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Graphic technology — Database architecture model and control parameter coding for process control and workflow (Database AMPAC)

Technologie graphique — Codage du modèle d'architecture de base de données et des paramètres de commande pour le contrôle du procédé et le déroulement des opérations (Database AMPAC)

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Foreword

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International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. 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.

In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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Introduction

The purpose of this Technical Report is to prepare a database architecture model and control parameter coding that can be widely applied to design, process control and workflow management in manufacturing processes focused on the graphic arts printing industry.

The proposed architecture model and parameter list with appropriate units and values will enable the exchange of information on a global scale that can be accessed freely using world wide distributed database approaches and can also be used effectively as part of process control techniques. Such enhancement of information exchange offers the potential for significant cost reductions and/or efficiency improvements.

In the proposed architecture, all of the parameters impacting a manufacturing system are classified by using a layer structure. The upper two layers categorize the systems and system elements and set the structure for the process. The following layers characterize the details of the parameters used in the system.

For using the defined parameters effectively in the graphic arts industry, an example of a data coding method is shown in Annex A. These may include

— standard formats that describe a variable and both the technical and functional relevancy to it of other parameters in the database;

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— requirements for describing a subset where a group of parameters are combined to give technical information;

— any requirements relating to access and disclosure of a specific information item.

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Such an architecture allows a well-defined complete set of unified parameters and thereby minimizes the difficulties that frequently occur because of the mismatch and misunderstanding about the parameters among different fields, different vendors and different countries. Using such an approach, each industrial field involving multiple participants can create an appropriate database that has a unified and exchangeable coded term, and communicates through a unified information transport system like the Internet.

In use in the graphic arts example, this architecture would tie the client, designer, material supplier, preprinting, print shop, prepress operators, printing and post-printing machine operators, machine manufactures and machine maintenance supporters together into a common communication database, making it much easier to connect one production facility and system to another, and to exchange and share knowledge about process operation and material usage between participants. Based on a unified code and composition, the necessary databases can be generated independently in distributed computer files, even in different companies and yet function together in an open printing production system.

It is envisioned that there would be two lines of communication in AMPAC. One consists of control parameters used as an intelligent database open to all clients, printing manufactures and vendors in the world. The other would restrict information to specific users as is commonly done on Internet websites.

Individual users could generate AMPAC-based databases at their sites for diverse applications including

— transmitting any material, machine and machine-element specifications to vendors, customers or other manufacturers;

— automatic process specification and workflow selection based on customer requirements for adapting to equipment and materials;

— search for common relationships among parameters such as the effect of temperature on the process;

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- constructing simulated systems for process design and testing;
- troubleshooting using related parameters;
- maintaining compatibility of machines and systems.

Since the architecture and database model proposed in this Technical Report have the potential to create high level intellectual databases, they can be easily joined with the Commerce at Light Speed (CALS) and Intelligent Manufacturing System (IMS) concepts.

The development of a Technical Report of this type can also contribute to the establishment of other standards such as standardized workflow-management systems and/or digital network-production systems.

Four data files are associated with this Technical Report: AMPAC_Parameter_list.csv, which provides a lookup table for obtaining the code corresponding to the alphabet name of a parameter; DatabaseAMPAC_PT.txt, which joins all named parameters to parameter codes; DatabaseAMPAC_VE.txt, which provides a list of available values for non-physical parameters; and DatabaseAMPAC_DE.txt, which provides the corresponding SI-base unit with a named unit.

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Graphic technology — Database architecture model and control parameter coding for process control and workflow (Database AMPAC)

1 Scope

This Technical Report specifies a basic standard architecture model and parameters used in a database for printing-process control and workflow description. It defines how all of the parameters impacting a manufacturing system are classified by using a layer structure. The upper two layers categorize the systems and system elements and set the structure for the process. The following third and fourth layers characterize all details of the parameters used in the printing system, including standard coding rules.

