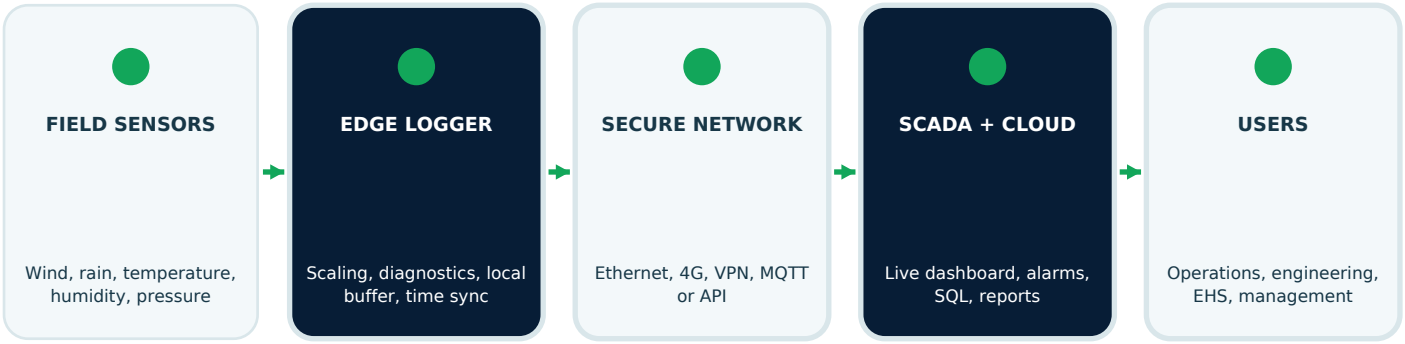
Engineering guidance for protocols, edge buffering, data models, alarm handling, cybersecurity, dashboards and acceptance testing.

Industrial sensors | Edge data logger | SCADA | SQL | Secure cloud

SS-WMS-INT-01

DESIGN PRINCIPLES

Separate measurement, control and visibility responsibilities



A robust integration architecture assigns each function to the layer that can perform it most reliably. Field devices measure. The edge logger validates, timestamps and buffers. The plant SCADA supports operators. The cloud platform supports multi-site access, collaboration and long-term analysis. Clear ownership prevents duplicated logic and makes recovery easier.

01 Edge first

Continue acquisition and local storage without cloud connectivity.

02 Open protocols

Use documented registers, topics, units and quality states.

03 Single time base

Synchronize devices and preserve source timestamps.

04 Least privilege

Expose only required data and restrict configuration access.

CONNECTIVITY

Choose protocols by operational purpose

Protocol	Best fit	Key engineering note
Modbus RTU/TCP	PLC and local SCADA	Freeze register map, scaling, byte order and status bits.
OPC UA	Structured plant integration	Use namespaces, security policies and quality timestamps.
MQTT	Cloud and distributed sites	Define topic hierarchy, QoS, retained messages and TLS.
REST API	Business applications	Control rate limits, authentication, pagination and retries.
SQL	Reports and analytics	Use a controlled schema, indexes, retention and read-only consumers.

Interface control document

Record every tag name, source, engineering unit, range, sample rate, timestamp, quality flag, alarm limit, protocol address and data owner. Version the document and use it for FAT, SAT and future changes.

TRUSTED DATA

Store value, time and quality together

01 Timestamp

UTC source time plus local display time zone.

02 Value and unit

Engineering value with explicit unit and range.

03 Quality

Good, uncertain, bad, stale or communication failure.

04 Device health

Supply voltage, enclosure status, sensor diagnostics.

05 Context

Site, station, sensor serial, calibration and mounting.

06 Provenance

Original source, transformation and synchronization state.

Data-quality rules should detect impossible values, excessive rate of change, frozen signals, missing samples, repeated timestamps and disagreement between related channels. Flag questionable records instead of silently deleting them; engineering teams need the evidence for diagnosis.

SECURE REMOTE OPERATION

Design for network loss and controlled access



01 Local buffer

Size storage for the expected outage and retain original timestamps.

02 Store and forward

Retry safely without duplicate database records.

03 Secure transpor

Use TLS or VPN and managed certificates where supported.

04 Role-based access

Separate viewers, operators, engineers and administrators.

05 Change records

Back up configuration and log firmware, setpoint and user changes.

06 Network zoning

Do not expose PLC or logger services directly to the public internet.

For safety-critical decisions, keep deterministic logic in the PLC or local control system. Cloud alarms can support awareness and escalation but should not replace approved local protection and interlocks.

Minimum remote-access checklist

- Named users with multi-factor authentication where available
- No shared default administrator credentials
- Firewall rules limited to required destinations and ports
- Encrypted backup of logger, gateway and dashboard configuration
- Documented incident, certificate renewal and recovery procedure
- Periodic review of users, logs, firmware and communication health

OPERATIONAL VISIBILITY

Design each view for a real user decision



01 Operator

Live values, station health, active alarms and acknowledgement.

02 Engineer

Trends, raw values, quality flags, diagnostics and communication history.

03 Management

Availability, exceptions, monthly summaries and multi-site comparison.

Alarm design should include priority, delay, hysteresis, acknowledgement, escalation and return-to-normal behavior. Avoid nuisance alarms by distinguishing sensor failure, communication loss and genuine process thresholds. Keep a complete alarm history for diagnosis and reporting.

ACCEPTANCE TESTING

Verify the complete data path before handover

01 Channel simulation

Inject or simulate each input and verify scaling, unit, timestamp and quality end to end.

02 Network interruption

Disconnect communication, confirm buffering, restore the link and verify ordered synchronization.

03 Alarm workflow

Test limit, delay, hysteresis, notification, acknowledgement and history.

04 User permissions

Verify viewer, operator, engineer and administrator access boundaries.

05 Report accuracy

Compare dashboard, export, SQL record and PDF report for selected timestamps.

06 Recovery

Restore configuration from backup and document the measured recovery time.

07 Time synchronization

Confirm logger, gateway, SCADA, cloud and reports use the agreed time reference.

08 Handover documents

Approve drawings, tag list, credentials process, certificates, SOP, spare list and support contacts.

START WITH A CLEAR REQUIREMENT

Information needed for a dependable proposal

Topic	Required project input
Measurements	Parameters, ranges, accuracy, sample rate and calibration expectation
Sites	Quantity, location, environment, mounting, power and service access
Integration	PLC/SCADA platform, protocol, register/tag list, database and API needs
Connectivity	Ethernet, 4G, VPN, static IP, SIM and cybersecurity responsibility
Outputs	Dashboards, users, alarms, reports, exports and data-retention period
Execution	Supply, installation, cabling, commissioning, training and maintenance scope

Discuss your weather monitoring integration project

Swarup Softech supports sensor selection, panel engineering, data logger configuration, PLC/SCADA integration, SQL reporting, secure cloud dashboards, commissioning and lifecycle support.

TALK TO AN ENGINEER