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REVIEW ARTICLE

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TUNING OF PRODUCTION SYSTEMS

ABSTRACT

Tuning can often be used to achieve substantial performance improvements. However, tuning is often conducted in a reactive, crisis-driven "fire fighting" mode that mostly considers individual infrastructure elements. Mercury interactive has developed a tuning approach that is proactive and goes beyond infrastructure elements to also include application and end-user views of performance.

INTRODUCTION

Tuning may be defined as the process of optimizing IT hardware and software configurations to deliver maximum performance and availability, without adding to the underlying hardware. The key benefit of tuning is realizing improved operational performance and efficiency on existing systems, without increasing basic hardware or deployment costs. Some of the major benefits of tuning include.

- Maximizing usefulness of deployed hardware and software
- Optimizing production systems, without increased IT spending
- Prevention slowdowns and downtime episodes
- Minimizing the total cost

Indeed, tuning can even help reduce IT costs by identifying excess or redundant hardware capacity for possible redeployment, thereby delaying or preventing the need for upgrades.

Common Tuning Practices: Reactive Fire Fighting

All to often, tuning is performed only when a major "performance crisis" occurs in a production IT system, typically during times of peak load. Under these circumstances, tuning is driven by an urgent need to fix the immediate performance or availability problem, often an unanticipated one. Here, the difficulties of identifying the problem, locating the source, and devising a tuning fix are compounded by the pressures of failing to meet immediate production requirements, which often include penalties for not achieving promised service levels. Such crisis-driven tuning or fire fighting is a reactive hit-or-miss approach to problem solving, which does little in the way of anticipating performance or availability problems or finding and fixing potential bottlenecks in advance of actual peak production loads.

Holistic Tuning: Infrastructure, Application, and End-User Views

Traditionally, tuning tended to concentrate on individual infrastructure elements such as network components, applications servers, or databases, often as seen from the "silo" perspective of a domain expert. While this can result in well-tuned infrastructure components, it is important to also tune the applications supported by the infrastructure, so that overall service objectives can be met. As part of applications tuning, it is necessary that tuning take into account performance requirements as seen from the end-user perspective, such as response times, transaction volumes, and peak user loads, especially for Web-enabled applications. Therefore, a comprehensive tuning approach must take into account infrastructure and applications, and it must also address performance form the end-user perspective.

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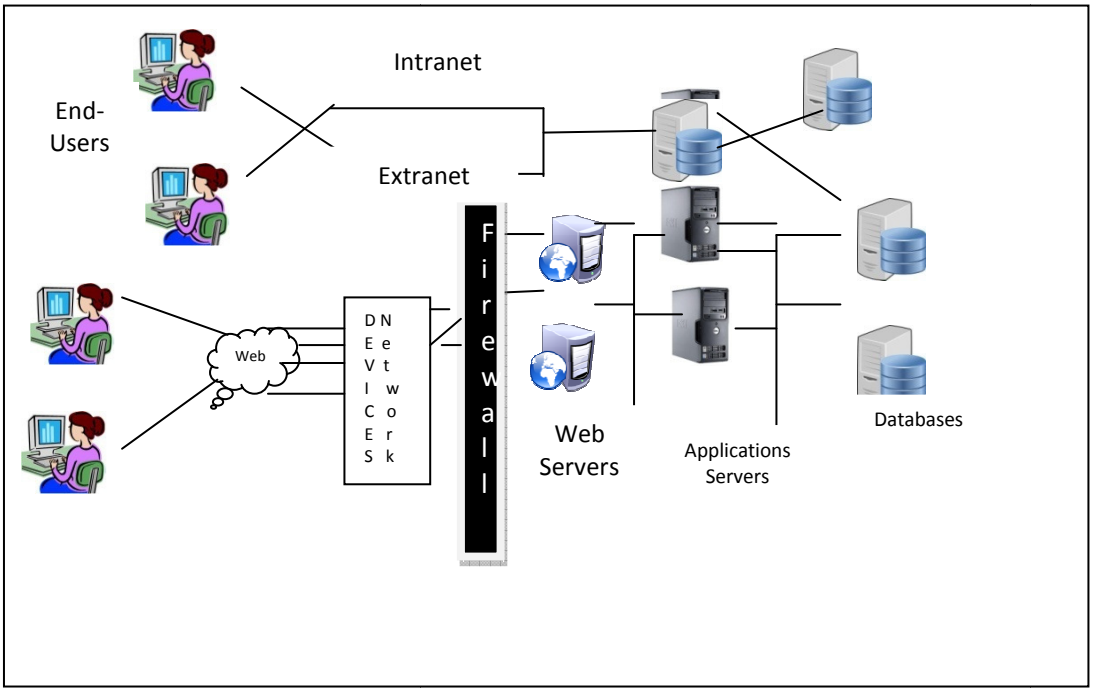
Tuning Objective : Finding and Fixing Performance Bottlenecks

Tuning means finding and relieving bottleneck conditions that causes performance or availability problems. A bottleneck may be defined as any hardware or software component that significantly slows down or impedes the progress of a transaction. Bottlenecks can occur during peak production periods due to such factors as heavily used hardware devices (e.g., high server or network utilizations), inefficient software (e.g., poor database indexing or searching techniques), or logical ceilings and limitations (e.g., maximum number of licensed users, maximum number of server connections). Symptoms of bottlenecks can include slow response times for end users, applications pauses or freezes, or even inability to log on or get access to applications.

Tuning Applications in Production

Production tuning becomes important to IT when an applications is deployed in the operational environment. Even if an application has already been tested and tuned in preproduction environments, such as development, the QA lab, and staging production can introduce many additional factors once the applications is deployed in "live" operational conditions. Often, production brings both scaled-up workload demands as well as new sources of potential bottlenecks.

