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**Datasheet for the decision  
of 10 March 2014**

**Case Number:** T 0042/09 - 3.5.07

**Application Number:** 03076109.2

**Publication Number:** 1357486

**IPC:** G06F17/50

**Language of the proceedings:** EN

**Title of invention:**

Logical hierarchical data model for sharing product information across product families

**Applicant:**

The Boeing Company

**Headword:**

Logical hierarchical data model/BOEING

**Relevant legal provisions:**

EPC Art. 56  
EPC R. 137(3)  
RPBA Art. 12(4)

**Keyword:**

Inventive step - main request (no) - auxiliary request I (no)  
Admissibility - auxiliary request II (no)

**Decisions cited:**

T 0049/99, T 0258/03, T 1227/05, T 1841/08, T 1954/08

**Catchword:**



**Beschwerdekammern  
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Case Number: T 0042/09 - 3.5.07

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.07**  
**of 10 March 2014**

**Appellant:** The Boeing Company  
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Chicago, IL 60606-2016 (US)

**Representative:** Land, Addick Adrianus Gosling  
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**Decision under appeal:** **Decision of the Examining Division of the  
European Patent Office posted on 8 August 2008  
refusing European patent application No.  
03076109.2 pursuant to Article 97(2) EPC.**

**Composition of the Board:**

**Chairman:** R. Moufang  
**Members:** R. de Man  
M. Rognoni

## Summary of Facts and Submissions

- I. The applicant (appellant) filed an appeal against the decision of the Examining Division posted on 8 August 2008 refusing European patent application No. 03076109.2.
- II. The decision made reference to the following documents:
- D1: Wongvasu N. et al.: "Representing the relationship between items in logical bill-of-material to support customers' requests for quotation for make-to-order products", Proceedings of SPIE, Vol. 4192, p. 74-85 (2000); and
- D3: Gu P. et al.: "Product modelling using STEP", Computer-Aided Design, Vol. 27, No. 3, p. 163-179, (March 1995).

The Examining Division decided that the main request contravened Article 123(2) EPC, that claim 1 of the first auxiliary request lacked an inventive step over a combination of documents D1 and D3, but also without reference to a document, and that the second auxiliary request again contravened Article 123(2) EPC.

- III. With the statement of grounds of appeal, the appellant filed a copy of the post-published document
- D4: Callahan S.: "Extended Generic Product Structure: An Information Model for Representing Product Families", Journal of Computing and Information Science in Engineering, Vol. 6, p. 263-275 (September 2006).

The appellant further indicated that a declaration by an expert in the field was expected to be filed soon. No such declaration has been submitted.

The appellant requested that the decision be set aside and that a patent be granted on the basis of a main request or, in the alternative, on the basis of a first or a second auxiliary request. According to the statement of grounds of appeal, the main request corresponded to the first auxiliary request as filed in the first-instance proceedings and the first auxiliary request corresponded to the second auxiliary request as filed in the first-instance proceedings.

- IV. The claims of the main request, the first auxiliary request ("auxiliary request I") and the second auxiliary request ("auxiliary request II") were filed on 22 December 2008 together with the "confirmation copy" of the statement of grounds of appeal, i.e. after expiry of the time limit for the statement of grounds of appeal. The claims of the main request corresponded to those of the first auxiliary request before the department of first instance. Claim 1 of auxiliary request I corresponded to claim 1 of the second auxiliary request before the department of first instance. The dependent claims of auxiliary request I differed from those of the second auxiliary request before the department of first instance.
- V. The Board appointed oral proceedings. In a communication accompanying the summons to oral proceedings, the Board provisionally expressed a negative opinion on all requests. Among other objections, claim 1 of both the main request and auxiliary request I appeared to lack an inventive step.

Questions were raised regarding the admissibility of auxiliary request II.

