centelon
robotics

The Imperative for Autonomous Water Resilience in Australia's Water Utilities

contact@centelonrobotics.tech | www.centelonrobotics.tech

Contents

Rethinking Water Monitoring for a New Operating Reality

The digital transformation of water utilities is compromised by a fundamental flaw: **"Smart analytics are only as good as the data they receive, and that's where the system breaks".** Significant investments have been made in SCADA, telemetry, PLCs, and cloud analytics, yet core operational issues persist: unreliable field data, slow incident response, and limited automation at the source of truth.

With up to **60% of operational data still considered low-integrity,** and response times delayed by hours or days, utilities struggle to extract meaningful ROI from digital transformation initiatives.

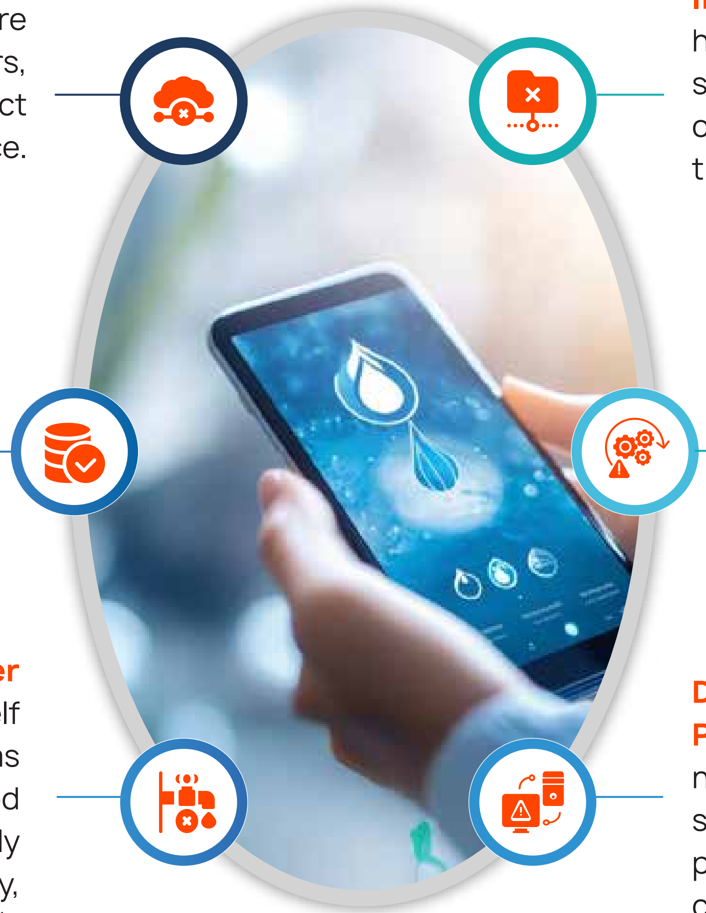
The next leap lies in shifting intelligence to the edge, where water assets operate. Purpose-built sensing, embedded processing, and autonomous local action represent the foundation of next-generation water resilience.

The Intelligence Gap: The Challenges Hindering Water Operations

Even with modernisation efforts, utilities continue to face systemic breakdowns across their networks. These challenges define today's Intelligence Gap:

No Edge-Level Intelligence: Field devices are limited to functioning as passive data loggers, possessing no internal capacity to analyse or act on detected events in real-time at the source.

Inaccurate Field Data: A lack of high-fidelity instrumentation means sensors often provide estimated, lagging, or derived values, failing to capture the true ground truth of a situation.



Data Quality Issues Delay ROI on Analytics: Without dependable, clean data input, advanced analytical models are unable to perform optimally, leading to misleading insights and failure to deliver on promised ROI.

Poor Automation Capability: The absence of real-time triggers or alerts at source points means critical actions such as adjusting a pump or changing a chemical dose are delayed, necessitating human intervention and delaying decisions.

Generic Hardware Not Built for Water Applications: A reliance on off-the-shelf devices means most monitoring systems lack the precision and ruggedness required for mission-critical measurements in highly corrosive water environments (flow, quality, or dosing).

Disconnected Hardware and Analytics Platforms: Data streams are frequently not in an analytics-ready state due to sync issues, formatting gaps, or latency, preventing immediate ingestion by central AI or reporting systems.

The Business Outcome Implications Utilities Can't Ignore due to the Systemic Challenges

Effect on Revenue

- **Higher Non-Revenue Water (NRW)** due to undetected leakage, pressure instability, and inaccurate consumption readings.
- Unpredictable **asset failures** interrupt service delivery and reduce customer confidence, directly affecting long-term revenue stability.
- **Billing inaccuracies** from noisy or inconsistent data streams.

NRW losses can account for up to 30% of a utility's total water supply in some regions, directly eroding potential revenue.

Reduction of Speed

- **Slow response** to critical events (pump failures, pressure drops, turbidity spikes) due to cloud-dependence and low field autonomy.
- **Operational bottlenecks** arising from manual processes across treatment, distribution, and wastewater operations.
- **Delayed analytics** activation because data is not clean, contextual, or ready for ingestion.

Delayed incident detection can extend response times by up to 48 hours when dependent on manual reporting or cloud-only systems.

Increase in Cost

- **High operational overheads** due to frequent field visits, manual inspections, and reactive troubleshooting.
- **Increased maintenance spend** driven by the absence of condition-based insights.
- **Higher treatment costs** due to dosing inefficiencies and inconsistent quality control.
- **Unnecessary energy consumption** in pumps and aeration systems without automated optimisation.