Production tuning is a dynamic process that must take into account significant changes in the applications or the environment on an ongoing basis. Events, such as mergers and acquisitions, server consolidations, and major changes in applications or databases, can create new performance bottlenecks that require tuning to help resolve. In essence, production tuning concentrates on optimizing specific applications running in production environments with production workloads – tuning the applications as deployed in the actual infrastructure configurations supported by IT operations. The complexity of this environment is illustrated in Figure 1.



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Tuning the Application and the Extended Infrastructure

Preproduction tuning tends to focus on optimizing the major components directly used by an application, such as applications servers and databases. However, once an application has been deployed in the complex distributed, network, and Web-based environments that underlie today's production systems, tuning must take on a much more holistic approach.

Production tuning extends to the It infrastructure that supports user access and usage of the application, including such components as web clients, networks, firewalls, Web servers, load balancers, and server farms. Indeed, one of the principal challengers of managing Web-based systems in monitoring and tuning from the end-user perspective, so that transactions that originate from browser-based client and traverse many different infrastructure components can be optimized to meet required service-level objectives.

An Approach to Production Tuning

Mercury Interactive has developed a standard methodology and approach for tuning production systems called "tuning in" production, which is based on Mercury's Active Tune service and on experiences gained form literally thousands of tuning engagements. The methodology used for production tuning is based on running script-based test transactions in production environments to exercise key application functions. Measurements of transaction behavior are obtained from monitoring software and are compared to performance objectives, such as required transaction throughput volumes or end-user response time values.

Production tuning starts with establishing baseline performance. Tuning sessions are conducted in which predefined scripts are run at the same time as normal production workloads. If performance is out of compliance with required objectives, the tuning process drills down to address problems at the infrastructure component level.

Mercury's tuning approach drills down to three key areas:

- Tuning the network and Internet infrastructure
- Tuning the application software and infrastructure
- Tuning the security software and infrastructure

Tuning is basically an iterative process in which test transactions are run, performance is evaluated, tuning changes are made, and tests are run again in the tuned environment to determine whether required performance objectives have been met. The overall Mercury production tuning process is illustrated in Figure 2.

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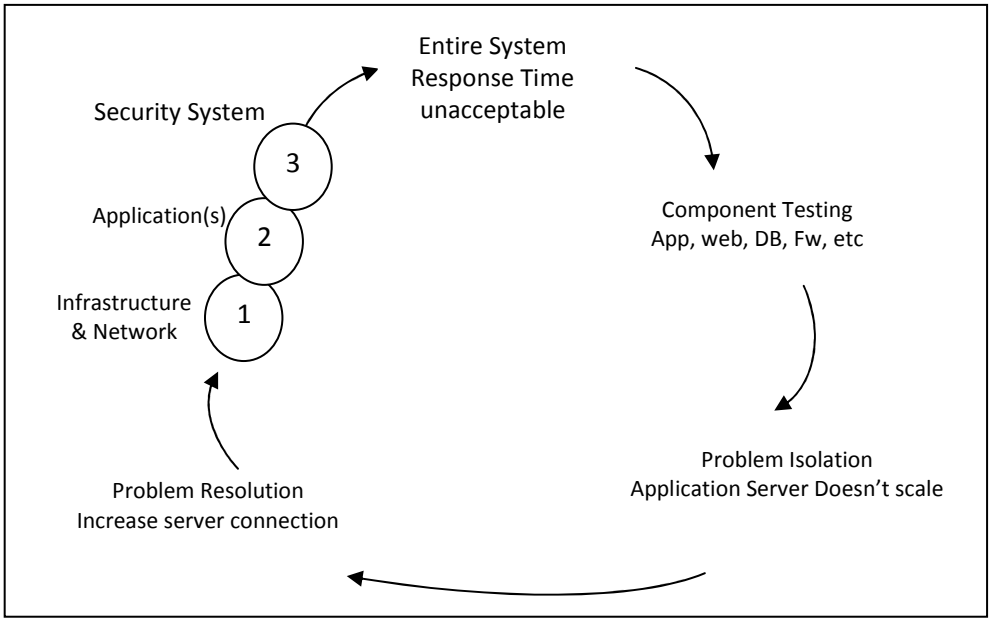

Tuning Specific Infrastructure Component "Tiers"

The use of scripted test transactions and performance monitoring in "live" production environments is the basic method for discovering whether – and where- significant bottlenecks exist. The key to resolving and fixing bottlenecks through tuning often depends heavily on knowledge and procedures that are specific to individual infrastructure " Tiers" such as network components, applications servers, or databases. As illustrated in Figure 3. Mercury Interactive production tuning approach encompasses the use of tier-specific transactions and monitoring, plus "best practices" tuning procedures for individual tiers.

Summary and Conclusion

Tuning is an activity that can reap substantial improvements in performance without increasing basic infrastructure costs – even helping to reduce costs in cases where hardware upgrades can be avoided or existing capacity can be redeployed. Clearly, tuning addresses some of the major business concerns in times of constrained IT budgets, such as reducing TCO and improving ROI.

Tuning in distributed and Web-Based environments-as well as for major applications such as enterprise resource planning (ERP) and customer relationship management (CRM) – is a complex undertaking, as performance optimization is required for multiple views of the extended environment, including infrastructure components, applications, and " end-to-end" transactions. Mercury Interactive has demonstrated an effective tuning methodology through are Active Tune service. By incorporating this strategy into the Pro Tune product, Mercury Interactive is extending the ability to conduct proactive tuning into the domain of IT operations Staff.

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