Typical versus Worst Case

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1 Introduction

A continuous tension exists between the day to day requirements for a new product and the requirements in exceptional cases. The System Architect must understand both requirements and be able to discuss them in terms of value in order to make a balanced product. This article gives some handles to tackle this problem.

This article builds upon the paper "Requirements Capturing by the System Architect" [1].

This article is part of the deliverables of the Gaudí project [2], which will describe the entire system architecture process.

2 SystemParameters

The performance of a system is often characterized by a very large set of parameters. These parameters together from a parameter space. The product specification

can describe the entire n-dimensional parameter space, or it can describe only a limited number of relevant points.

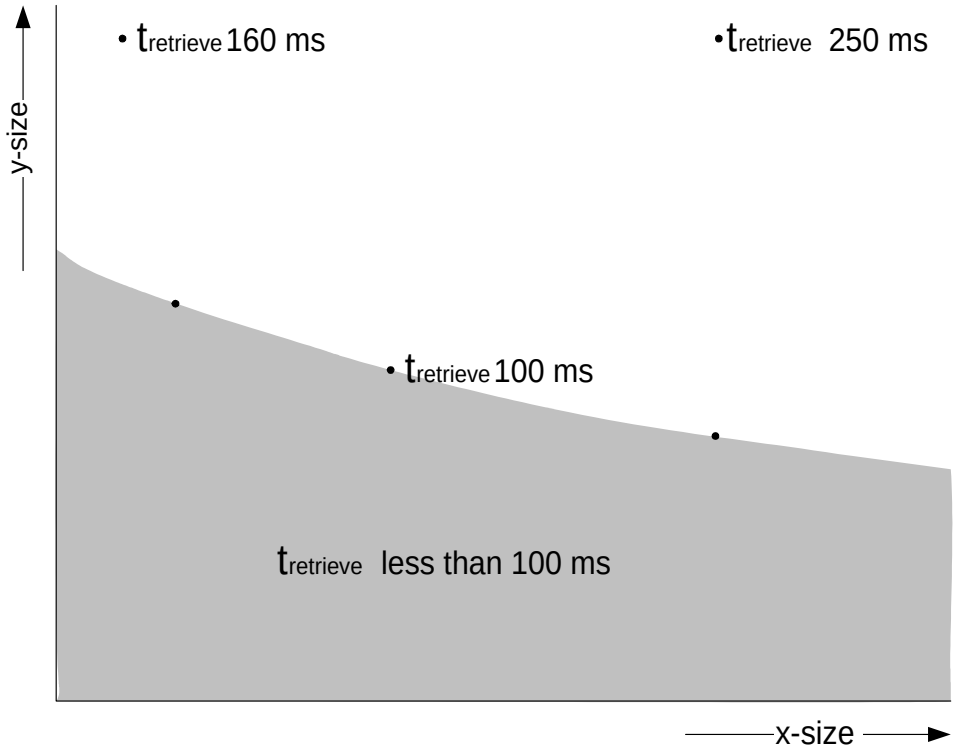

Figure 1: An extremely simple example with 3 parameters. The grey area is the feedback from the designers with respect to the retrieve time, all images in the grey area can be retrieved in less than 100 ms

Figure 1 shows an extremely simple example with 3 parameters: the size of an image in x- and y- direction and the retrieve time. The requirement for the retrieve time is 100 ms or less, i.e. significantly less than the human response time, however significantly slower than the human eye. The design department gives the information that due to technical constraints the retrieve time is dependent on x- and y- size of the image, in this case according to the formula: The figure shows a grey area which fulfils the 100 ms retrieve requirement.

$t_{retrieve} = y_{size} * (t_{rowoverhead} + x_{size} * t_{pixeloverhead})$

where

$t_{rowoverhead} = 15\mu sec$

$t_{pixeloverhead} = 100nsec$

The requirements can be formulated in many different ways, for example:

1. Images upto 1k*1k, retrieve time less than 100 ms

2. Images upto 1k*1k, retrieve time 100ms@500*500

3. Images upto 1k*1k, retrieve time 100ms@500*500, 200 ms@1000*1000

4. Images upto 1k*1k, retrieve time number of pixels * 200 ns.

5. Images upto 1k*1k, $t_{retrieve} = y_{size} * (15\mu sec + x_{size} * 100ns)$

The requirement formulated in 1 is not feasible according to the technical department, it can not be incorporated in this way in the product specification. The formulation in 2 repairs the feasibility aspect, however it does not define anything for retrieve times of larger images. Again a repair action is possible as shown in 3, which defines the retrieve time explicitly for 2 image sizes.

In an attempt to be explicit and complete a more technical formulation can be used, as 4. Here the more or less naieve user assumption is used that the retrieve time is directly proportional to the amount of pixels. Although the description is short and close to the users way of thinking, this description is either too exacting (retrieve time of 50 ms for a 500*500 image!) or not ambitious enough if the pixel time is relaxed to meet the 500*500 retrieve time.

Again the shortcoming of 4 can be repaired by describing the relationship between image size and retrieve time more exact, as in 5. However this formulation is far away from the "real" user requirements, which in fact was: *to have an interactive feeling when retrieving images*. This formulation is in fact entirely implementation driven, the formulation of the requirement in fact prescribes the implementation.

References

[1] Gerrit Muller. Positioning the system architecture process. URL: http://www.extra.research.philips.com/natlab/sysarch/index.html, 1999.

[2] Gerrit Muller. The system architecture homepage. URL: http://www.extra.research.philips.com/natlab/sysarch/index.html, 1999.

History

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- Created, no changelog yet