

Rheinisch-Westfälische Wasserwerksgesellschaft GmbH SCADA automation for water treatment operations



Customer Highlights

Challenges

- Reliable wireless network across five square miles for SCADA automation
- Low latency
- Strong security

Solution

- Highly reliable broadband mesh network with link-level redundancy and low latency times between node hops (<10ms)
- Tough environment - no competitor could achieve reliable link quality nor offer the cost effective redundancy of a mesh network
- Fast wireless router installation and seamless association with network upon power-up
- Real-time SCADA data access via IEC-104
- Multi-layered, standards-based security

Results

- Proof of concept (POC) was successful; and customer was impressed with the Tropos network
- Tropos network has achieved 99.999% reliability
- 1 - 2 millisecond latency per hop
- Cost savings with ability to easily monitor remote field SCADA devices including ABB RTU's and PLCs

Systems and Services

- ABB
 - RTU560 / RTU511
 - AC500 PLC
- Tropos mesh routers
 - 7 Tropos 6320 wireless mesh routers
- Tropos Control wireless network management system

Rheinisch-Westfälische Wasserwerksgesellschaft (RWW) was founded in 1912 and is one of the largest water utilities in North-Rhine Westphalia, Germany, with an 850 square mile service area and a pipeline network of approximately 3,000 kilometers. It provides drinking and industrial water service to people, industry, and commerce. RWW operates as a public-private partnership between the cities of Mülheim and der Ruhr, Oberhausen, Gladbeck, Bottrop, and the district of Recklinghausen and on the private side, by RWE Deutschland AG, the largest of the German multi-utility. RWW serves 15 municipalities and counties from the Dutch border in the north to the Bergischland in the south. RWW's operations include 9 water treatment plants and 13 water tanks as well as water wells and distribution lines to end-use customers. In 2013, RWW reported revenues of €107.8M.

Challenges

In early 2014, RWW sought to modernize one of its water treatment processing operations located in the water-rich Ruhr Valley between Essen and Mülheim-Kettwig-Styrum where they have an extensive pipeline network that is over 2980 km long and includes feeder, main, supply and connection pipes into various coverage areas. There are also 33,500 feeder valves and 23,500 fire hydrants connect to the pipeline. Approximately 140,000 pipeline connections to homes and businesses delivers drinking and industrial water to a population of 825,000.

Monitoring of the adjacent water intake basins, feeders and wells was performed manually. This provided the control center with limited and sporadic visibility into the status of the levels in various water basins, each of which can handle up to 150,000 m³ daily. RWW sought to replace manual water level monitoring with real-time, remote monitoring of various SCADA devices. Their expectation was that centralized visibility would help identify potential problems quickly, increase water quality and avoiding risk of contamination from wastewater, and reduce operating costs.

To achieve the desired level of automation for remote SCADA monitoring and control, RWW identified the need for a combination of Programmable Logic Controllers (PLCs) and Remote Terminal Units (RTUs) connected to SCADA devices.

For communications between the remote SCADA devices and the central data center, RWW identified they needed a wireless network. Requirements for the wireless network were: high reliability, strong security, high bandwidth, low latency, and cost effectiveness.

