Website Monitoring in a Competitive Landscape

An overview of different practices pertaining to website monitoring

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Contents

1 Introduction

1.1 DevOps

The topic of DevOps revolves around different practices that help bridge the gap between Development (Dev) and Operations (Ops). These practices assist in shortening the development life cycle as inconveniences relating to the delivery process are counteracted [1]. The process of delivering new software is usually depicted as containing 7 different stages that all different DevOps tools, in one way or the other, adhere to. The last stage, monitoring, will be at the center of this essay and, more specifically, in regard to websites.

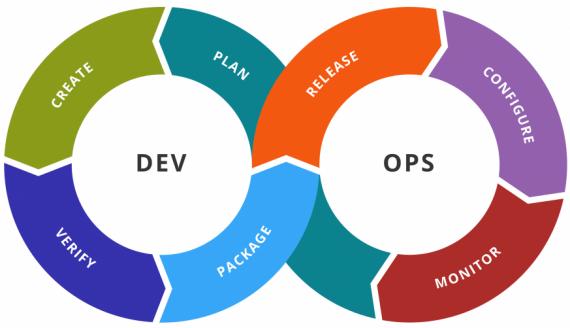

Figure 1: The different stages of DevOps [2]

1.2 Monitoring

Monitoring is the act of observing different aspects of a system's performance. These aspects can significantly vary depending on which domain is being monitored. However, it will primarily be centered around providing feedback from the production environment to aid in the engineering process. One key component of varying types of monitoring is time to detect (TTD). TTD is minimized by utilizing good monitoring practices so that the development team can be notified of a potential issue as quickly as possible. These developers can, subsequently, try to solve the problem to the best of their abilities in order to minimize the time to mitigate (TTM) [3]. When the problem has been taken care of, all affected processes go back to normal and the development of new features can, once again, be prioritized.

One overarching challenge in regard to monitoring is the availability of countless different performance indicators to monitor. It can, therefore, be challenging to decide which type of information we deem to be of importance. One vital indicator, that does not relate to availability, is to monitor the usage of your application. For instance, this can give you insight into how well different design requirements are being fulfilled. This information could, subsequently, be the driving factor behind certain business decisions as well [3].

2 Website monitoring

Website monitoring primarily serves the purpose of ensuring that the website at hand is available to all users and that the performance is optimized. Ensuring availability is primarily centered around minimizing the total amount of downtime that the website experiences. Furthermore, performance can be optimized by monitoring user behavior. The following section will underline these factors in greater detail as well as highlighting the importance of website monitoring in general. Some of the most essential practices in regard to website monitoring will also be described.

2.1 Importance

In a competitive landscape for online platforms, ensuring that downtime is avoided can be very important in order for websites to stay competitive. There are significant costs associated with your application going down which can be divided into two different categories. The first one are costs relating to *intervention* and includes the expenditures that are caused by having your team spend time attending to the issue at hand. The second category is, simply, referred to as *downtime* costs and correlates to expenses caused by slowing down production on other important engineering objectives as establishing uptime will be of priority instead. The consequences of shifting focus might also include, for instance, the quality of other objectives being reduced as the team still needs to meet a specific deadline even though time was lost preventing downtime [4].

Several attempts have been made to estimate the costs caused by websites experiencing downtime. A number that is often being referenced is $5,600 per minute which is based on industry surveys carried out by Gartner [5]. However, there is a large amount of variance involved in estimating these numbers as they highly depend on what type of business the website is running. For instance, when users of Amazon experienced downtime back in 2013, it is estimated that the e-commerce retailer lost around $66,000 per minute [6]. An average is primarily difficult to measure due to a lot of unpredictable factors being involved such as stock prizes [4].

Other than preventing downtime, ensuring that the website performs well can also significantly affect potential revenues. If the performance is slow, the user experience gets hampered drastically which can lead to the overall user retention being lowering and, subsequently, sales being lost. One less obvious factor which relates to visibility is the fact that the speed of a website is regarded as a key factor used by Google's search algorithm to rank websites [7].

