

Chapter 31

Technologies for Industry 4.0 Data Solutions

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ABSTRACT

One of the main objectives of Industry 4.0 (I4.0) is to generate new opportunities based on the convergence of traditionally isolated technologies such as industrial control systems (ICSs) and information and communication technology (ICT). This presents new opportunities to take advantage of ICT technologies to develop new applications and services related to industrial processes. However, there are a variety of requirements and constraints that must be addressed for the attainment of this purpose. Moreover, the large amount of existing technologies and tools that can cope with these requirements makes the definition and selection of a solution a cumbersome task for traditional industrial workers with a non-ICT focused background. This chapter analyses and describes the main requirements and technologies required to provide a data-based Industry 4.0 solution.

INTRODUCTION

Traditionally, technologies from ICS (Industrial Control System) and ICT (Information and Communication Technology) have been historically isolated research fields. However, in Industry 4.0 these two domains have been experiencing a strong convergence that is enabling the develop advanced industrial applications.

Nevertheless, this new industrial paradigm is still in an early stage. Thus, knowledge and technologies from ICS and ICT are still isolated within organizations, slowing the adoption of Industry 4.0 applications. This chapter focuses on the technologies behind Industry 4.0 applications, highlighting the point of view from ICT and aiming to clarify their main requirements and related technologies.

The chapter starts introducing main technologies and architectures required to acquire data, communicate it between devices, process it, and design and deploy Industry 4.0 applications.

The chapter continues proposing a classification of the main requirements of Industry 4.0 data applications that directly affect their design and the resources required for their development. These requirements include whether data acquisition and process should be performed in magnitudes of milliseconds; if data volumes generated by the application require a Big Data architecture; if access to the application is remote or local; and if a cloud infrastructure would be available. Then, a classification of industrial application is presented according to the previous requirements.

Finally, an Industry 4.0 application developed for Gaindu Automation is described. The objective of this application is to manage and visualize the state of the stations and machines of production lines, consolidating the concepts and technologies highlighted during the chapter.

MAIN TECHNOLOGIES RELATED TO INDUSTRY 4.0 APPLICATIONS

The revolution of Industry 4.0 is directly related to several ICS and ICT technologies. However, only when all the different actors involved on the industrial manufacturing process have achieved certain degree of evolution on these technologies, it will be possible to push industry standards one step forward.

This section introduces the most important technologies related to the Industry 4.0.

Communication

Different elements and devices operating in industrial environments communicate among them to exchange information and to guarantee their correct working. Thus, adapted communication protocols that enable components to share information have played a fundamental role in the development of productive plants.

Traditionally, communication protocols in ICS technologies were proprietary, based on undisclosed specifications and not interoperable with the devices of any other manufacturer. Therefore, enterprises were locked to solutions and families of hardware of specific manufacturers. Back in those days, security was not an important issue, since the ICS were completely isolated from other networks, such as Internet.

However, in the last years different needs have been identified, such as the interoperability between different devices, remote access, and security risks in the communications. Thus, some standardization attempts have been accomplished to provide open solutions for these needs. Thanks to these attempts, the Industry 4.0 paradigm has a solid base in terms of interoperability and communications.

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