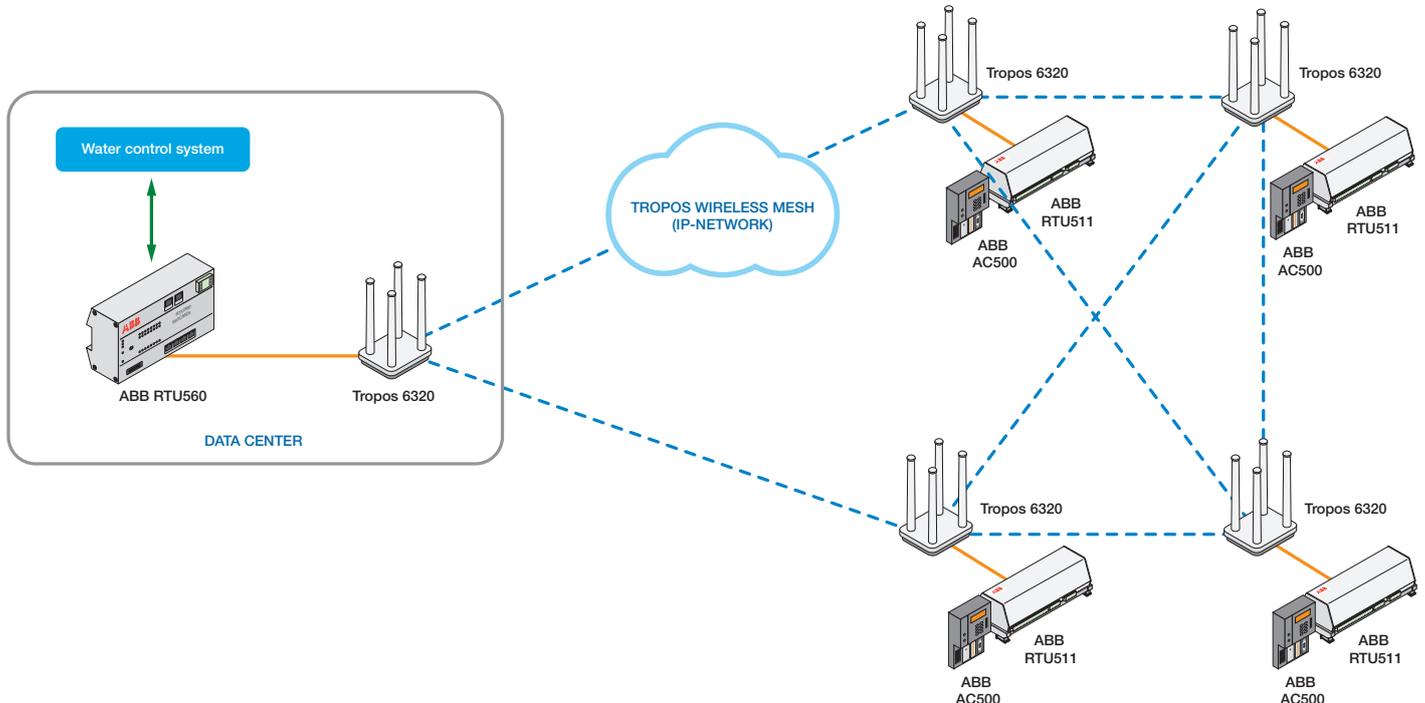
Solution

For the wireless network, several technologies were considered including Terrestrial Trunked Radio (TETRA), UHF 400-470 MHz radios and wireless mesh. TETRA, which operates in the licensed band, was evaluated and deemed undesirable due to its low bandwidth (typically 128-256 kbps); high monthly recurring costs (€30 per SCADA device); and limited ability to handle additional applications in the future such as CCTV, VoIP, and

Wi-Fi access. Considering a 10-year product life, the total investment (CAPEX and OPEX) of a TETRA solution would cost 20% higher compared to a similar Tropos solution. A UHF 400-470 MHz radio solution was considered but was not ideal due to the monthly license band costs and low bandwidth capacity.

A wireless mesh network from ABB-Tropos was evaluated and met RWW's key criteria for high reliability, strong security, high bandwidth, low latency, and cost effectiveness. It was effective and maintained reliability and performance event in the challenging environment with solid structures (trees, bridges, etc.). RWW deployed a pilot Tropos mesh network and was pleased with its performance results, which included latency per hop of 1-2 milliseconds. Based upon the positive results from the pilot, RWW selected Tropos for its wireless communications and deployed model 6320 mesh routers across a 5 square mile area. The Tropos nodes are mounted on stainless steel poles that are 3 meters in height.

For its remote control and monitoring of SCADA devices and integration into the control system, RWW selected a combination of ABB RTUs and PLCs. An [ABB RTU560](#) in the data center serves as the main controller and connects to the Tropos 6320 gateway via Ethernet. An RTU560 at the water station communicates over the Tropos wireless mesh (using the IEC-104 protocol) to seven [ABB RTU511s](#), which connect to an [ABB AC500 PLC](#) for process automation of the feeders at the water intake basins.



Results

RWW is now polling each SCADA device every minute, which utilizes approximately 1 Mb of the network's available capacity. With additional network capacity available, RWW can add other applications in the future, thereby leveraging their network investment to support additional applications. Real time SCADA data is becoming increasingly important for mission critical infrastructure operations. It provides ongoing visibility and early awareness of potential problems, in many cases averting a much more critical issue. The reliable and cost-effective ABB-Tropos solution at RWW improves operations and safety, and helps to ensure high quality water treatment for the community.

Access to ad-hoc equipment readings such as damper position, fault, intrusion detection, water intrusion, etc., can increase operational efficiency and simplify maintenance of large water supply networks and at the same time reduce costs. Real time information can minimize reaction time to problems and prevent more critical situations, and provides precisely and real time guidance to the field service team so that problems can be quickly pinpointed.

Additional Applications under Consideration

- CCTV
- VoIP
- Additional SCADA data

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