- VI. With a letter dated 11 February 2014, the appellant informed the Board that it would not appear at the oral proceedings. The letter did not address any of the issues raised in the communication accompanying the summons.
- VII. The oral proceedings were held on 10 March 2014 in the absence of the appellant. At the end of the oral proceedings the chairman announced the decision of the Board.
- VIII. Claim 1 of the main request reads as follows:

"A method of designing products using CAD and of manufacturing products using CAM, wherein a product data-model is stored in a memory associated with a computer, said product data-model representing product information about at least one component that is a constituent of at least one parent assembly, comprising:

    a parent assembly and two or more children, each comprising at least one component, said parent assembly holding information for associating the two children with the parent assembly;

    a plurality of component-usages for holding information relating to usages of the component, said component-usages being operatively connected to a component of the parent assembly;

    a plurality of logical component-usages for holding information relating to logical usages of the component, said logical component-usages being operatively connected to said component-usages; and

said parent assembly, said component-usages and said logical component-usages being hierarchically interconnected."

IX. Claim 1 of auxiliary request I reads as follows:

"A method of designing products using CAD and of manufacturing products using CAM, wherein a product data-model is stored in a memory associated with a computer, said product data-model representing product information about at least one component that is a constituent of at least one parent assembly, said data model comprising a parent assembly and two or more children, said parent assembly holding information for associating the two children with the parent assembly, said method comprising:

selecting one component-usage to be included in a product configuration from a plurality of component-usages in said data model and for holding information relating to usages of the component;

selecting one from the component-usages connected to it from a plurality of logical component-usages of said data model and for holding information relating to logical usages of the component, said logical component-usages being operatively connected to said component-usages; wherein said logical component-usages are used to identify the existence of a role for said component-usages in an assembly configuration represented by a general motional [sic] mechanism for expressing to which particular configuration each logical component-usage and component-usage is applicable, the logical component usages are labeled with applicability attributes (O1, O2) that determine whether they apply to a given product configuration, including option attributes (O1, O2) of which the options are mutually exclusive."

X. Claim 1 of auxiliary request II reads as follows:

"A method for representing assembly configurations using a generalized occurrence structure stored in a memory, comprising:

(a) constructing a plurality of occurrence nodes corresponding to paths in a representation of a product data-model comprising hierarchically interconnected parent assembly, a plurality of component-usages, and a plurality of logical component-usages;

(b) constructing a plurality of logical occurrence nodes associated with a plurality of said occurrence nodes;

(c) storing product data in said occurrence nodes;

(d) associating a plurality of part-interfaces with said occurrence nodes;

(e) associating a plurality of part usages with a plurality of logical occurrence nodes depending upon logical relationships between said part-usages; and

(f) forming a mapping of a plurality of computer-aided designs of said parts with said product data-model

wherein said step (a) further comprises

forming a mapping of at least one manufacturing assembly sequence to at least one computer-aided-design that is stored in said product data model, said manufacturing assembly sequence comprising a plurality of manufacturing assemblies which include a plurality of components and a plurality of assemblies, wherein it is ensured by an effectivity or applicability scheme that for any one valid assembly configuration of the parent assembly 12 using the logical component usage node 18, there is only one component usage node 14, the logical component usage node 18 determining which one of the multiple (if any) component usage nodes 14

associated with it becomes part of a given valid assembly configuration of the parent assembly 12."

XI. In support of inventive step, the appellant essentially argued as follows:

The data models described in the claims were used in the technical field of computer-aided design systems and computer-aided manufacturing environments. In this technical field virtual product modelling could expedite a design process for a family of products sharing an overall product architecture. The designer could customise the product selected from a product family that included many product variants.

Before the present invention, a designer reconstructed relationships between product design domains, either mentally or with some minimal computer support. Manual tracking of such relationships incurred high costs and was prone to errors. Reduced use of effectivity, viz. defining which part went into each end product configuration, meant diminishing knowledge of what was common among different product designs.

The invention avoided the undesirable situation where there were many copies of engineering bill-of-material assembly definitions that were similar but had unique copies of product structure definitions. In addition, multiple and independent drawings, CAD data and product structures for variance were eliminated.

The "logical component usage" concept was used to check the consistency of the selection of component usages and was a mechanism to help designers understand which component usages were alternative to each other, versus



which component usages fulfilled different purposes in the design.

The present invention introduced logical component usage as an abstraction of component usage. In the prior art a component usage was considered to be a relationship object. It was counter-intuitive to consider abstracting a relationship.

The invention introduced the idea of considering a component usage as a lightweight copy of a component instead of as a relationship. This allowed component usage to be abstracted, since it had become a virtual thing instead of a relationship. This concept of a lightweight copy was further introduced in document D4.

