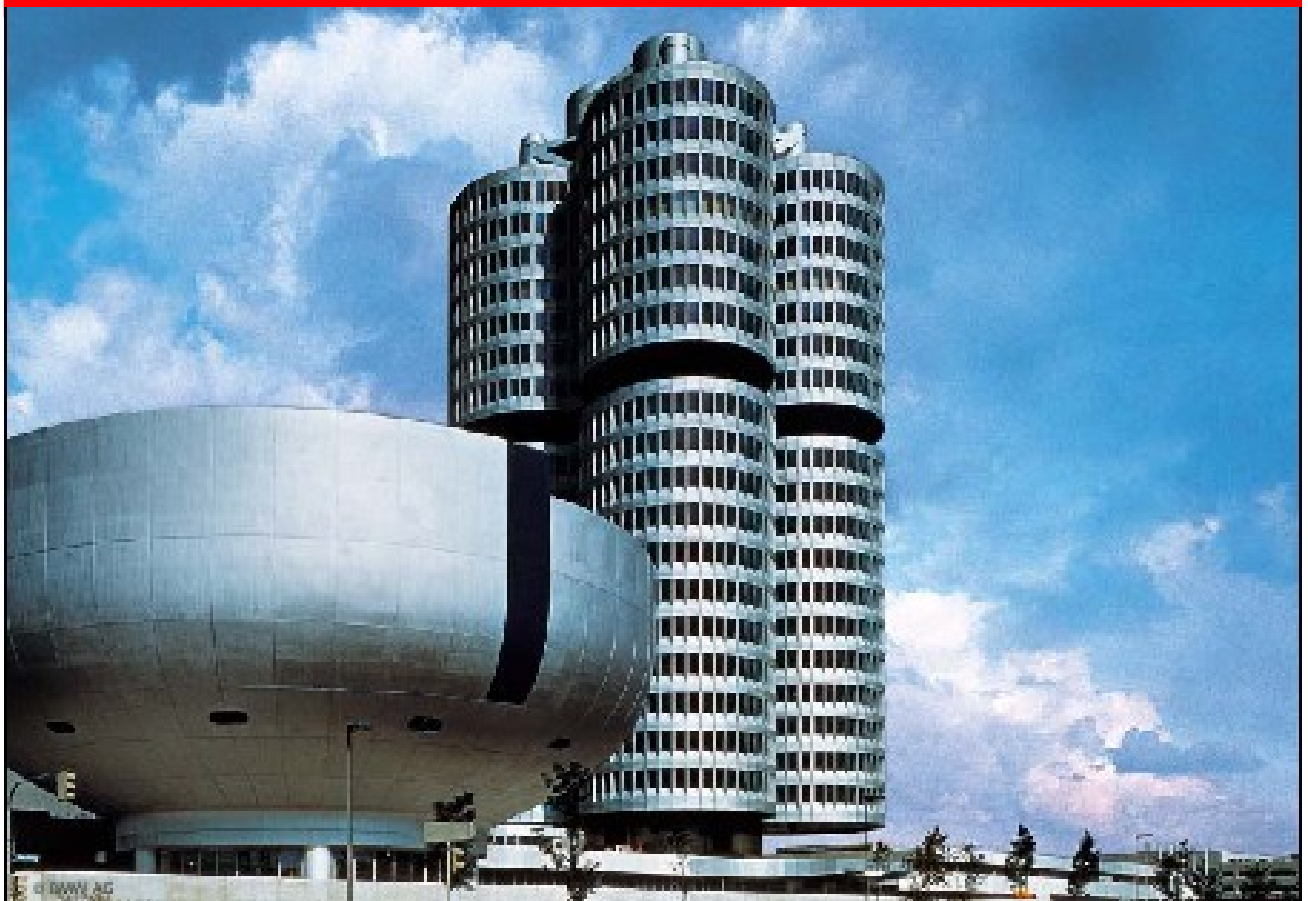


Successful tuning lasts from program development to the End-to-End Performance.

User Report



Reduction goals are quickly reached and proven with an extensive strategy.

As this user report by the BMW Group points out, systematic Performance Management and the corresponding tuning actions clearly reduce the required capacity on the host computer, which also prevents costly hardware upgrades.

The BMW Group and TRILOGexpert – A partnership-based cooperation for success

Since TRILOGexpert was founded, the BMW Group has worked closely with it in the areas of performance management and host tuning. In the course of 2002, structures were made on the part of the BMW Group through the foundation of its Host Tuning Center, a part in which TRILOGexpert specialists are engaged, in order to do systematic performance management on the host and clarify tuning successes. As a visible success of this cooperation, savings were realized through the middle of 2003 in the range of approx. 5% of the total computer capacity needed on the host. As proof, a hardware upgrade of the total host environment was prevented.