2 References

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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ISO 1000:1992, *SI units and recommendations for the use of their multiples and of certain other units*

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ISO/IEC 646, *Information technology — ISO 7-bit coded character set for information interexchange*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
ASCII
graphic character codes as defined in ISO/IEC 646

3.2
parameter
variable that specifies the state of an object

NOTE Two types of parameter are used in this Technical Report. One is the physical parameter, and the other is the non-physical parameter. The physical parameter is a variable that has a numeric value following its physical dimension given in SI units. The non-physical parameter is also a variable, but this one specifies the state of the object by using a non-numeric value that is assigned from a term or symbol list.

3.3
related parameter
another parameter that directly or indirectly affects the use of a required parameter

3.4
subset
set of parameters, selected from the Database AMPAC parameter list, to explain an object

EXAMPLE Objects may be machines, machine elements, materials or even concepts.

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3.5
workflow
organizational scheme that gives the time schedules and relationships of all factors (operations, materials, process control elements and locations) in the process

4 Database architecture and coding rules

4.1 Layered structure for the architecture model

The architecture model shall contain all relevant process parameters such as the parameters relating to design specification, manufacturing process control measurements, material characteristics and specifications for machine and machine elements. These parameters shall be organized in a layered structure with four levels for classification (see Figure 1).

Each classification level shall be internally consistent with the broadest categories of the process workflow in the first level and increasing detail and specifics concerning the manufacturing process, materials and related parameters in levels two to four. The parameter shall appear in the 4th layer, and shall have a clear physical meaning and/or SI unit as defined in ISO 1000.

The values for a given parameter, listed in level four, or a function name (pointer) for getting the value of the parameter may be described by using the methods as shown in Annex A. The relationship of other parameters to that parameter can also be described. They give perspective to the function and are used to obtain the calculated resultant value of the parameter in the 4th the layer.

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Any type of algorithm can be selected in this way, such as a numeric value, table, analytic function or membership function, since the description is only a pointer which points to the file location of the algorithm.

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The combination of appropriate parameters defines a process that is a subset of the whole system (see Annex B). A factory or machine element may be a subset. In some cases, the parameter set used for describing a product may also be a subset, extracted from the parameter set contained in this architecture model.

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Subsets may be constructed in all cases by using the basic architecture and parameters described here in order that subsets can be easily combined. To start and operate a production process, the value of all parameters in this subset shall be previously set or defined. A part of the production process may also be used as a subset, as long as the architecture and all relevant parameters are included.

Each conceptual element and parameter in each layer shall have a corresponding decimal numeric code. The code of each successive layer shall be combined in successive series in order to identify the parameter. The details of the combination and how it is used are shown in 4.2 and Annex A.

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1st layer	Dictionary	Design	Production process	Material/Machine
2nd layer	0	Specification for products	Kind of specification for each process	Name of material/machine
3rd layer	0	Element of specification	Element of specification	Functional classification
4th layer	0: reference word (code)	Parameter	Parameter	Parameter
		List of units and values, if necessary		

Figure 1 — Architecture model for classification of parameters

4.2 Definition of parameter code and coded parameter list

In the database constructed on each site, each parameter shall be indicated by using a code number or a corresponding alphabet name as defined in this Technical Report.

When parameters use a written name, they shall be transferred to code for the convenience of data exchange in linguistic independency before being sent to another site. The graphic-arts table for obtaining the code corresponding to the alphabet name is given in File AMPAC_Parameter_list.csv. For reader convenience, Table 1 provides a listing of the names used in layers 1 and 2.

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Code numbers shall consist of a combination of four blocks of decimal numeric characters, each of which shall uniquely designate the item in sequential layers. Four sets of decimal code numbers shall be joined serially in the order of the layer, followed by a "period" (character at position 2/E of ISO/IEC 646) as a separator, as follows:

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"1st layer code. 2nd layer code. 3rd layer code. 4th layer code"

EXAMPLE "10.2.6.16" means: specification for design (1st layer). Information for placing and receiving order (2nd layer). Information about products (3rd layer). Number of products (4th layer). (See Annex A and File AMPAC_Parameter_list.csv.)

NOTE In Annex A, the parameter having the code [0.0.0.0] is assigned as the dictionary and is used for defining in terms other than the numeric values or contents of the special parameters defined. The parameter name (code) of this category shall be given as "reference" in the data format and the specification of values associated with this parameter is given as a group of non-numeric terms (see Annex B). Individual Database AMPAC databases can prepare their dictionary as a specified dictionary and it shall have highest priority, although the standard common dictionary will be prepared in the common Database AMPAC for convenience. The defined values of parameters may be chosen from the common dictionary in the subset for each user.