### **Reasons for the Decision**

1. The appeal complies with the provisions referred to in Rule 101 EPC and is therefore admissible.
2. *Main request - Article 56 EPC*
  - 2.1 In the communication accompanying the summons to oral proceedings, the Board raised various clarity objections against claim 1. Nevertheless, with the help of the description the invention as defined by claim 1 can be understood to an extent sufficient for performing the assessment of inventive step.
  - 2.2 The application seeks to address the problem of modelling a "family" of products. Instead of providing a separate model for each variation of a product within a family of products, a single "product data-model" is provided that captures the whole family. This product

data-model models a generic product by means of a number of "logical component-usage" nodes. Each "logical component-usage" node essentially represents a logical component function and is connected, by means of a number of "component-usage" nodes, to respective "components" providing such function. The "component-usage" nodes thus represent configuration options for the "logical component-usage" node. By applying certain "applicability attributes", at each "logical component-usage" node a choice is made from the possible "component-usages" and their corresponding "components". See in particular paragraphs [0034]-[0036] of the description.

This product data-model can be understood more easily with the help of Figure 3A. Product data-model 20 models a family of product configurations. The data-model comprises two logical component-usage nodes 18<sub>3</sub> and 18<sub>4</sub>, each representing a "logical" component having a pump function. The component usage nodes 14<sub>9</sub> and 14<sub>10</sub> represent possible choices of specific pumps for the "logical" component 18<sub>3</sub>, component usage node 14<sub>9</sub> representing a large pump P1 and component usage node 14<sub>10</sub> representing a small pump P6. Similarly, component usage nodes 14<sub>11</sub> and 14<sub>12</sub> model a choice between pump P1 and pump P6 for logical component 18<sub>4</sub>. A product configuration is now obtained by labelling each component usage node with an "applicability attribute" designating the choice being made.

- 2.3 Although claim 1 of the main request is directed to a "method of designing products using CAD and of manufacturing products using CAM", it does not define any steps, let alone steps of designing products using CAD and of manufacturing products using CAM. Instead,

claim 1 defines features of a "product data-model" without explaining its relation to a method of designing or manufacturing.

In this respect, the Board notes that the invention as disclosed in the application also rather appears to be concerned with the general use of a particular "product data-model" stored in the memory of a computer in unspecified activities related to CAD/CAM. For example, paragraph [0005] of the description suggests that the product data-model may serve logistical purposes.

The arguments put forward by the appellant further confirm that the present invention is essentially aimed at solving non-technical administrative problems such as checking product configurations for consistency and reducing the number of copies of similar but unique documents.

- 2.4 The features of claim 1 relating to the "product data-model" define an abstract information model. Indeed, these features are worded in abstract terms and make no reference to any concrete physical representation of the product data-model. A product data-model having these features could take the form of a drawing on paper such as depicted in Figure 3A.

According to decision T 49/99 of 5 March 2002, reasons 7, information modelling is in principle a non-technical activity, and only a purposive use of information modelling in the context of a solution to a technical problem may contribute to the technical character of an invention. For the reasons given under point 2.3, the Board considers that the claimed connection with CAD/CAM activities cannot qualify as such a purposive technical use. The product data-model

does not enable, improve, or otherwise contribute to the solution of a concrete technical problem.

The features defining the "product data-model" hence are non-technical. This means that they cannot contribute to an inventive step. Since the mere additional mention of unspecified CAD/CAM activities and the feature specifying that the product data-model is "stored in a memory associated with a computer" cannot support an inventive step either, the invention as defined by claim 1 lacks an inventive step within the meaning of Articles 52(1) and 56 EPC over a notorious general purpose computer.

2.5 The same conclusion is reached when starting from document D1 as closest prior art.

2.5.1 Document D1, section 2, discloses in Figures 2 and 3 and on page 76 a "Logical BOM" (i.e. a logical bill-of-material), which is a generic product model modelling a "Logical Top Product" (LTP) comprising a hierarchy of "Logical Sub-assemblies" (LSAs). At the bottom of the hierarchy are "Logical primary components" (LPCs). With each "Logical primary component" a number of "Physical primary components" (PPCs) are associated, the latter being "variants" of the "Logical primary component".

