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Executive overview

IT applications are fundamental to successful client relationships. For that reason, they must run optimally and consistently. That’s why HP introduces a new strategy, business technology optimization (BTO), which improves IT service delivery and management lifecycle. BTO puts into place and leverages the proper resources to increase the value of your business.

HP Performance Center suite is a set of BTO applications and services that helps IT manage and optimize the performance of delivered applications.

HP deploys HP Performance Center by drawing on and applying extensive best practices: in-depth knowledge, experience and expertise to facilitate dramatic improvement of critical application performance for your organization.

HP best practices form the core of all HP Performance Center implementations. These best practices cover all aspects of HP Performance Center deployment, including product installation and operation, organizational design, process implementation, continual process improvement and measurement of return on investment (ROI). HP knows that applying lessons learned means that you shorten time to value, reduce the total cost of achieving that value and lower your risk during the period of change.

HP Services for Products, People and Processes is the model by which HP Performance Center is most successfully introduced into an organization. By concentrating on these three most-vital assets, you begin building an optimized IT organization that leverages state-of-the-art testing products and a skilled and experienced team. HP has proven methods for achieving quick and significant improvement in IT processes and application performance.

HP Services for Products, People and Processes is applied throughout the HP Services Methodology, a phased approach by which HP Performance Center is integrated into your organization. The HP Services Methodology encompasses a clear series of iterative steps that guide you in applying HP best practices. This takes you toward self-sufficiency in your management and optimization processes.

This white paper introduces HP Performance Center best practices as delivered through the HP Performance Center Implementation Service. These help to make certain that HP Performance Center implementation drives continual value for your organization.

Why best practices?

The benefits of even the most advanced performance testing automation and management system can be lost when it is not implemented properly, the organization’s testing personnel lack proper knowledge or when appropriate processes are not implemented. But unrealized benefits are only a fraction of the losses that inevitably result from inefficient system capacity, inferior user experience and increased infrastructure cost due to ineffective performance validation and optimization.

The wealth of skill and proficiency documented in HP Performance Center best practices reflects the depth of know-how that increases the benefits of application performance testing and management processes.

Employing HP Performance Center best practices allows you to achieve the benefits of HP Performance Center through a smooth implementation:

- Faster time to achieve value
- Lower risk of implementation failure
- Reduced total cost of ownership for the entire project
These best practices are neither theoretical nor abstract, but real-world knowledge that has emerged from HP experts and HP customers, creating novel solutions to emergent problems and challenging service delivery issues. Throughout HP Performance Center implementation, HP applies these best practices to your specific situation, creating world-class processes for you that drive long-term success.

HP Services for Products, People and Processes

Achieving continuous, long-term improvement in application performance takes more than just state-of-the-art technology. Simply installing even the best technology will provide little benefit. Your teams must be able to make the best use of the products and your existing processes must be updated to include their use.

It is critical that best practices cover each of these three aspects. HP uses a three-fold approach called HP Services for Products, People and Processes. HP best practices address each of the following areas.

Products

HP installs the appropriate HP Performance Center components, configures these in an optimal way for your situation and integrates these into your existing hardware and software infrastructure. The HP team verifies that the entire HP Performance Center test environment, including core systems, load generators and application server, is properly installed and configured on adequate hardware. It is integrated into your IT environment, with special considerations for network, security and other systems.

People

HP starts by training your team in the effective use of the products. Following the standard classroom training, we mentor your team through their first projects. This is where they apply what they have learned in the classroom and gain real-world experience. Additionally, the different team members become familiar with the interfaces between each group and learn how to rely on each other appropriately. HP also helps you design an optimal organizational structure for the operation of HP Performance Center.

Processes

Performance validation and optimization, as well as the operation of an enterprise-wide HP Performance Center, present a variety of challenges that call for specialized experience and expertise. HP applies its best practices—created over years of successful customer engagements—to your specific situation, and creates repeatable processes that you can use to operate HP Performance Center and validate and optimize performance across your application portfolio. Additionally, the new HP Performance Center processes are fully integrated with your other IT processes.

In summary, HP Services for Products, People and Processes addresses the three fundamental elements—HP products, your people and your processes—that you need to optimize to enable your success in improving your organization’s application performance.