The path to Performance Management.

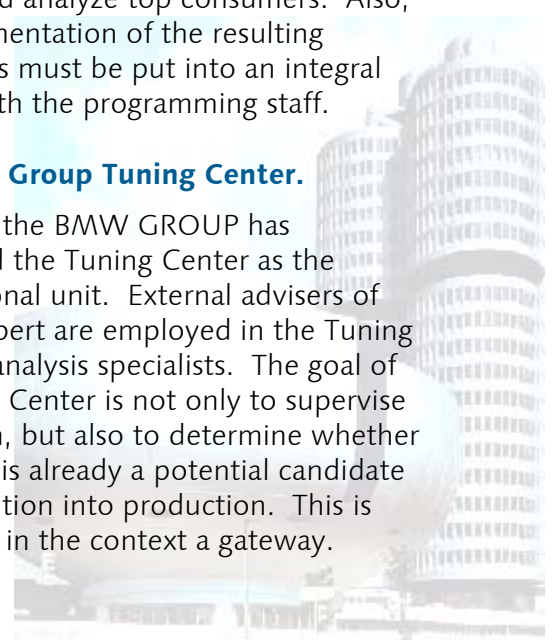
Performance Management frequently starts using a fire fighting phase. The available computer capacity no longer suffices. As an alternative to a computer upgrade (whose costs – especially software life cycle costs – rise quickly into seven digit heights depending on the computer size), an evaluation is set up with the goal to find and optimize top consumers. Experience points out that as a rule high potential can be found and realized in the context of an IPA (Initial Performance Analysis). In this phase of performance management, preferential project control is worked. The ideal team consists of internal system specialists and external advisers that have a vastly accumulated experience regarding the execution of such an analysis.

IPA successes must be observed in the production weekday.

In order not to lose the achieved successes immediately after the (often) successful project completion, a corresponding organization structure must be created within the company. New processes must be defined and supporting tools introduced. Now the goal is to permanently examine the production based on increasing consumption and to identify and analyze top consumers. Also, the implementation of the resulting suggestions must be put into an integral process with the programming staff.

The BMW Group Tuning Center.

Therefore, the BMW GROUP has established the Tuning Center as the organizational unit. External advisers of TRILOGexpert are employed in the Tuning Center as analysis specialists. The goal of the Tuning Center is not only to supervise production, but also to determine whether a program is already a potential candidate at its transition into production. This is performed in the context a gateway.



Successes must be measurable: The efficiency of tuning actions can be calculated.

When is Performance Management worth-while?

The investments that are necessary for performance management aren't low. Acquisition and maintenance costs for supporting software, as well as staff and 3rd party service costs, are the main items. Economically, Performance Management makes sense only if the costs saved by tuning are higher than the expenditure outlined above.

Consumption must be documented exactly.

The possibilities to prove an economic success are certainly different from company to company. Fixed billing costs or operating costs that are determined by a benchmark are only two of many possibilities. However, one is a prerequisite for all methods: all achieved successes must be documented. For each case, the easiest method is to record the computer consumption before and after the implementation of the suggested tuning actions and document the details regarding the call frequency of the programs.

Decision basis against expensive hardware upgrade of the complete host environment.

Most spectacular is when it can be proven by means of the documented data that an upgrade was prevented. This was the case at the BMW Group in the summer of 2003.

Figure 1 shows the average daily utilization of the host in the time period from 1.July 2003 to 14.July 2003.

In the time period between 08:00 and 16:00, two of the four computers were utilized more than 95%. From the documentation of the tuning cases, it can be calculated that during the time frame of the observed peak load more than 5% of the total computer capacity was reduced.

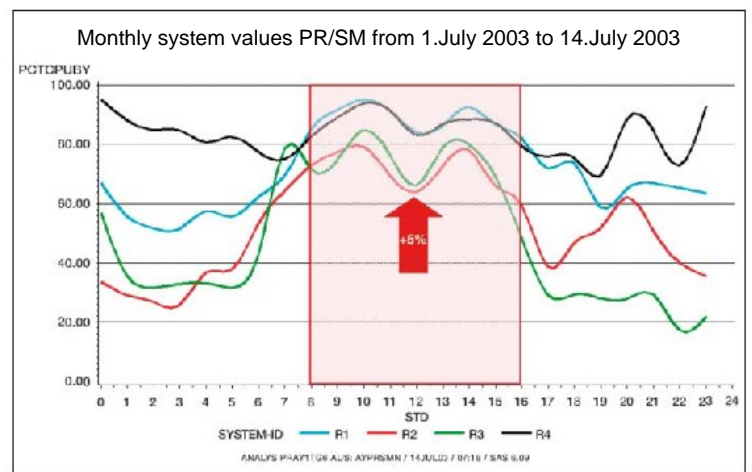


Fig. 1: Original Utilization Curve of the BMW Computer

Figure 2 shows that without tuning 100% utilization would be reached at times and a hardware upgrade would be inevitable.