Document D1, section 4, further discloses on pages 82 and 83 that a model (BOM) of a variant product may be generated from the "logical BOM" of a product family based on a "product specification" of that variant. This specification in particular identifies suitable PPCs for all LPCs.

The "logical BOM" of document D1 is disclosed in a CAD/CAM context, see the paragraph bridging pages 76 and 77, Figure 4, and Table 2.

- 2.5.2 In point 2.1 of the decision under appeal, the Examining Division equated LSAs to "parent assemblies", LPCs to "logical component-usages" and PPCs to "components". The claimed invention differed from the "logical BOM" of document D1 in that the "logical component-usages" were hierarchically connected to "component usages" instead of to their associated "components". The Board agrees with this analysis.
- 2.5.3 According to the contested decision, the distinguishing feature solved the problem of how to avoid having multiple copies of components. The claimed solution was considered to be obvious in light of the common general knowledge that, when multiple copies of identical components are needed, memory can be conserved by creating only a single copy and employing references to that single copy. An example of this common general knowledge was to be found in document D3, Figure 5, in the form of "NextAssemblyUsages".
- 2.5.4 In the statement of grounds of appeal, the appellant submitted that the decision under appeal "disregards the definition of logical component usage as given in the patent specification" and that "[l]ogical components usage (LCU) identifies that a role for a component usage (CU) exists in an assembly and also storing the implementing component usages". The appellant referred to paragraph [0034] of the description as filed. Referring to Figure 3A, the appellant further submitted that document D1 did not disclose a logical component usage connected to options that are mutually exclusive.

- 2.5.5 According to paragraph [0034], logical component usage node 18 "determines which one of the multiple (if any) component usage nodes 14 associated with it becomes part of the given valid assembly configuration of the parent assembly 12". The Board understands this as expressing that a "logical component-usage" node models a choice between various configuration options in the form of "component-usages", essentially in the same way as the LPCs of document D1 model a choice between PPCs.
- 2.5.6 Regarding the argument based on mutually exclusive options, the Board notes that claim 1 of the main request does not contain features relating to such options. In any event, in view of the examples in Figure 3 of document D1, for example the choice between a "rubber grip" and a "leatherette grip" and the choice of a "club head" from a "47° head", a "56° head" and a "60° head", it is an obvious possibility, if not implicitly disclosed, that the PPCs connected to an LPC are mutually exclusive.
- 2.5.7 The appellant further argued in favour of inventive step on the basis of the introduction by the present invention of "the idea of considering the component usage to be a lightweight copy of a component instead of as a relationship". The appellant submitted document D4 to "further introduce" the concept of a lightweight copy.
- 2.5.8 The Board understands this argument as being intended to support the non-obviousness of the provision of "component usages" as a link between "logical component usages" and "components", instead of providing multiple full copies of a component definition. It could be

argued, as the Examining Division did, that this reduces memory usage.

However, any such reduction of memory usage manifests itself only at the level of the physical layout of the product data-model as a data structure in the memory of a computer. The claim defines the product data-model in more abstract terms and would appear to cover implementations requiring essentially arbitrary amounts of memory.

Furthermore, the Board considers that a reduction of memory usage merely arising out of a change in an abstract data model does not confer technical character on the data model. See in particular decisions T 258/03, OJ EPO 2004, 575, headnote II, T 1227/05, OJ EPO 2007, 574, reasons 3.2.5, and T 1954/08 of 6 March 2013, reasons 6.2.

For these reasons the Board considers, consistently with the reasoning in point 2.4 above, the distinguishing feature to be a non-technical feature not contributing to an inventive step.

For completeness the Board notes that it is also convinced by the reasons provided by the Examining Division as summarised in point 2.5.3 above, which were not addressed by the appellant. In a practical implementation of the "logical BOM" of document D1 as a physical data structure, the various possible PPCs would typically be provided in the form of a library of PPCs, and it would be obvious to include in the data structure implementing the "logical BOM" not a complete copy of the PPC data, but only a considerably smaller reference to the PPC data present in the library, for example in the form of an identifier of the PPC.

3. *Auxiliary request I - Article 56 EPC*

3.1 Claim 1 of auxiliary request I is again directed to a "method of designing products using CAD and of manufacturing products using CAM". It defines steps of selecting "component-usages" from a product data-model and comprises various features defining this product data-model. These latter features essentially correspond to those of claim 1 of the main request and are understood as explained in point 2.2 above.