HP Services Methodology

HP Services Methodology is a proven approach to achieving improved application performance across the entire organization. Using HP Services Methodology, documented improvements range up to 400 percent.
increase in overall system capacity without additional investments into hardware and software infrastructure. The methodology has five defining characteristics:

- **Concentrate on all aspects required to successfully instill change in your organization**: technology introduction, people enablement and process change. This three-part focus—known as Products, People and Processes—is the basis for all HP Performance Center services.

- **Determine that the approach is practical**: Start with an achievable objective and build based on the success of that project. In practice, this means that HP Performance Center deployments typically start small and then build toward complete implementation across the organization when the organization is fully ready. This phased approach also leads to flexibility, enabling HP to help you implement different processes as required.

- **Drive to value as quickly as possible**: In nearly all cases, HP implements a pilot project as part of the implementation. In the case of HP Performance Center, this means that one of your most important applications is tested and optimized with the help of HP experts. In this way, you learn how to effectively use HP Performance Center from an operations standpoint while you deliver improved performance to your organization.

- **Follow specific steps based on best practices**: There are literally thousands of successful implementations of HP products. Based on these successes, widespread industry expertise and internal use of the products, HP has created an extensive set of best practices for the successful deployment and use of HP Performance Center. These best practices are put into action as HP consultants follow a detailed roadmap to complete your deployment.

- **Enable your self-sufficiency**: One of the primary goals of HP Services Methodology is to transfer expertise to you as quickly as possible, so you can get the most value from your investment in HP products. In addition to using a project-based approach with side-by-side mentoring, HP consultants apply best practices and create processes that are customized to your organization, so your team can achieve your desired business objectives using HP Performance Center.

**Implementation phases**

Implementation of HP Performance Center in your organization is directly guided by HP Services Methodology. The implementation process itself is comprised of distinct and iterative phases that take the project from conception to completion in incremental steps. This achieves not only a finely tuned and customized performance-testing platform and processes based on your organization's specific needs, but also leads you to achieving hands-on proficiency while under the guidance of the on-site HP consulting team.

**Assess**

The purpose of the initial phase of the HP Performance Center implementation is to determine the high-level architecture and the implementation approach. To start deploying HP Performance Center in the context of an actual testing project, HP consultants assess the relevant strategic, functional and technical aspects of your organization, meet with the right team of business and technical stakeholders to identify existing pain points and assess the current state of your organization’s testing environment. Your highest-priority testing project is then identified and selected as the pilot for the implementation process, providing you with immediate value.
Scope
Drawing on the information gathered in the assess stage, the HP team works with you to formulate a comprehensive solution roadmap specifying the major parameters, overall strategy and detailed process flow of the implementation. This includes a decision to implement HP Performance Center in-house or through HP Managed Software Solutions. Resource planning and optimal capacity recommendations are aligned with your expected required testing capacity and high-level business objectives are identified that will define the project’s success. This phase results in a proposal detailing the optimal HP solution and a written statement of work (SOW).

Design
The next phase begins with a series of discovery meetings to confirm assessment findings and conduct a more in-depth analysis of your existing organization, infrastructure and application environment. This includes system architecture, infrastructure, data flows, main users, machine accessibility, physical layout, enterprise network, maintenance procedures, your processes and workflows, security requirements, and so forth. With this information combined to form the requirements specification document, the HP team works to design your enterprise deployment with a project strategy and risk management strategy that:
• Define the general framework for the project
• Determine the optimal sizing of the HP Performance Center environment and technical specifications for deployment
• Specify required processes modifications
• Specify knowledge transfer (training and mentoring) plans
• Fulfill quality, resource and timeline requirements

Implement
The approved plans from the preceding phases become reality as HP implements the selected project. This phase starts with the installation of the product suite in your testing environment, including validating the hardware and software environment, installing the appropriate products and validating the installation.

Once the HP Performance Center environment has been installed and configured, and the classroom training completed, the pilot project begins with the specification of well-defined, measurable performance requirements that fulfill the high-level business objectives. These performance requirements will determine the success or failure of the project in meeting the objectives.

The next step is to identify which components to monitor based on the performance requirements that apply to the system being tested. Below is an example of monitoring metrics:

To form the basis for an automated script, use cases are established and documented appropriately. HP then helps you formulate the requirements document and project plan, detailing aspects such as the number of projected users, the project test environment, test data, hardware and software.

In the next step, performance validation is conducted on the system. Depending on your specific situation and business needs, HP may recommend running some or all of the different test types. The results are then recorded and analyzed.

