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Industrial automation systems — Manufacturing Automation Programming Environment (MAPLE) — Functional architecture

Systèmes d'automatisation industrielle — Environnement de programmation pour l'automatisation industrielle (MAPLE) — Architecture fonctionnelle

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 13281 was prepared by Technical Committee ISO/TC 184, *Industrial automation systems and integration*, Subcommittee SC 5, *Architecture and communications*.

Annexes A to C of this International Standard are for information only.

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Introduction

Over the recent past, manufacturing systems have become considerably more flexible and have acquired greater functionality. The numbers and types of component devices of manufacturing systems, such as NC machines, robots, automated guided vehicles and programmable controllers, have increased. Furthermore, there is a definite trend for some of these devices to be incorporated in manufacturing cells. Manufacturing engineers are thus required to develop and update programs not only for many kinds of individual devices but also for combinations of devices and ultimately manufacturing cells. Due to this fact, the difficulty of integrating and programming the control of manufacturing operations has increased.

Manufacturing programs have an intense need for a large variety of manufacturing data, including product oriented data, process oriented data, operation oriented data and management oriented data. This diversity means that manufacturing data has a much more complicated and varied schema than the usual processing data encountered in other systems, e.g., business systems. Therefore, the use and management of manufacturing databases requires a special high-level technology.

MAPLE addresses the following problems that have been traditionally recognized to be within the domain of manufacturing application programming languages for automated production:

– Manufacturing presents a diversity of tasks with widely varying requirements and constraints. Often, addressing these tasks requires programming. Because of the diversity of requirements and constraints, a variety of manufacturing application programming languages have been found necessary.

– Typically, each manufacturing application programming language has its own unique environment of development methodologies, development, debug and simulation tools, and run-time services. Because these environments are stand-alone, it is difficult to achieve convenient access to the manufacturing databases.

– As a result, it is only with difficulty that an application developer or designer may coordinate the use of differing manufacturing languages for the individual tasks of a complete project, though this is a common need.

– Similarly, it is with great difficulty that systems engineers and integrators combine programs developed using different manufacturing languages, because they use or require different run-time services.

To address these problems, a language-independent manufacturing automation programming environment (MAPLE) is being standardized. This International Standard represents the functional architecture of MAPLE as a first step towards achieving such an environment. MAPLE is a structured set of capabilities that connects the objects such as data used in advanced manufacturing technologies to the required user oriented tools.

This International Standard for the MAPLE functional architecture specifies the functionality and interconnection of the components in the environment. It is intended for the technical committees, subcommittees and working groups of those standardization bodies whose mandate will be to develop the standards for the MAPLE services and interfaces, as well as for the commercial developers of MAPLE.

The MAPLE environment can replace existing in-house solutions that have been created by system integrators during the last decade to solve the above mentioned problems.

This support facility for programming will need a set of functionalities that are typical for the manufacturing environment, mainly because of the specific requirements of programming automated devices. Environments to support the programming of other automated devices outside the manufacturing domain (e.g. a transportation system with unmanned trains) will have similar architectures to MAPLE. Nevertheless, the functionality and implementation of the components needed by these other environments will be different from MAPLE.

MAPLE will provide the following benefits, which will lead to considerable time and cost reduction:

– easy and quick development of manufacturing programs;

– easy and quick updating of manufacturing programs;

– unified access for distributed manufacturing databases;

– unified management of manufacturing databases;

– effective utilization of manufacturing software tools;

– provision of a framework for future manufacturing software tools and data models.