Performance Engineering: A discipline for prevention

`Nothing creates change better than a problem`

Get behind the front lines of your web and mobile applications performance to discover actionable change early before it’s too late!
Introduction

The performance engineering discipline or practice within your quality organization can make an amazing difference to improve quality, provide good customer experience, cut costs, and accelerate the delivery model. If you’re not getting actionable results that you expect from your performance testing, can’t quite get the right approach or the strategy implemented or are new to performance testing in general, you need to start doing performance engineering to enhance your performance testing teams’ value to the business.

This white paper will introduce you to the performance engineering persona and professional services that we specialize in and offer from our Enterprise Quality Assurance and Testing (EQAT) practice solutions at Ciber. Please read through this short paper to gain insight and interest in learning more about this uniquely valuable capability to enhance your project or organizational performance efforts. We hope that you will gain knowledge about the role and spark a desire to employ it with Ciber’s help within your quality and performance testing initiatives.

Be fast, good & reliable or else...

Today, web and mobile software applications are fully meshed into the fabric of our daily lives and businesses. New services, Internet of Things (IoT), constantly expanding portfolio of smartphones and tablets, cloud computing, new high-speed 5G mobile networks, and today’s demanding users and their high expectations are all conduits connected to the significance of the performance of software applications.

The new Users

Bots are poised to disrupt the enterprise, are your systems ready for them?

The new types of users or clients have made it into the spectrum of business application usage - “the bots” which require the applications and systems that they operate against to perform fast and reliable.

Advances in AI implementations, digital assistants, speech recognition, chatbots, machine learning (ML) technologies, advanced cognitive automation such as robotic process automation (RPA) for streamlining business tasks and processes are generating new demands well beyond people that require your software applications and systems to be highly performant, reliable, available and efficient now more than ever.

The winding road to fast, good and reliable

The performance of systems and software is a function of many things such as code, networks, hardware, configuration, memory, CPU speed, storage capacity, databases, cloud services, and client-side computing. It is almost impossible to predict exactly where a performance contention or failure might occur.

- Companies with a website or mobile application that generates revenue, represents their brand, provides an important function or business service will have a vested interest in the performance of those resources, assets, and services.
• The burden today for ensuring applications are responsive, reliable, and functional often falls on the shoulders of the performance engineer. Although the primary ownership for this responsibility generally originates from within the quality assurance performance testing team, the performance engineering discipline reaches back deep into the entire product organization.

• Performance engineering embraces cultural practices and capabilities that build quality and performance throughout an organization, including non-functional requirements (NFRs), security, usability, technology platform management, devices, third-party services, cloud and more. A performance engineer not only participates in and drives these practices, but also ensures or validates the output of the practice within their role in quality assurance.

So how do you prevent performance issues without assuming too much about what lies ahead?

Performance engineering methodologies align perfectly with agile processes, taking a shift-left approach to address performance much earlier in the development process. Performance cannot be an afterthought; it needs to be at the forefront of your team’s thinking from the very beginning and throughout.

Employ Ciber’s EQAT performance engineering capabilities to guide and promote your company’s quality transition from performance testing to performance engineering.

The Performance Engineer (PE)

Performance engineers are uniquely talented specialists possessing a rare combination of skills, traits, and experience that is hard to identify, recruit, retain, classify specific job duties for, and develop. The skillset generally requires a great deal of proto-typing hands on time and lots of differing challenges and experiences. They are part software developer, part QA tester, part network engineer, part cloud architect, part system architect, and part hardware engineer. Most importantly, they are required to blend different skill sets spanning various disciplines to remain effective.

Performance engineering is a blend of science and art. Performance engineers can make crucial positive impacts on the ability of a website or mobile application to perform timely, remain responsive, perform transactions effectively, and deliver data. They can play a pivotal role in the success of software development projects when involved early in the project’s lifecycle.

A performance testers (PT) role differs from that of the PEs, so let’s distinguish the traits and attributes of the PE’s role beyond that of a PT. Performance testing tool(s) expertise is a required skillset to the performance engineering role but does not necessarily qualify a PT having just performance testing tool expertise as a “Performance Engineer”.

PE’s Qualities:

• Most of them possess curious, inquisitive and analytical qualities. They often question answers to complex challenges when the answer is not concise or self-evident. They
investigate, dig deep and apply scientific observation, rules and principles to achieve a greater understanding of a complex problem or a complete system so they can construct a factual representation.

- Typically take great **satisfaction in solving** difficult challenges. This is a core attribute as the performance engineering discipline is devoted to preventing, uncovering or solving unique and challenging problems.

- Are **technology generalists** and possess broad knowledge of infrastructures, and the numerous technologies that comprise an environment, platform, and a web app – from the application to the database, app server firewall, load balancer, and numerous other components.

- Are **experts in testing and analysis tools**. They take the time to understand use cases and scenarios so that they can properly exercise the applications and achieve a close simulation of the real-world environment. They can recommend and design tests or scenarios because they have a greater knowledge of the architectures and applications. They can determine the frequency, size, and types of tests to run.

- Examine, analyze and **explain technical results in detail**, not just reporting and graphing them. This involves collaboration, sessions and discussions across many departmental domains.

