A Literature Survey on Open Platform Communications (OPC) Applied to Advanced Industrial Environments

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Abstract: Extensive digitization and interconnection through networks have ushered in a number of new paradigms over the last years: Internet of Things, cyber–physical systems, Industry 4.0, etc. These challenging systems rely on an effective information communication between distributed components. Therefore, the heterogeneity of entities, both hardware and software, must be handled to achieve an operative interoperability and a proper behavior. However, there is also a heterogeneous availability of solutions; different technologies, protocols, and architectures aim to achieve a seamless interconnection. Henceforth, the standardization still requires great efforts from industrial and scientific environments. In this sense, the interface of the open platform communications (OPC) has supported connectivity for automation and supervision infrastructures for more than two decades. The OPC comprises the so-called classic OPC, the original protocol, as well as the last specification, unified architecture (UA). The widespread utilization of the classic OPC together with the powerful functionalities of OPC UA, make the latter one of the main candidates to lead the standardization and systems integration. This paper presents a survey of recent OPC-based systems reported in scientific literature for different domains as well as research projects. The goal of this paper is to provide a broad perspective about the OPC' applicability and capabilities in order to support the decision about communication interfaces. The results are analyzed and discussed putting special attention on the aforementioned new paradigms. Finally, the main conclusions and open research directions are highlighted.

Keywords: industrial communications; OPC UA; classic OPC; SCADA; interoperability; Internet-of-Things; Industry 4.0; automation

1. Introduction

Digitization and interconnection through networks are increasingly affecting industries. As the advances in information and communication technologies (ICTs) penetrate the whole chain of processes, the evolution towards new paradigms is unstoppable: Internet of Things (IoT), cyber–physical systems (CPS), Industry 4.0, big data, etc. Namely, CPS combine mechatronics and ICTs to control physical processes and systems, designed as a network of interacting software and hardware components, devices, and systems [1]. This approach applied to production systems is named cyber–physical production systems (CPPS) [2–4] or industrial CPS (ICPS) [5–8].