

4th Generation of SCADA Technology

4th generation of SCADA, based on IIoT technologies, is probably the biggest revolution in the industrial and utilities markets since the adoption of modern controller and automation technologies.

Different generations of SCADA system are as follows:

First Generation - Monolithic SCADA system:

The functions of the monolithic SCADA systems in the early first generation were limited to monitoring sensors in the system and flagging any operations in case of surpassing programmed alarm levels.

Second Generation- Distributed system:

In the second generation, the sharing of control functions is distributed across the multiple systems connected to each other using Local Area Network (LAN) which is known as distributed system.

Third Generation-Network SCADA system

The current SCADA systems are generally networked and communicate using Wide Area Network (WAN) Systems over phone or data lines. These systems use Ethernet or fiber optic connections for transmitting data between the nodes frequently. These third generation SCADA systems use programmable logic controllers (PLC) for monitoring and adjusting the routine flagging operators only in case of major decisions requirement

Fourth Generation –Cloud\ Internet Based SCADA System:

By using fourth generation SCADA system infrastructure cost of the SCADA systems is reduced by adopting the internet of things technology with the commercially available cloud computing. RealiteQ is Fourth Generation SCADA system.

4th generation of SCADA systems, as a huge step up off earlier generation, makes the entire operation and management of devices, facilities, Networks and processes smarter, simpler, safer, more flexible and widely available.

At the same time, new aims and cyber security issues force developers to be more creative and create more reliable and much more secured systems.

Ans, above all, the word “Affordable” is not anymore a dream. It is absolutely a reality.

“Reality” actually, was more than 10 years ago the code name of a new and innovative project of a young company, **Real Technologies LTD**.

At that time, Reali's R&D team decided to use **IM** (instant messaging) as the "carrier" of the communication protocol and proved that telemetry and SCADA can be flexible, open and affordable. XMPP, a communication protocol for message-oriented middleware based on XML was the chosen one. It enabled the near-real-time exchange of structured yet extensible data between any two or more network entities.

Since Reali invented its earlier version of IM based SCADA, some other companies followed and duplicated this technology. Some of them are still using it even today, after all these years.

However, Reali didn't stop there. The firm continued to move forward. Leading by experienced CEO and CTO that are both with many years and experience in the field of system engineering, control and SCADA, Reali abandoned the old IM technology, re-developed the technology and created the most innovative, multidisciplinary and inclusive concept that is based on modern & "future secured" open web tools. **RealiteQ** was introduced as the first **Real Time Remote Control & Monitoring** technology working as a real cloud application with the option to be running on-premise (www.realiteq.com).

Today, leading market research claims that RealiteQ's cloud-based SCADA systems, which they call "the 4th generation of SCADA systems", not only enable systems to be enriched with modern features but also contribute significantly to system reliability and lower both CAPEX & OPEX.

..." Cloud-based SCADA **dramatically lower the costs** associated with a traditional SCADA system... getting started with a cloud-based SCADA, users can achieve about **90% reduction in costs**..."

..." Cloud-based SCADA **improve the system's reliability**. Cloud computing platform enables water and wastewater utilities to deploy redundancy and disaster recovery capabilities far beyond that found in the typical water and wastewater IT departments..." (Source: 2017 Zion Market Research)

..."The water and wastewater industry is in transition to a digital revolution that has the potential to transform the industry from innovations such as the **internet of things** and machine learning."

"...there has been an increased uptake of monitoring and control systems that are able to detect changes **in real-time**..."

"In the future data-feeds and cognitive **computing could** govern water management and inform every decision in the municipal and industrial sectors" (source: Water's digital future, GWI 30.9.2016)

Cloud service providers must stake their livelihoods on the reliability and security of their systems and therefore have the latest, cutting-edge defense mechanisms, far more advanced compared to your average IT network. (Source: Industrial Ethernet Book Issue 109 / 8)

New SCADA technologies, that use advanced tools from the ICT and IOT worlds, enable the implementation of modern systems and provide users, each with their own needs, operating interfaces and analysis from BI and AI worlds.

Unlike in the past, when SCADA software became increasingly heavy and complex so advanced features such as historian and data processing were removed and transferred to separate software, the almost infinite cloud computing power allows us to restore data processing and transform it to the main topic.

Nobody collects data from remote facilities just for fun. The aggregation of data and the creation of Big Data have a critical impact on the efficiency of facilities and systems operation, operating costs and the improvement of products and global services.

Today, SCADA is a collection of many powerful computing machines that perform complex tasks. Ranging from communications and telemetry management through **Big Data**, historical data management, real-time operational information, data analysis, **Machin Learning**, **Predictive Maintenance** and more.