- An innovator, and can **make recommendations** supported by fact or evidence about the issues identified or engage in deeper triage, remediation and targeted testing.

**The W's of (PT) and (PE)**

**Why**
- Performance testing simulates how a system will perform under production loads and to discover issues that might arise during heavy load conditions.

- Performance engineering is driven by business requirements. The aim is to provide better business value for the organization by discovering potential issues early in the development cycle.

**What**
- Performance testing simulates production loads to detect potential performance bottlenecks.

- Engineers following performance engineering methodologies optimize the application for performance from the earliest design stages.

**When**
- Performance testing is often a distinctive QA process that occurs once a round or sprint of development is completed.

- Performance engineering is an ongoing process that occurs through all phases of the development cycle, from the design phase, development to QA.
Who

- Specialized QA teams including performance engineers design and execute performance testing.
- Performance engineering occurs throughout the development cycle, hence everyone takes part. The responsibility for performance starts with software designers and system architects, extends to developers who do the coding, and gets finalized with QA.

System Categories

To help document, understand, and optimize your performance, the PE will interrogate a broad array of the application and the systems’ components supporting it.

<table>
<thead>
<tr>
<th>Server sizing</th>
<th>Site web pipe issues</th>
<th>Web server issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Server tuning and optimization</td>
<td>Border Routers</td>
<td>Application server issues</td>
</tr>
<tr>
<td>Capacity planning &amp; Scaling</td>
<td>Load Balances</td>
<td>Database server issues</td>
</tr>
<tr>
<td>Third-party validation</td>
<td>Monitoring</td>
<td>Edge Firewalls and DMZs</td>
</tr>
<tr>
<td>Security exposures</td>
<td>Peripheral systems</td>
<td>IDS: Intrusion detection system</td>
</tr>
<tr>
<td>Infrastructure or Cloud Provider</td>
<td>External systems</td>
<td>Connection Pools</td>
</tr>
<tr>
<td>Browser/user community profiles</td>
<td>Distributed hosting</td>
<td>Storage Tiers</td>
</tr>
<tr>
<td>Internet / Intranet</td>
<td>Firewall issues</td>
<td>APMs</td>
</tr>
</tbody>
</table>

Ciber’s Unique Approach

Ciber has performed performance engineering services and enhanced performance testing capabilities across a broad vertical market and brings unique expertise and seasoned approaches to performance engineering and testing which includes:

- Innovative testing tools, frameworks, and proven processes:
  - Processes to support Agile, DevOps and CI/CD performance execution
  - Performance test execution using test automation frameworks
  - Packaged tools for performance testing in Dockerized container, launched on demand via AWS API to drive large scale Jmeter execution in the cloud
  - Cloud Load Test scheduling as part of CI/CD Process
  - AWS CloudWatch Analysis, Splunk and AppDynamics integration for test runs
  - Monitoring with Prometheus for Cloud and JMX connectivity
  - Dashboard and Analysis visualizations for time series metric repositories

- Performance Sandbox Lab – An internal use only sandbox for (training, prototyping customer solutions, concept development, demonstration) environment.
• Performance engineers and performance test resources exclusively allocated to the practice of performance engineering and testing. Certified, professionally trained, and always perfecting or learning the latest skills, methods and technologies through mentoring, online university education programs or self-study.

• Our performance consultants are familiar with and have been professionally trained and certified in applying the following leading performance engineering and testing tools: Oracle OATS, LoadRunner Cloud (SaaS), LoadRunner Enterprise, LoadRunner Professional, Apache JMeter / Blaze Meter, WebLOAD, LoadUI NG Pro, NeoLoad, Rational Performance Tester, Visual Studio / Azure DevOps and SOASTA Cloud Test.

• Methods to expand conventional web testing tools to drive mobile traffic at scale, without emulators, device labs or tethered hardware.

• Methods to derive scripts for web and native mobile and web applications protocols from TCP/IP packet captures.

Conclusion

The performance engineering discipline influences transitional change that enables teams to deliver fast, efficient, and responsive systems architected for your target populations of customers, employees, regulators, managers, and others.

The actions are more than just testing. Done right, performance engineering means understanding how all the parts of the system fit together, and designing for performance from the inception.

Making the journey from performance testing to performance engineering isn’t easy. However, proven practices established over years of observation and practical application can help you on your way. Take the first step and seek the services of a seasoned performance engineering consultancy.
About the Authors

**Ken Brown** has 38 years of experience in the performance, systems, electronics manufacturing and quality engineering worlds. For the past 15 years he has fulfilled a Solutions Architect role in the Enterprise Quality Assurance and Testing Practice (EQAT) at Ciber Global. Ken holds degrees in Electrical Engineering and Industrial Engineering Technology. He is a professional educator, trainer and has worked and consulted with 100’s of organizations worldwide and amassed a variety of engineering skills and practical knowledge. He is an active member of the Performance Engineering and Test Automation communities.

**Vinai Gangireddy** leads the Enterprise Quality Assurance and Testing Practice (EQAT) at Ciber Global with over 20 years of testing experience and is a member of the Performance Engineering advisory team. He has effectively executed multiple software testing projects including web applications and mobile apps. Working in different technology stacks and domains, he has assisted numerous clients in implementing quality best practices and performance engineering and testing solutions that have resulted in high-quality software.