• Load tests are end-to-end performance tests that emulate the anticipated product environment and situation.
• Failover tests demonstrate what happens when a primary system fails under load.
Durability tests validate system performance under heavy load for an extended period of time.

Stress tests determine the maximum capacity of the system by increasing load until the system fails.

Infrastructure tests isolate different components in the infrastructure tier to identify bottlenecks.

Performance tests determine end-to-end timing for the system under low load with a production-size database; this helps set the “best case” for end-user timing.

At appropriate points throughout the validation process (or once the validation process has been completed), the tuning process can begin to verify that your application fits the production environment in the optimal way. Choose the tier to tune (infrastructure, database, application, J2EE layer), then define the specific purpose of the tuning run and establish the threshold for the specific metric you are evaluating. Develop the tests for the tier, and use the guidelines available for your organization.

Each tuning run should be highly collaborative among the tuning experts, the application experts and the environment experts. Implement the appropriate alerts and then run the load test. Use your analysis of the results to determine the likely candidate for the load bottleneck and then recommend the appropriate change. If possible, implement the change and rerun the test. Once you have completed tuning a tier, move to the next tier until all are completed. This iterative process of test execution, analysis, recommending changes and re-scripting is the center of the performance tuning process.

In parallel with performance validation and optimization for a pilot project, the HP team documents all processes, changes in performance and new methods used. This helps in creating the best practices specific to your organization, augmenting the HP best practices that are part of the knowledge transfer method that also includes training and mentoring. These are the best practices that your team will use in future projects to validate and optimize your application performance. In subsequent projects, review and update the processes as appropriate.

In addition to testing activity, it is critical to determine that the HP Performance Center administrator properly maintains users and projects, applies software maintenance and upgrades HP Performance Center as soon as is practical when new releases become available.

Validate

Once implementation is complete, the principal stakeholders and the HP team conduct a retrospective to review the execution of the implementation and evaluate the HP Performance Center infrastructure and the pilot testing process. Successful completion of deployment is validated against the validation checklist. After confirming that best practices were followed and compliance to the implementation framework was maintained, the technical outcomes of the implementation, including quantified system capacity and performance improvements, are documented. The project final report contains technical results, estimates of achieved value realization and implementation documentation. It is accompanied by an executive summary report detailing key performance indicators (KPIs) and recommendations for future improvements. The process continues by identifying the next major phase in your HP Performance Center of Excellence evolution.
Realize

The realize phase is performed throughout the implementation. As stated above, each of the five phases has its specific set of indicators and goals against which to monitor progress. It is vital to check KPIs throughout the deployment to monitor the achievement of implementation objectives, business performance and operational effectiveness. Tangible value realization is demonstrated in the context of the specific phase by refining and redefining these KPIs to reflect increasingly higher levels of performance improvements as the project progresses. In the context of the implementation as a whole, value is realized by applying best practices to increase the benefits of the deployment.

HP Performance Center

best practices overview

This section lists some of the areas of best practices that are covered in the HP Performance Center Implementation Service. Areas listed in bold are detailed in the following section.

• Building and maintaining the HP Performance Center hardware and software environment:
  – Sizing
    ○ Number of servers
    ○ Number of hosts
    ○ Servers HW configuration—CPU, RAM, disk space
    ○ Hosts HW configuration—CPU, RAM, disk space
    ○ Number and location of users
  – High availability
    ○ Staging/testing areas
    ○ Monitoring and alerting
  – Disaster recovery
  – SLAs
  – Administrative team
  – Administration
    ○ Performing maintenance
    ○ Managing data
    ○ Managing users and roles
    ○ Managing projects
    ○ Upgrading to new versions
• Organizing and training the HP Performance Center team:
  – Roles
  – Skill sets and prerequisites
  – Knowledge transfer
• Integrating performance optimization with other IT processes:
  – Change management
  – Test management
  – Release management
  – Availability management
  – Resolution management (problem management)
• Validating project performance:
  – Organizing performance projects in HP Performance Center
    ○ Creating new projects
    ○ Resource allocation
    ○ Project team
    ○ Maintaining project materials
  – Determining project performance requirements
    ○ High-level business requirements
    ○ Next-level business requirements
Technical requirements
- Load testing objectives
- Measurable performance requirements
- Preparing the test environment for each project
  - Identifying/populating data
  - Setting monitors
  - Enlisting subject matter experts
- Creating scripts and scenarios
  - Selecting and creating use cases
  - Identifying data
  - Scripting tips and tricks
  - Identifying load patterns
  - Creating scenarios
- Executing scenarios and analyze results
  - Preparing test environment
  - Lining-up subject matter experts
  - Reading and interpreting the results data
  - Preparing reports
• Optimizing project performance:
  - Baselining
  - Choosing appropriate subject matter experts
  - Optimizing the infrastructure tier
  - Optimizing the database tier
  - Optimizing the J2EE infrastructure
  - Identifying specific problem indicators
  - Validating fixes