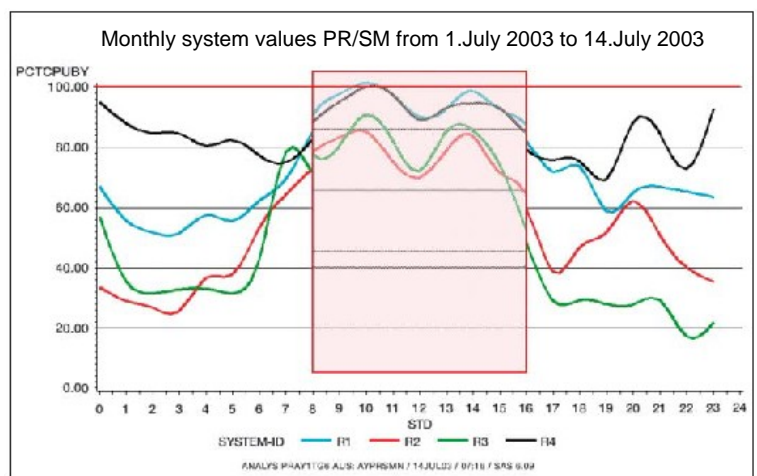


Fig. 2: Potential Computer Utilization without Tuning Actions

Future visions: Innovative measuring concepts that start before programs are released to production and continue throughout their complete life cycle.

The Performance Gateway: Seeing performance bottlenecks before they appear.

A goal of Performance Management must be to identify non-performing programs before they are introduced into production, rather than after. Such problems could certainly be identified by means of appropriate tests. However, the effort to construct such tests and to make the appropriate test environments is very high. The BMW Group has therefore chosen another approach.

Together with TRILOGexpert, rules have been established on which a program is checked during the production transition. For example, SQL statements are examined for the use of subselects. For all rules that currently exist, success stories can be derived from the examinations and documentation of the last two years. All rules are therefore based on empirical experiences. Using a prototype realized by TRILOGexpert and in the context of a joint project, the existing sources at the BMW Group are examined for violations of the defined rules. The BMW Tuning Center analyzes the recognized spots in order to check the correctness of the rules. With corresponding success, the method should be tied into the production hand over process so that performance measurements are automatically kicked off by appropriate violations during the first production run.

An important prerequisite with the implementation of a gateway is the possibility to completely automate the process. For that purpose it is necessary that the used tools can communicate with

each other. Due to using APC as a control tool for the use of the real measurement tool STROBE at the BMW Group APC has to be extended in its functionality such that APC can be triggered over an API to start measurements.

Performance Management and End-to-End measurements

End-to-End measurements turn out to be more and more an important part of the Performance Management. The cooperation encouraged by the BMW Group between TRILOGexpert and Geyer & Weinig, the producer of the End-to-End monitoring tool INFRA-XS, opens up completely new aspects. APC Enterprise and INFRA-XS make data of identical objects (e.g. transactions) available for each other. Via the interaction of those tools the way from the monitoring tool to the detailed analysis can be shown first time.

The End-to-End transactions measured in INFRA-XS refer over the transaction ID to the resource consumption from the mainframe gathered in APC Enterprise. The measurement results recorded in APC Enterprise are assigned to the End-to-End transactions in INFRA-XS. All information are available in the intranet. Thus there is a transparency of 100% for reporting and analysis. It is planned that the measurement tool STROBE can be activated automatically.

With continuity in a new dimension of tuning

The BMW Group has established performance management as a continuous internal activity in the company and created its own organizational unit to do this – the BMW Tuning Center. Based on this, project successes are permanently kept, also in the daily production. Tuning provides a cost reducing optimization of the host utilization. Costly hardware upgrades are avoided. The economic advantages are verified with exactly documented consumption measurements before and after the tuning actions.

Beyond this, the BMW Tuning Center develops strategies with TRILOGexpert in order to recognize potential performance bottlenecks before the production hand over of a program. Another joint project is the optimization of end-to-end measurements on the basis of a continuous concept that performs end-to-end monitoring and a detailed analysis.

The BMW Group.

With over 100,000 employees and an annual turnover of 42.3 billion Euro, the BMW Group is one of the ten largest automobile manufacturers in the world*. BMW common shares have been listed on the stock exchange since 1926. Operating only as an automobile enterprise, the BMW Group is exclusively working in the premium segment of the automobile market and currently has more than 22 production and assembly locations in 14 countries. Through a wide-branched sales network, the company is represented in over 120 countries on all five continents. Legendary records, championships, and numerous successes in international motor sports underline the technology and innovative leadership of the company since 1919.

*as of 31.December 2002