And, all this, without the need for large financial resources. Enterprises aren't required to purchase expensive software licenses nor to employ many IT engineers. 4th generation SCADA can be installed as on-premise solution, but it can, and usually that how it be, to operate in a highly secure cloud such as **AWS** and the heavy computing and licensing costs do not apply to the organization fully, but are charged according to actual use of the **SaaS** (Software as a Service) model.

But RealiteQ is not only SCADA. It enables much more. Actually, RealiteQ is a perfect example to the "80/20 philosophy for big data".

Past experience and needs analysis show that highly expensive BI/AI software tools are used by less than 20% of users. Moreover, those who have them, exploit normally less than 20% of their capabilities.

The integration of embedded BI/AI capabilities into RealiteQ solves more than 80% of users needs.

RealiteQ supports the whole way From field to operation and management. It offers an advanced embedded tool for data processing, thus contributes to improvement and efficiency while analyzing the Big Data it produces.

Hence, The company's R&D planes are to invest more in these issues the next year and to expand the BI/AI functions offered in RealiteQ, thus enabling users to have a comprehensive solution.

Frost & Sullivan, the global research and analysis firm, refer to RealiteQ's unique technology in one of its last works for the SCADA market:

...“In recent years, a fifth market segment was added, which provides holistic software and hardware solutions from the infrastructure level (communication) up to the ICT and SCADA systems level. This market segment is developing at a fast pace and is led by RealiteQ”...

The fifth segment was for many times the missing link. However, it is not missing any more!!!. The link is a real fact in RealiteQ.

The goal is to provide the highest quality information to the operational level and decision makers, and this goal is now reachable.

RealiteQ 4th generation of SCADA is currently used by thousands of users in more than 40 countries. It is used everywhere; from utilities, to industrial use, agriculture, water, wastewater, energy, O&G, smart city and many more sectors and applications.

One of the highlights of RealiteQ, as a leader in this area of cloud-based SCADA, is the security. The system is robust, secured and safe.

It starts from the **iCex**, the Integrated Cellular & Ethernet Explorer, that is what was called before RTU and now, in the time of IOT, people prefer to call it a **Gateway**. iCex is Embedded or Encapsulated Data Producer that explores sensors, analyzers, controllers etc. over I/O, Ethernet or Serial protocols, and link them to the internet by any cellular, satellite or other connection. In its encapsulated versions, iCex has an integrated Ethernet communication ports, serial ports, I/Os in some of the models and, when redundancy is required, it may be supplied with 2 integrated modems that may operate in parallel on 2 different cellular networks and thus enable full redundancy. Redundancy may be done also with one ADSL and additional one cellular modem. The operating system of iCex units support all types of redundancy.

Local security is achieved in iCex by several methods. One of them, as an example, is the integrated **firewall** that prevent any access to the unit not only from remote but also locally.

Many other security options such as SSL/TSL, SSH and more enhance the security as part of the overall concept of the telemetry and communication.

The security issue does not end there. Security is a key factor in system reliability and is ubiquitous. Users access to the system requires strong identification, and managers can impose a tougher security policy, including the use of **2FA** (Two Factors Authentication) mechanisms.

Moreover, at the applicative level RealiteQ runs several dedicated algorithms that identify access to critical valued only and for these unique and critical values, further identity checks are done. In addition, messages are sent to administrators/managers as alerts about this approved but unique operation.

RealiteQ includes also a built-in graphical full browser-based HMI that is the most modern **UI** (User Interface) implemented by HTML5 technology. It is not required to purchase or to install additional software beyond a standard web browser (Chrome, FireFox, Edge, Safari etc.) since the graphic screens design editor is fully executed through a built-in browser that was developed by the company and which in itself represents a significant breakthrough in web HMI and SCADA systems.

As part of the overall concept, the UI not only enable visualization of the graphical screens, but it allows to display alarms status, reports and trends.

All of these items are possible to be brows individually or displayable when integrated within the dynamic graphical screens. Managerial dashboards are displayed as well.

In conclusion, 4th generation SCADA systems are definitely here and undoubtedly a real revolution in the remote control of facilities.

RealiteQ undoubtedly represents the technological frontage of these systems and its presence in the global SCADA market, with installations in more than 40 different countries, for sure proves that innovation and technology are both advancing and improving processes.

RealiteQ integrates information technology (IT) with operational technology (OT) and it has the whole package: Real Time remote Control, Telemetry technology, Operation & HMI, Data Acquisition, Real Time & Alerts notifications, Trend & Reports & Data analytics. All what modern SCADA and IIOT should have.