HP Performance Center best practices examples

This section describes a limited number of examples of the best practices that are utilized in the HP Performance Center Implementation Service. This white paper is not intended to constitute a summary of the complete best practices; therefore, only a few of the best practices are shown. The examples in this section include:
• Managing data
• Roles
• Skill sets and prerequisites
• Optimizing the infrastructure tier

Managing data
HP Performance Center has a repository of all account information, test run histories and test results. It is important to be able to retrieve historical information to compare current conditions, rerun tests or for accounting purposes. The retention period is a matter of formal obligation to the project team and their expectations, but is typically at least as long as a “normal” release cycle for the application under test. The repository includes data in the HP Performance Center database and file server. It is highly recommended to back up this data in case of human error or a technical failure that might cause some or all of the data to be lost. Following is a short description of suggested steps to enable a reliable backup process.

The data
There are four types of project data:
• Account and management—including test run history—reside in the database.
• Load test definitions, monitor profiles and all other load testing “assets,”—other than those listed below—reside in the database.
• Virtual user scripts reside on the file server.
• Test run results reside on the file server.

All test results appear on the file system as soon as the run is collated. The rawresults.zip file is sufficient to reconstruct the test runs and their results. All project data is saved in the file system under directories numbered by project ID.

The backup
The backup procedure is comprised of two steps:
1. Perform a full backup of all accounts.
   • Each project directory should be archived with a full-directory structure. All archive files should be transferred to the backup file system under the designated directory. This is a “vertical” backup, as each account is saved separately.
   • Available archiving software can be used to compress and preserve the directory structure of the file system.
2. Schedule daily backups. These include an incremental backup of the file system and a full backup of the database.
   • Using RDBMS management tools, set up a daily full backup to a directory on the file system.
   • A daily incremental archive file should be created to include all modifications to the entire file system in the previous 24 hours. This is a “horizontal” backup, as it includes data from multiple accounts. This file is transferred to the backup file system under the designated directory.
   • If multiple HP Performance Center farms are available, it is possible to use each file system as the backup of the other. Alternatively, a backup file server can be used.
To reduce the amount of backup data, it is recommended to purge inactive accounts.

Set up monitors to validate that the daily database backup is executed and that the daily scheduled backup process is completed.

Roles

The following roles should be defined and staffed for a successful HP Performance Center deployment.

It is critical to fully staff the HP Performance Center administrator and the performance tools champion roles.

You should have one HP Performance Center administrator. Also, one performance engineer usually works full time on a validation and optimization project for approximately five weeks. You should have one performance engineer per every 20 projects you do annually. It is possible that the performance engineer fulfills the performance-tools champion role; in that case, the performance-tools-champion role takes approximately 25 percent of a full-time equivalent.

Skill sets and prerequisites

**HP Performance Center administrator**
- Very good knowledge of existing system infrastructure
- Very good problem-solving skills
- Very good communication skills, especially with technical personnel
- Good understanding of the general load testing process

**Performance testing project manager**
- Good understanding of the load testing process
- Very good familiarity with HP LoadRunner software and HP Performance Center
- Good programming skills (C, shell scripts)
- Good knowledge of Java™ or VB script (required for testing specific application protocols)
- Good knowledge of system infrastructure
- Very good problem-solving skills
- Excellent communication skills, with both technical and non-technical personnel

**Performance engineer**
- Excellent understanding of load testing process
- Excellent knowledge of HP LoadRunner
- Very good knowledge of Java or VB script (required for testing specific application protocols)
- Good understanding of existing system infrastructure

**Performance-tools champion**
- Good understanding of the load testing process
- Very good familiarity with HP LoadRunner software and HP Performance Center
- Good programming skills (C, shell scripts)
- Good knowledge of Java™ or VB script (required for testing specific application protocols)
- Good knowledge of system infrastructure
- Very good problem-solving skills
- Very good communication skills

