
LAMP (Linux Apache, MySQL, PHP) Performance End to End

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Foreword

In 2011, someone suggested that I put Linux, Apache, MySQL, PHP Performance End to End together a quick Linux, Apache, MySQL, PHP Performance End to End 'howto' on optimizing LAMP. Now, 3 years later, like many of the “simple” tasks I start, it has proved to demand more effort than I had initially thought!

A lot of performance tuning is based on received wisdom and informed guesswork, but I would not be comfortable expecting to people to pay for a list of unjustified recommendations, or a rehash of documentation available in a coherent form in the form of manuals. Hence behind this book lies a lot of research and testing – I could have written a much longer book, but edited out a lot of the content that might simply too ephemeral, or off topic. There is more coverage of networking and TCP/IP than I had originally intended; while most developers and systems administrators have limited scope for improving performance through tinkering with the network, it is a fundamental constraint on the Linux, Apache, MySQL, PHP Performance End to End performance of web browsing.

I have included references to source material found on the internet and resources for further reading. There is a wealth of great material on the internet (and some very bad information too) however most of the good stuff written about web performance comes from companies like Google and Yahoo who have characterized and challenged the limitations of the World Wide Web. But they have Linux, Apache, MySQL, PHP Performance End to End started this journey from a mature skill base in managing backend systems Linux, Apache, MySQL, PHP Performance End to End – standing on the shoulders of giants, if you like. There seems to be a paucity of information on optimizing servers. A further gap I have tried to address here is to look at the problems in delivering small scale and/or business applications over HTTP as Linux, Apache, MySQL, PHP Performance End to End opposed to massive public-facing information

and retail sites. These have different objectives and subtly different performance problems.

In researching and writing the book, I have gained new knowledge and several times found my own pre-conceptions did not stand up to scrutiny. Linux, Apache, MySQL, PHP Performance End to End But despite my Linux, Apache, MySQL, PHP Performance End to End efforts, and the efforts of other people I have cited here, the best advice I can give to you is to experiment and measure – don't take my word for it. Knowledge only teaches you the right questions to ask.

About the book

While print layouts afford a degree of precision over layout, ebooks are Linux, Apache, MySQL, PHP Performance End to End a different story. And I have learnt Linux, Apache, MySQL, PHP Performance End to End that a word processor is surprisingly poor tool for writing one in – particularly when it includes tables, charts and diagrams. To try to ensure portability I have not used many of the typographical tricks common in print publishing such as callouts and footnotes, and restricted the fonts to sans-serif for headings and serif for body text. Code snippets are presented in monospace font, on a grey background inside a box. Each line is initially indented by 2 spaces so that wrapping text Linux, Apache, MySQL, PHP Performance End to End can be distinguished from new lines:

This is a short line.

This is a very long line of text and should, at some point wrap. But wrapping is controlled by your device, and indeed may even change with its configuration or orientation.

Citations are referenced by chapter number and serial number in square brackets e.g. [2.5] is the 5th reference document in chapter 2. The full citations appear at the end of each chapter.

Figures are numbered similarly and each has a legend (in italics) describing its content. Tables are implemented as images.

Many diagrams are presented as hand-drawn sketches. While I do have access to some excellent tools for producing high quality diagrams, this is intended to encourage you to think about sketching out *your* ideas on paper both as tool for gaining insight and a means of recording and communicating your design decisions.

Of course Linux, Apache, MySQL, PHP Performance End to End all documentation is out of date as soon as it is saved. For updates and more performance tips, please visit the LAMP E2E blog Linux, Apache, MySQL, PHP Performance End to End at <http://lampe2e.blogspot.co.uk/>

Even though the book is reflowable, it will be difficult to read on a screen smaller than 7 inches. The quality of eBook readers varies greatly - for Android, the best free eBook readers I have encountered are [Universal Book Reader](#) by Mobile Systems and [Gitden Reader](#) by Gitden Inc. Both are available from the Google Play Store. See the LAMP E2E blog for more info.

Chapter 1: A Performance Strategy

I should start with a definition of what I mean by the term performance. There are 2 sides to performance: How quickly a user perceives a web page as loading: And how much infrastructure is required to deliver pages in an acceptable/optimal time to a growing number of clients. The latter is often referred to as capacity. Improving the former drives engagement and improves sales/productivity, while optimizing the latter should improve the former *and* reduce operational costs.

Since you're already reading this book, you're concerned about service performance. But where does this fit in to the bigger picture of service provision? How do you assess the importance of performance and convince others? And how do you achieve great website performance? These are some Linux, Apache, MySQL, PHP Performance End to End of the questions this book will attempt to answer.

For a computer system to have value, then it needs to be able to carry out some function: It needs to be accessible in order to carry out that function: It should not be used for functions it is

not intended for: It has to carry out that function quickly enough that it adds value.

