Multiplicity and Cardinality

TN-008

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1 Introduction

Having worked intermittently with diagrams and models that include cardinality and multiplicity nomenclature I have always been seeking a more complete set of the annotations. In reading Fowler, [2], a comprehensive set of explanations was found which for my own benefit have been transcribed into this paper.

2 Mappings

The annotations for diagrams to express cardinality and multiplicity are displayed in Figure 1. At this stage probably no further explanation is required.

2.1 Multiplicity Notation

Although Figure 1 expresses one view of multiplicity on "crows feet" diagrams, a more generic labelling approach for other diagrams can be achieved by using the notation of Table 1.

Table 1: Multiplicity Notation

Notation	Description
$0 \ldots 0$	Must be empty, zero.
$1 \ldots 1$	Must be exactly one.
$n \ldots n$	Must be exactly n.
$0 \ldots 1$	Zero or one.
$0 \ldots *$	Zero to many.
$0 \ldots n$	Zero to n.
$1 \ldots *$	One to many.
$1 \ldots n$	One to exactly n.
$n \ldots *$	Exactly n to many.
$m \ldots n$	Exactly m to exactly n.

2.2 Alternative Notations

More than one method, standard, of diagramming exists and with each there is an attendant nomenclature for multiplicity and cardinality. Two such standards are:

- UML, Unified Modelling Language, [1];
- IDEF1X, Integration Definition for Information Modelling, [3].

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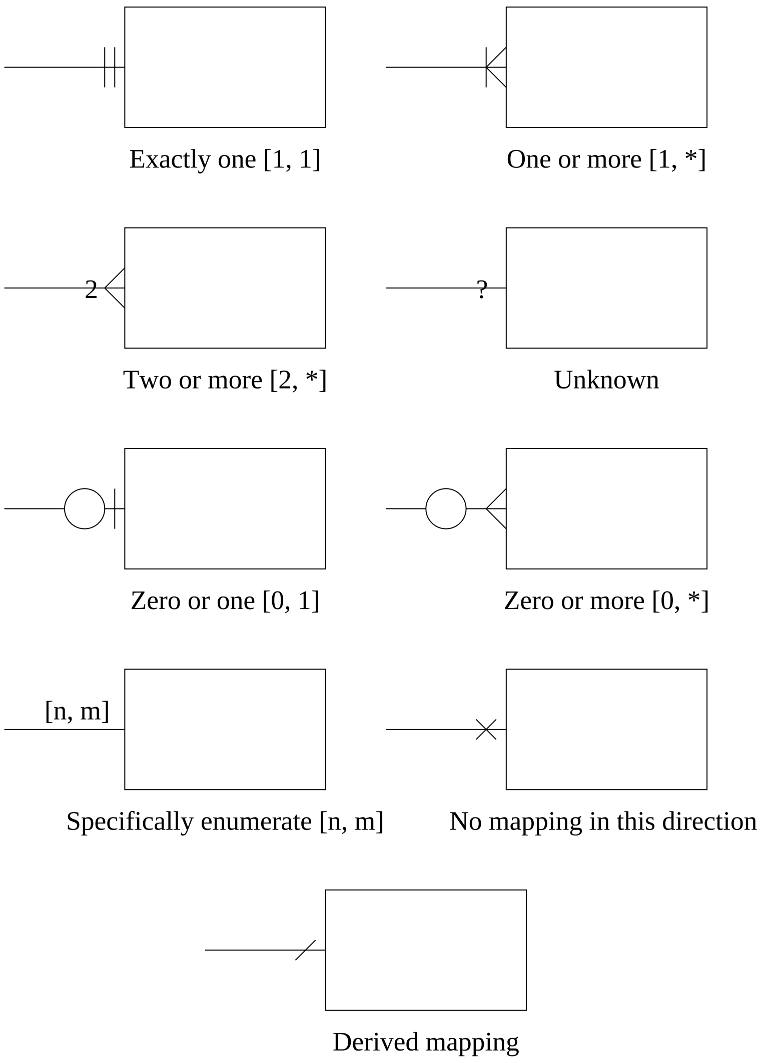

Figure 1: Cardinality and Multiplicity Annotations

3 Summary

A simple crib sheet has been produced for multiplicity and cardinality nomenclature on diagrams, both "crows feet" and for generic diagrams.

4 Feedback

If this paper has been of value, or even if it has not, feedback and comments are welcome. What questions has it raised? How could it be improved?

Bouquets or brickbats to jsglover@zetnet.co.uk

References

[1] G. Booch, J. Rumbaugh, and I. Jacobson. *The Unified Modeling Language User Guide*. The Addison-Wesley Object Technology series. Addison-Wesley, 1999.

[2] M. Fowler. *Analysis Patterns: Reusable Object Models*. Addison-Wesley Series in Object-Oriented Software Engineering. Prentice Hall, 1997.

[3] National Institute of Standards, Technology (U.S.), and Computer Systems Laboratory (U.S.). *Integration Definition for Information Modeling (IDEF1X)*. Federal information processing standards publication. Computer Systems Laboratory, National Institute of Standards and Technology, 1993.