**Performance testing project manager**
- Very good project management skills
- Very good business analysis skills
- Good understanding of load testing process
- Good basic technical skills
- Good problem-solving skills
- Very good communication skills

**Performance engineer**
- Excellent understanding of load testing process
- Excellent knowledge of HP LoadRunner
- Very good knowledge of Java or VB script (required for testing specific application protocols)
- Good understanding of existing system infrastructure

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**Table: Roles of select HP Performance Center personnel**

<table>
<thead>
<tr>
<th>Roles for administration</th>
<th>Roles for performance team</th>
<th>Other team collaborators</th>
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<tbody>
<tr>
<td><strong>HP Performance Center Administrator</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Installs HP Performance Center components</td>
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<tr>
<td>• Creates users</td>
<td></td>
<td></td>
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<tr>
<td>• Creates projects</td>
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<td></td>
</tr>
<tr>
<td>• Manages HP Performance Center availability</td>
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<tr>
<td><strong>HP Performance Center Project Manager</strong></td>
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<td></td>
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<tr>
<td>• Queries test runs</td>
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<tr>
<td>• Validates results</td>
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<td></td>
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<tr>
<td>• Manages schedule conflicts</td>
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<tr>
<td><strong>Performance Engineer</strong></td>
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<tr>
<td>• Generates scripts</td>
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<td></td>
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<tr>
<td>• Schedules load tests</td>
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<tr>
<td>• Runs load tests</td>
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<tr>
<td><strong>Performance Tools Champion</strong></td>
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<td></td>
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<tr>
<td>• HP Performance Center usage assistance</td>
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</tr>
<tr>
<td>• Enhances/disseminates best practices</td>
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<thead>
<tr>
<th>Server Administrator</th>
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<tbody>
<tr>
<td>Network/Security Administrator</td>
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<tr>
<td>• Resolves hardware and software issues</td>
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<tr>
<td>Executive Sponsor (VP Quality, VP Applications, etc.)</td>
</tr>
<tr>
<td>• Resolves business issues</td>
</tr>
<tr>
<td>Business Process Expert</td>
</tr>
<tr>
<td>• Provides expertise for application under test</td>
</tr>
</tbody>
</table>
Optimizing the infrastructure tier

During the infrastructure tuning, evaluate the following for potential bottlenecks:

- Browser
- User profiles
- Internet
- Site web pipes
- Border routers
- Load balancers
- Peripheral systems
- External systems
- Distributed hosting
- Firewalls
- IDS (intrusion detection systems)
- Security

Example of security sub-system tuning

When tuning your security sub-system, evaluate the following security issues for potential performance bottlenecks:

- Firewalls and multiple DMZs
- IDS
- Pre-load, load and post-load infrastructure scans
- DOS attack simulation
- Bandwidth saturation flood
- HTTP connection flood
- Web session flood
- 404 File Not Found flood
- Trinoo attack
- TFN UDP flood
- TFN SYN flood
- TFN ping flood
- TFN Smurf flood
- TFN Targa3 attack
- Buffer overflow attack
- ISAPI buffer overflow attack
- IP fragmentation attack
- TCP segmentation attack
- Request obfuscation
- Search engine flood
- IDS limit test

Example of database sub-system tuning

When tuning the database sub-system, evaluate the following for potential bottlenecks.

- Connection management
- Sort data
- Hash data
- I/O requests
- Indexing
- Fetch time
- Data buffering
- Disk reads/writes
- Caching
- Locking
- Timeouts
- SQL statements

Additionally, monitor and measure additional aspects that are specific to different database vendors (Microsoft®, IBM, Oracle® and Sybase) to identify and correct bottlenecks.
Conclusion

Enterprise-wide deployment of any software can be complex. While operation of HP Performance Center technology can be quite straightforward, experience and knowledge are required to efficiently tie together all of the implementation aspects in a reasonable timeframe. HP has leveraged its extensive customer base and thousands of implementations to consolidate the knowledge and expertise that will assist you in the implementation of your HP Performance Center.

HP Performance Center best practices are structured policies and procedures that guide you through the performance testing lifecycle and help you to leverage HP Performance Center. These best practices support you through an incremental and iterative implementation enabling fast results while consistently expanding the role and increasing the value of HP Performance Center within your organization.

To learn more, visit www.hp.com/go/software

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