The unit accompanying the parameter is also defined in the dictionary in a similar way to the assignment of values just mentioned above (see Annexes A and C). Each subset can define its own unit, although it should contain an explanatory note about the unit, except in the case where the meaning is given in ISO 1000.

Table 1 — First two layers of AMPAC architecture as applied to the printing industry

	1st layer	2nd layer
DIC	0 (Dictionary)	0
DESIGN	Specification for design	Information for placing and Receiving order Specification for rough design Instruction for layout Page contents of product Instruction for plate making Instruction for proof Instruction for printing Instruction for bookbinding Instruction for slitter Instruction for bag making Instruction for sack ...
PRODUCTION PROCESS	Prepress process	Character input Character composing Image input Image processing / edit Line-art image input Assembling / Markup Imposition Colour and text proof Proof Film output Press plate output Common ...
	Printing process	Process management Sheet-fed offset press Web offset Sheet letter press Web letter press Gravure sheet printing Gravure web printing Flexographic printing Screen printing Thermal transfer Electrostatic printing Magnetographic printing Electronic printing ...
	Postprinting	Cutting Web folding Sheet folding Web stacker bundler Gluing Gathering Saddle stitcher Adhesive binder Tipping (tip-in) Collator Laminate Extrusion laminate Unwind / wind Flexible packaging slitter Bag making Carton diecutting and creasing Box forming Sack Embossing Coating ...
	Printed material (substrate)	Paper Cloth Metal sheet Plastic sheet ...

	1st layer	2nd layer
MATERIAL MACHINE	Printing materials	Film Printing plate Photo-polymer relief plate Blanket Ink Fountain solution Gravure cylinder ...
	Prepress systems	Phototypesetting Word processor Composing system Drum scanner Flat-bed scanner Digital camera Image processing system Line art processing system Page layout system DTP system Imposition system RIP Proof printing Film composing printer Platesetter Imagesetter Developer Composer CTP CTC (Computer To Cylinder) Inspection Data server Cylinder polisher Cylinder plating ...
	Printing machine systems	Sheet-fed offset press Web offset press Sheet-fed letter press Web gravure Sheet fed gravure Web gravure Web flexographic press Screen printing Thermal transfer Electrostatic printing Magnetographic Electronic printing ...
	Finishing/Converting	Cutting machine Folding machine for sheet Folding machine for web Gluing machine Web stacker bundler Gathering machine Saddle stitcher Adhesive side stitcher Tipping (tip-in) machine Collator Laminator Extrusion laminator Unwind / winder Slitter Enveloping machine Carton die cutter Box forming machine Sacker Embossing machine Coater ...

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The following are three additional files associated with this Technical Report:

— **DatabaseAMPAC_PT.txt** The dictionary joins all of named parameters to a parameter code. Each parameter shall be coded by using the rule specified in A.3.1.

— **DatabaseAMPAC_VE.txt** Available-values list for non-physical parameter (see Annex B). This record is written by the format described in Annex A. The parameter name code of this record is 0.0.0.0:parameter name (code) and Q(name) is replaced by CDIC(name).

— **DatabaseAMPAC_DE.txt** Corresponding to SI basic unit with named unit (see Annex C). When the parameter name is 0.0.0.2:parameter name (code), the list of available units for the parameter name (code) is given in Data of the format described in Annex A (see Annex D).

NOTE The data in files named DatabaseAMPAC_VE and DatabaseAMPAC_DE may be imported by using conventional database software, although some of these are coded by using the Database-AMPAC format (see Annex A). When it is desired to export them to conventional database software, the character “semicolon” (character at position 2/C of ISO/IEC 646) should be specified as the data separator.

5 Limitation on usage of the parameter list

The parameter list, and associated code structure, contained in this Technical Report may be used freely, but should be ascribed to this specific version (Version 1) of AMPAC because every subsequent version of AMPEC will include added parameters.

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