Advanced Networked Systems Architecture

ANSA

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Abstraction

Abstract:

This document discusses the meaning of the term **abstraction** within ANSA, and its relationship to the dimensions of the architectural framework.

It concludes that the dimension previously termed **abstraction** is really about **decomposition** of systems into parts, and that **abstraction** is an important technique for deciding on appropriate **decompositions**.

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1 INTRODUCTION

The basic work on the dimensionality of the ANSA problem space [1] identifies five dimensions upon which will be founded the ANSA architectural framework. One of these was termed **abstraction** although it was not clearly understood. Various commentators have suggested that several concepts have been folded into the one term, such as **hiding of detail, decomposition**, and **granularity**.

As part of the clarification of this confusion, this document addresses what we mean by **abstraction**.

2 OUTSIDE VIEWS

In clarifying our understanding of the term **abstraction** and its use by elsewhere, we have sought definitions. In particular [2] sections 1.1 and 1.2 define abstraction as -

> "... a way to do decomposition productively by changing the level of detail to be considered. When we abstract from a problem we agree to ignore certain details in an effort to convert the original problem to a simpler one."

and

> "Decomposition is used to break software into components that can be combined to solve the original problem; abstractions assist in making a good choice of components."

and

> "The process of abstraction can be seen as an application of many to one mapping. It allows us to forget information and consequently to treat things that are different as if they were the same."

A similar view is expressed in [3] page 83, -

> "Abstraction arises from a recognition of similarities between certain objects, situations, or processes in the real world, and the decision to concentrate on these similarities, and to ignore for the time being the differences."

The central importance of abstractions is emphasised in [4] -

> "Only by using *abstractions*, which capture the important properties of an object of interest and suppress irrelevant details, can one hope to master the complexity associated with supporting fault tolerance and distribution."

3 ABSTRACTIONS IN ANSA

Abstractions as described above abound within ANSA. The **object model** [5] is one such abstraction, as are **types, recipes, specifications**, and indeed the **architecture** itself!

The main question to be addresses is whether **abstraction** should be included as a dimension of the ANSA problem space.

To quote [1] -

> "The level of abstraction dimension is concerned with the range of abstraction that is used to represent the architecture. At one extreme, the representation is a single object - ANSA - , and at the other it is a considerable amount of detail about the implementation of systems conforming to ANSA.
>
> Details of appropriate coordinate systems are unclear, but must broadly correspond to 'degree of decomposition', or in the case of software objects, the depth of the type definition down the inheritance tree (mesh)."

Given the usage of **abstraction** described in section 2, it is clear that what is being addressed in [1] is the **decomposition** of ANSA conforming systems into parts, rather than a variation in the type or degree of **abstraction.** This does not imply that variation in the **abstractions** will not occur, but that the structuring principle for the architectural framework should be the **decomposition** of the whole into parts.

4 Conclusions

This brief examination of the usage of the term **abstraction** within the ANSA framework has shown that it is not appropriate to define an **abstraction dimension**, and that the putative dimension is actually concerned with the **decomposition** of systems into parts. This will be reflected in the next issue of [1].

4 REFERENCES

[1] *The ANSA Climbing Frame.* (AO.16.02)

[2] Liskov, B. 'Abstraction and specification in program development.' *The MIT electrical engineering and computer science series, 1986.* ISBN 0-262-12112-3

[3] C. A. R. Hoare 'Notes on Data Structuring' *STRUCTURED PROGRAMMING. A.P.I.C Studies in Data Processing No. 8,* Academic Press 1972

[4] Fred B. Schneider 'ABSTRACTIONS FOR FAULT TOLERANCE IN DISTRIBUTED SYSTEMS.' *INFORMATION PROCESSING 86.*

[5] *The Object Model* (To be supplied)