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Web-based Wireless Sensor System for SCADA Environment

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Abstract

This paper explores the context of remote monitoring of parameters acquired through SCADA (Supervisory Control and Data Acquisition) systems, with particular focus on parameters that change infrequently (temperature, light levels, humidity, etc.). We aim to design a simple and cost-effective framework that allows a DAS (Data Acquisition System) with networking capabilities to make its collected data available to multiple distributed clients.
Keywords: on-demand data transfer; wireless sensors; DAS; SCADA; DSC.

1. Introduction

Monitoring and control of industrial processes using integrated information systems is a common solution in current industrial practices. An important issue when designing and implementing such systems is the solution choice for data transfer subsystem. Of course, numerous variants can be adopted, but the choice must be made by considering a range of issues such as the size and number of units that will constitute the system (number of sensors, number of concentrators, number of control units, etc.), the imposed communication parameters (eg: communication channel capacity), the costs and not least the required security conditions.

The industrial systems whose facilities spread over large spaces involve the adoption and implementation of distributed systems that need to allow the communication despite considerable distances. A major impediment in reaching this goal, besides the physical conditions, is represented by the significant amounts of material and communication equipment and also by implementation costs. The minimization of these costs can be achieved by adopting wireless communication solutions [1]. The present paper aims to identify the most appropriate solution by

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using current technologies in order to develop a system for monitoring and control whose primary data process sources are gathered from a sensors network.

The paper presents two solutions that can be adopted, experimental results regarding their performances, considerations and conclusions that can represent a starting point in choosing monitoring and control systems solutions for specific industrial distributed systems [2].

Nomenclature	
DAS	Data Acquisition System
SCADA	Supervisory Control and Data Acquisition
DSC	Distributed Control System
PLC	Programmable Logic Controller
AP	Access Point
SK	Security key

2. Remote Monitoring of Process Parameters

In order to identify the appropriate solution for implementing a monitoring system of remote process parameters two options are considered: a solution based on unidirectional periodic transfer and a second solution based on bidirectional on-demand transfer.

2.1. Solution 1: Periodic Unidirectional Transfer

The core focus of our first proposal is the simplicity. We propose a unidirectional communication channel, in which data flows from the acquisition system towards a centralized data server. The former collects data and periodically sends it to the latter, without expecting any acknowledgement of successful receipt. At the other end, the recipient continuously listens on the channel and, whenever it receives data, it stores it in a database which is made available to its web clients (Fig. 1.). This is an instance of best-effort delivery, which trades off guaranteed quality of service for simplicity: on one hand, the lack of synchronization between the two end points allows for a simple design; on the other hand, it cannot prevent data from being occasionally lost.
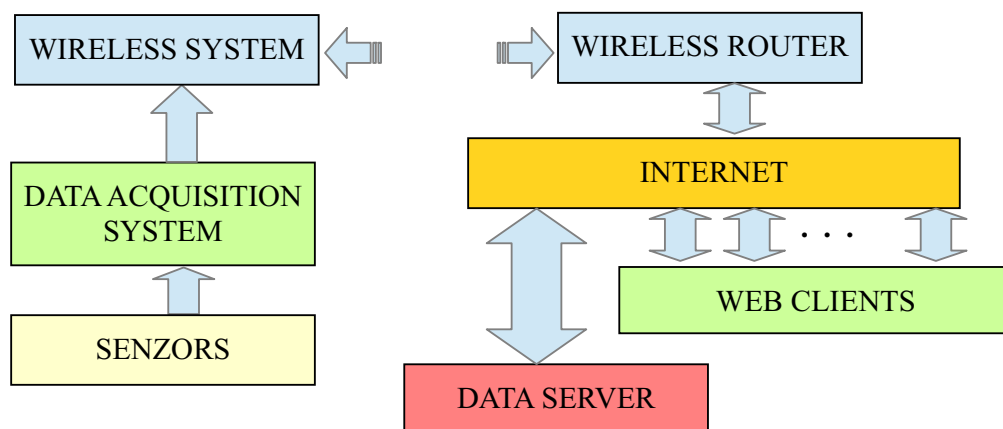

Fig. 1. Architecture of the distributed monitoring and control system.