Reading 4 -- Class diagrams x Class descriptions

Goal: To verify that the detailed descriptions of classes contain all the information necessary according to the class diagram, and that the description of classes make semantic sense.

Inputs to Process:

1. A class diagram (possibly divided into packages) that describes the classes of a system and how they are associated.
2. A set of class descriptions that lists the classes of a system along with their attributes and behaviors.

1) **Read the class diagram to understand the necessary properties of the classes in the system.**

   INPUTS: Class diagram;
                              Class description.

   OUTPUTS: Discrepancy reports.

   For **each class on the class diagram,** perform the following steps:

   ☞ Find the relevant class description. Mark the class description with a blue symbol (*) when found. **If you can't find the description, you have found a defect of omission. This class was represented but not described on the class diagram. Fill in a discrepancy report for this.**

   ☞ Check the name and textual description of the class to ensure that they provide a *meaningful* description of the class that you are considering at this time. Also check that the description is using an adequate abstraction level.

   Can you understand the purpose of this class from the high-level description? If not, the description may be too ambiguous to be used for the design model. Fill out a discrepancy report describing the situation.

   ☞ Verify that all the attributes are described along with basic types.

   Are the same set of attributes present in both the class description and the class diagram? If not, it means that attributes are not appropriately described. This represents an inconsistency between the documents. Fill in a discrepancy report describing this situation and showing which document didn't capture the appropriate information.

   Can this class *meaningfully* encapsulate all these attributes? That is, does it make sense to have these attributes in the class description? Are the basic types assigned to the attributes *feasible* according to the description of the attribute? If not, it represents an ambiguity or an incorrect fact. Fill in a discrepancy report describing this situation and showing which document didn't capture the appropriate information.

   ☞ Verify that all the behaviors and constraints are described.

   Are the same set of behaviors and constraints present in both the class description and the class diagram? Does the class description use the same style or level of granularity (e.g. pseudocode) to describe all of the behaviors? If not, you have discovered an inconsistency. Different information is contained in different documents, or different styles are used within the same document. Fill in a discrepancy report describing this situation and showing which document didn't capture the appropriate information.

   Can this class *meaningfully* encapsulate all these behaviors? Do the constraints make sense for this class? If not, it represents an ambiguity or an incorrect fact. Fill in a discrepancy report describing this situation.

   Do the behaviors accomplish this procedure using attributes that have been defined (for this or some other class)? Are the constraints satisfiable using the attributes and behaviors that

have been defined? If not, you may have discovered an omission or ambiguity. The behaviors and constraints as defined cannot be satisfied using the attributes and behaviors that have been defined. It may be that new attributes must be included in the design, or the definition of the constraint/behavior changed. Fill in a discrepancy report describing the problem.

Do the behaviors for this class rely *excessively* on the attributes of other classes to accomplish their functionality? (Note that you must make a value judgement about what is meant by "excessive reliance." You should compare the number of references to other classes for this class with the rest of the system, and consider the type of functionality addressed to determine if such reliance is really necessary.) If so, you have uncovered a potential style issue: unnecessarily high coupling. Fill in a discrepancy report describing the problem as a "miscellaneous" defect.

☞ If the class diagram specifies any inheritance mechanisms for this class, verify that they are correctly described.

Is the inheritance relationship included on the class description? If not, you have uncovered a defect of omitted information. The class diagram specifies that this class is part of an inheritance hierarchy that should be described in the class description. Fill in a discrepancy report describing this situation.

Use the class hierarchy to find the parents of this class. Is it true that, *semantically,* a <class name> is a type of <parent name>? Does it make sense to have this class at this point of the hierarchy? If not, you have uncovered a potential style issue: the hierarchy should not be defined in this way. Fill in a discrepancy report describing the problem as a "miscellaneous" defect.

☞ Verify that all the class relationships (association, aggregation and composition) are correctly described with respect to multiplicity indications.

Were the object roles captured on the class description? Is the correct graphical notation used on the class diagram to denote the type of relationship? If not, you have discovered an inconsistency; the information on the two diagrams does not agree. Fill in a discrepancy report describing this situation and showing which document didn't capture the appropriate information.

***Semantically*, do the relationships make sense given the role and the objects related? For example, if a composition relationship is involved, do the connected objects really seem like a "whole-part" relationship? If so, you have uncovered a potential style issue: the relationships should not be defined in this way. Fill in a discrepancy report describing the problem as a "miscellaneous" defect.**

If cardinalities are important, were they described in the class description? Given your understanding of the relationship, do the quantities of objects used seem enough? If not, you may have discovered an inconsistency. Fill in a discrepancy report describing the problem.

Is there some attribute representing the relationship? Does it use a feasible basic type, or structure of basic types (if multiple cardinality is involved)? If not, you may have discovered an inconsistency (if the documents do not agree). Fill in a discrepancy report describing the problem.

2) Review the class descriptions for extraneous information.

INPUTS: Class description.

OUTPUTS: Discrepancy reports.

☞ Review the class descriptions to make sure that all classes described actually appear in the class diagram.

Is there an unstarred class description? If so, you have discovered a defect of extraneous information. Class information has been described that does not actually participate in the class diagram. Fill in a discrepancy report describing the problem.