Awair: Software solution for monitoring wireless network quality

Apart from its proven utility for the home and office, wireless communication is becoming an increasingly attractive solution in industrial environments. Major benefits include flexible installation and expansion, as well as the ability to integrate portable objects into a network. For this reason, a variety of manufacturers in the automation industry is adding wireless components to their product portfolios. However, this requires adhering to the stringent demands that industrial applications place on data transmission, whether it is reliability, security or real-time capability. Given these requirements and the physical transmission characteristics, special attention must be paid not only to operating, but planning wireless networks. This especially applies to the impact of coexistence issues and sensitivity to external interference.

With Awair, Fraunhofer ESK offers a software solution capable of capturing, visualizing and analyzing wireless spectrum occupancy. The software can identify authorized and unauthorized transmitters or sources of interference within a wireless network. Awair, which eliminates the need for special hardware, can be deployed prior to bringing a wireless network on line, or while an existing network is running.

Commissioning industrial wireless networks

Before bringing an industrial wireless network on line, Awair can be used to analyze the current channel situation and supply key information related to existing wireless systems and standards and occupied channels. It also recognizes the existence of interference sources. This provides network specialists a quick picture regarding the feasibility of integrating a new wireless system into an existing environment.
Monitoring the radio spectrum of live networks

Through continuous monitoring of important frequency spectrum parameters while the network is running, abnormalities in both the time and frequency domains can be identified. This approach permits the early detection of potential sources of interference, generation of alarms and resolution of the problem. The result is that issues such as wireless node outages or the presence of unauthorized devices (Bluetooth©, WLAN) in production halls can be detected.

Functionality

The Awair system consists of various wireless sensors and a central server. The hardware can be based on commercially-available routers for managing the sensor network and an industrial PC that acts as the central server. The Awair software components operate within the routers and the server. The router components monitor the spectrum (spectrum sensing) and process the lower-level data. The server components log, store and process the high-value data. The server also features a user interface for visualizing the results and managing the system. Each of the wireless sensors can be programmed to cover a defined frequency range. Stringing together multiple sensors allows the system to sense scalable bandwidths or multiple frequency bands.

While Awair operates autonomously, it can also be integrated into a company’s existing network. The spectrum sensing within the wireless systems is completely passive. Potential fields of application include local wireless transmissions in the ISM (industrial, scientific and medical) bands.

At the heart of Awair’s processing of the high-value data is a multilayer, quantitative analysis metric that determines the quality and characteristics of one or more wireless channels. With the metric, the system can also carry out an aggregate analysis of an entire wireless spectrum and perform functions such as generating an alarm when a defined threshold is exceeded. This feature is particularly important when analyzing live networks.

Summary and outlook

Awair offers a powerful and cost-effective solution for monitoring, visualizing and analyzing radio spectrum in industrial environments. Potential fields of application include the commissioning of new wireless networks and monitoring the quality of live networks. Future versions of Awair will contain additional high-value analysis features, such as not only detecting, but localizing sources of interference.

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1 Awair monitors the wireless spectrum to identify potential sources of interference and provide warnings.