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Figure 1.1: Utility (value) of a service depends on functionality, availability, security and performance

There Linux, Apache, MySQL, PHP Performance End to End are very immediate costs if the system is not capable of performing its designated function. So it is perhaps not surprising that functionality is usually very well defined at an early stage of development, as are the processes for ensuring compliance of the system with the functional requirements. Typically compliance is established via testing (unit, integration, system through user-acceptance).

Security is the flip-side of functionality – while there is a finite and well-defined set of things the system should do, there are a lot of things the system shouldn't do. Indeed, it's not practical to enumerate all the things a system shouldn't do, hence documented requirements for system security are often a lot less specific. Compliance is typically addressed via parallel routes to functional testing, however increasingly, service providers are looking at ways of integrating ongoing security monitoring within services; SIEM, intrusion detection systems and data honeypots being examples. While the costs incurred via a failure of security can be greater than the overall utility of a system, these are offset by the likelihood of those costs not being realised or at least delayed. Linux, Apache, MySQL, PHP Performance End to End

The intrinsic functionality and security of a system are unlikely to change over time without specific intervention. Although these are unlikely to be *proven* to be complete at handover, they are well defined. Some sort of warranty on these is common.

Availability and performance are similar in that they will change over time but unlike functionality/security are relatively easy to measure.

Functionality and security are strongly dependant on, and aligned with software, while availability and performance are often *perceived* to be more associated with hardware. This is only partially true.

If you buy shrink wrapped Linux, Apache, MySQL, PHP Performance End to End software then the contract will usually only address the functionality and security of the product. Unfortunately, when buying hardware, you will rarely get any measure of the performance in terms relevant to the user experience, and only with very expensive hardware are you likely to get an indication of it's availability.

If the value of a system is in it's utility, then it's clearly in the customers interest to pay for a service which addresses all four aspects. This should be set out in the Service Level Agreement (SLA). A detailed document which sets out Linux, Apache, MySQL, PHP Performance End to End Linux, Apache, MySQL, PHP Performance End to End not only what targets for the 4 components will be set, but how data will be collected and processed to measure these targets.

Note, in ITIL terminology, SLA Linux, Apache, MySQL, PHP Performance End to End explicitly relates to a binding agreement between a service provider and an external service consumer – here I'm using the term to describe any formal statement regarding the expected quality of the service. This may include internal and/or informal agreements over the quality of the service.

Having clearly defined boundaries is also in the suppliers interest regardless of the size of the supplier's organization. Even if there is no requirement to provide a Service Level Agreement to the users, establishing one is a basis for assigning resources, division of responsibilities, setting targets, managing priorities and establishing expectations. Internal IT departments are often perceived as cost centres – increasingly organisations are looking beyond Linux, Apache, MySQL, PHP Performance End to End cash flow to measure effectiveness. Being able to demonstrate your success and quantify change can put IT in a strong position within an organization. But even if the entire business is operated by a single person, it provides a tool for controlling your workflow.

1.1 How fast is fast enough?

Jakob Nielsen has published a great deal of research on web usability, and much of it is accessible on the internet. In 1993 [1.1] he set out 3 intervals which are the milestones in the users' perception of performance:

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- 0.1 second is about the limit for having the user feel that the system is reacting instantaneously, meaning that no special feedback is necessary except to display the result.
 - 1 second allows the user's flow of thought to stay uninterrupted, even though the user will notice the delay. Normally, no special feedback is necessary during delays of more than 0.1 but less than 1.0 second, but the user does lose the feeling of operating directly on the data.
 - up to 10 seconds is the limit for keeping the user's attention focused on the dialogue. For longer delays, users will want to perform other tasks while waiting for the computer to finish, so Linux, Apache, MySQL, PHP Performance End to End they should be given feedback indicating when the computer expects to be done.

1.2 Impact on customer facing sites

In 2000 [1.2] Google carried out usability research on their search results which indicated that users wanted more results on a page – but when they implemented the recommendation, they found they were *losing* customers. Google identified that the problem was Linux, Apache, MySQL, PHP Performance End to End not the amount of content but the speed it was delivered to the customers which affected loyalty / satisfaction. Increasing page load times from 0.5 to 0.9 seconds was resulting in a 20% drop in traffic.

In a later study in 2009, [1.3] they found that adding 2% latency to Google Checkout resulted in a 2% drop in traffic; a similar rate to that reported by Amazon in 2006 [1.4]who found that revenues dropped by 1% for each 100ms added to response times.

AOL report that the fastest 10% of pages get 3 times more views per visit than the slowest 10%. [1.5]

In 2010, Akamai found that 57% of customers will abandon Linux, Apache, MySQL, PHP Performance End to End a site taking more than 3 seconds to load. [1.6]

Page performance directly affects customer loyalty, satisfaction and conversion rates. Making your site gives you a competitive advantage. [1.7] If you provide a service to customers who can obtain a comparable service from other organisations, the answer to the question of “how fast” is simple: Faster than your competitors.

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