3.2 Claim 1 further contains the following features:

- wherein logical component-usages are used to identify the existence of a role for said component-usages in an assembly configuration represented by a general motional [sic] mechanism for expressing to which particular configuration each logical component-usage and component-usage is applicable,
- the logical component usages are labeled with applicability attributes (O1, O2) that determine whether they apply to a given product configuration,
- including option attributes (O1, O2) of which the options are mutually exclusive.

The Board understands the intended basis for these features to be original claim 3, page 19, lines 20-22, and page 10, lines 13-15, 22 and 23.

However, the sentence on page 10, lines 13-15, states that the component usage nodes and the logical component usage nodes are labeled with applicability attributes, whereas claim 1 refers only to logical



component-usages being labeled. In addition it is noted that according to page 10, lines 16-22, and Figure 3A the "option attributes (O1, O2)" are shown (only) inside the component usage nodes. It therefore appears that these features should be understood as defining that applicability attributes specify which of the component-usage nodes associated with a logical component-usage node is chosen for a particular product configuration, some of the attributes being mutually exclusive.

- 3.3 In the Board's view, the reasoning presented in point 2.4 applies *mutatis mutandis* to claim 1 of auxiliary request I. The added features define further abstract aspects of the product data-model and its abstract use in defining a specific product configuration. A concrete link to the purposive use of the product data-model in the context of a solution to a technical problem is still missing.

Claim 1 hence lacks an inventive step (Articles 52(1) and 56 EPC).

4. *Auxiliary request II - admissibility (Rule 137(3) EPC and Article 12(4) RPBA)*

- 4.1 Claim 1 relates to a method for "representing assembly configurations using a generalized occurrence structure stored in a memory". The notion of a "generalized occurrence structure" was not present in any of the independent claims of the claim requests on which the Examining Division's decision was based.

- 4.2 According to the statement of grounds of appeal, claim 1 of auxiliary request II is based on originally

filed claims 21, 22 and 23 and a passage from the description on page 9 as originally filed.

In support of inventive step, the appellant submitted that "the objections regarding lack of inventive step from the examining division appear to be no longer valid" and again referred to the possibility of running a check on the design of a product configuration, which was said to be extremely valuable for products that contained hundreds of thousands of component usages.

- 4.3 Originally filed claim 23 is dependent only on originally filed claim 21. The originally filed claims therefore do not form a basis for a combination of the features of claims 21, 22 and 23. In addition, the "passage from the description on page 9", which appears to be the passage in lines 15-22, does not appear to be disclosed in combination with the features of claims 21-23.

There is therefore doubt as to the compliance of this request with Article 123(2) EPC.

- 4.4 In addition, the method of claim 1 still appears to be directed to the abstract construction of information models, the only technical feature of the claim being "using a generalized occurrence structure stored in a memory". There is therefore considerable doubt that this request could overcome the objection of lack of inventive step.

- 4.5 In the communication accompanying the summons, the Board voiced these concerns and further stated that auxiliary request II appeared to be an attempt to restart the examination of the present application. The

admissibility of auxiliary request II was therefore in question.

The appellant did not address these concerns in writing, and did not attend the oral proceedings.

4.6 The primary purpose of appeal proceedings is to give the appellant the possibility of a judicial review of the first-instance decision. New requests may be admitted if they are serious attempts to overcome objections. If they are not, the Board has the discretion not to admit them into the appeal proceedings (Rule 137(3) EPC and Article 12(4) RPBA, see also decision T 1841/08 of 9 October 2012, reasons 3.1).

4.7 Auxiliary request II raises questions of added subject-matter which cannot be answered on the basis of the appellant's submissions. In addition, the appellant has not explained why this request would overcome the inventive step objection raised by the Examining Division, but has merely repeated the alleged advantage of the invention. Under these circumstances, the Board considers it appropriate to exercise its discretion under Rule 137(3) EPC and Article 12(4) RPBA to not admit auxiliary request II into the proceedings.

5. Since neither the main request nor auxiliary request I is allowable and auxiliary request II is not admitted into the proceedings, the appeal is to be dismissed.

## **Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chairman:



I. Aperribay

R. Moufang

Decision electronically authenticated