Reactive maintenance can cost utilities up to 3- 5 times more than planned, condition-based interventions

Introducing The SPARC Architecture: The Foundation for Autonomous Water Systems

SPARC is our foundational framework for enabling autonomous, high-integrity water operations. It defines how modern water networks should function with edge intelligence.

The SPARC Philosophy

Traditional cloud-driven IoT creates delays.

SPARC shifts the decision-making to where events occur - at pumps, valves, reservoirs, treatment units, and distribution nodes, ensuring the network can act immediately and reliably.

The Five Pillars of SPARC

S — SENSE

Know what's happening, the moment it happens. This means having reliable readings from the field - levels, flow, pressure, quality captured by equipment built specifically for water environments, not generic sensors that drift or fail.

P — PROCESS

Make the raw data usable. Before anything is sent upstream, the system tidies the information removing noise, filling gaps, and putting it into the right context so operators don't have to interpret messy or incomplete data.

A — ANALYSE

Understand what the data actually means. Instead of just reporting numbers, the system interprets patterns: "Is a pump about to run dry?", "Is pressure dropping abnormally?", "Is this chlorine swing normal or a risk?"

R — RESPOND

Take the right action at the right time. If something needs immediate attention, the system handles it locally - slowing a pump, triggering protection, or stabilising a process, and only notifies operators when human decision-making is genuinely required.

C — CLOSE

Close the operational gaps between sites, teams, and systems. Everything stays coordinated: data, actions, updates, and asset health giving utilities a single, unified way to keep the network functioning as one system.

How SPARC Makes the Difference Across the Water Network

SPARC delivers its value by directly addressing the day-to-day challenges operators face across treatment plants, reservoirs, borewells, wastewater systems, distribution networks, and field assets. The following breakdown shows how the framework aligns with real operational realities and improves outcomes where it matters most.

Segment		Key Challenge	The SPARC Approach	Outcome
Water Treatment Plant (WTP)	Operators manage fast-changing parameters like pH, turbidity, chlorine, flow, and level - all of which affect compliance, dosing accuracy, and plant stability.	Data delays, inconsistent readings, and fragmented systems make it hard to maintain quality and prevent dosing overshoots or asset stress.	Reduce process variability by providing clearer, real-time visibility of pH, turbidity, chlorine, and flow. This supports more accurate dosing and early identification of treatment deviations that typically disrupt plant performance.	More stable water quality Fewer manual corrections Reduced plant downtime.
Reservoirs & Borewells	Teams need reliable level tracking, dry-run protection, and dependable pump control often in remote or unmanned locations.	Without real-time local intelligence, pumps run longer than needed, assets run dry, and field teams make unnecessary trips	Strengthen remote operations through dependable level insights and automated threshold responses. This protects pumps from dry-run conditions, reduces unnecessary site visits, and ensures more reliable extraction and storage.	Lower operational costs Safer pump operations Fewer asset failures

Segment		Key Challenge	The SPARC Approach	Outcome
Wastewater & Sewage Systems	Aeration, sludge control, and clarifier operations directly impact energy costs, safety, and effluent quality.	Manual interventions slow down processes, while lack of predictive insights causes unexpected failures and unsafe conditions.	Improve process stability by interpreting aeration, sludge, and clarifier behaviour as it changes. Early detection of anomalies enhances energy efficiency, safety, and operational consistency.	Lower energy usage Compliant effluent quality Safer working conditions.
Asset & Energy Management	Pumps, motors, valves, and blowers require continuous health visibility to avoid breakdowns and reduce energy consumption.	Most utilities rely on periodic inspections, missing early signs of asset stress or abnormal power draw.	Enables continuous visibility of asset health and performance trends. This helps utilities anticipate failures sooner, transition toward condition-based maintenance, and address energy-heavy equipment more effectively.	Fewer emergency repairs Measurable energy savings.
Smart Water Management	Pressure and flow must be continuously balanced to minimise NRW, detect leaks early, and maintain service quality.	Sparse instrumentation and delayed analytics leave operators unaware of losses, bursts, or pressure fluctuations until customers report them.	Improves distribution reliability by identifying pressure and flow abnormalities earlier. This supports quicker leak detection, better pressure control, and more coordinated responses across the network.	Reduced NRW More consistent supply Quicker restoration during incidents.

The Path Forward: A Future Built on Autonomous Resilience

What utilities now need is infrastructure that can steady itself, systems that understand conditions in real time and take corrective action without delay.

This shift toward autonomous resilience reduces operational burden, strengthens reliability, and gives teams the confidence that every asset is working with consistency and clarity.

By moving intelligence to the field, models like SPARC offer utilities a path toward networks that operate faster, fail less, and remain stable even as conditions change.

Where your SPARC Journey Can Begin

Our IoT-enabled SCADA solution 'Metiz AquaSPARC' operationalises the SPARC approach, enabling water utilities to build stable, responsive, and resilient networks powered by high-integrity data and real-time local insight.

Let's explore how Metiz AquaSPARC can support your operational goals!

Connect With Us

contact@centelonrobotics.tech

About Centelon Group

centelon

Centelon is a Melbourne, VIC-based technology solutions company that has grown from two employees in 2017 to nearly 400, spread across multiple locations. We serve several large and medium enterprises as well as government departments and non-profits in their digital transformation journeys. Over the course of several years, we have built several IP assets that enable us to significantly increase impact for our customers' businesses and improve time to realisation for them.

About Centelon Robotics

centelon robotics

Backed by the Centelon Group, our vision is to integrate hardware precision, software logic, and intelligent responsiveness, to create solutions that align with how people live, feel, and work. From humanoid robots to IoT Platforms, Centelon Robotics transforms your world with automation, insight, and adaptive design.

contact@centelonrobotics.tech