2.2 Practices

There are several different practices to employ within the field of website monitoring. They are important to consider in order to ensure that your monitoring stays effective. Some of the most important ones will be outlined in the following section.

2.2.1 Identifying key performance indicators

Measuring different performance parameters can give a good indication of the overall performance of your website. However, with so many different parameters to measure, it can be quite challenging to decide which ones are of most benefit for you. Making this distinction is essential as taking in too much noise can cloud your judgment regarding the overall health of your website. Some *Key Performance Indicators*, also referred to as KPIs, include the following:

Uptime
Ensuring uptime is a consistent theme throughout many monitoring practices and it is no coincidence that it gets mentioned first. However, tracking uptime can become challenging as it has to be carried out for all different components of your website. Furthermore, with website architectures becoming more advanced, the number of different components to monitor increases. It is not sufficient to simply monitor a home page as this will not give an authentic representation of the overall health of your site. By, instead, being thorough in collecting uptime data for all different components, the process of identifying weak spots within your website gets facilitated [8].

Bounce rate
Bounce rate is a lesser-known KPI but can be useful to hone in on for several reasons. It refers to the percentage of visitors who decide to continue browsing the site after only viewing one page. The bounce rate could indicate whether the initial exposure to the website is driving users away. If this is the case, it could be because the speed of loading in the website is not up to par. Furthermore, bounce rates can give you insight into how well your website manages to engage the visitor. If the rate ends up being low, it can give you a reason to reevaluate your strategy in order for the website's content to become more engaging for your target audience [9].

Complete page load time
As previously mentioned, the time to load a website can play a crucial part in retaining first-time visitors. If the page load ends up being too long, the risk of visitors leaving increases at an exponential rate. The difference between the load times being acceptable and deal-breaking can differ in only a few seconds. It is important to take into consideration that users from different parts of the world with different setups on their disposal will experience varying load times. Knowing that only a subset of your user base in a specific region experiences good load times is not sufficient in terms of ensuring that your website stays competitive. Therefore, load times need to be measured in with different circumstances in mind [8].

2.2.2 Internal and external monitoring

A key distinction can be made regarding the type of monitoring. This relates to the monitoring being either internal or external. They differ in the sense that internal monitoring is being carried inside the firewall of a company while external takes place outside. The key benefits of internal monitoring consist of being able to monitor aspects

relating to your own servers such as memory usage and page load times. It can help expose flaws within, for instance, the codebase or your own infrastructure. However, only making use of internal monitoring is not sufficient as the monitoring software is running together with the corporate server. Therefore, a server outage would result in all monitoring capabilities becoming inaccessible [10].

With the possibility of a server outage in mind, we need to also make use of so-called external monitoring. As previously mentioned, external monitoring takes place outside the corporate firewall. This enables it to monitor, among other aspects, response times and customer experiences by tracking how they traverse the website. Considering that external monitoring will continue to work through server outages, it can act as a safety net by sending notifications in the case of downtime. These notifications can become extremely crucial in order to act fast and, thus, minimize the previously mentioned TTD. Considering that both internal and external monitoring serves different purposes, the key principle to abide by is to take advantage of both types. This makes it possible to monitor the website continuously while also correlating different discoveries regarding observed issues with your own infrastructure [11].

2.2.3 Setting up application performance management

Application performance management (APM) revolves around the act of managing the performance and availability of software applications. APM monitors different aspects of your application such as the speed of which transactions between the end-user and your application are made. They often take the form of different services which are capable of providing an overview of the website's overall performance as well as uncover hidden bottlenecks within your system [12]. The market for different website monitoring services grown increasingly saturated with countless of different options available, an amount that has exceeded 150 [13].

Three examples of different techniques that APM services apply include *URL Monitoring*, *Content Monitoring* and *Synthetic Transaction Monitoring*. URL Monitoring serves the purpose of notifying whether the website is experiencing downtime or not. This is achieved by sending requests to the website at certain intervals that make sure whether a positive response is being sent back from the server. Furthermore, it can be used to measure response time which is another KPI that was previously highlighted [14].

Content Monitoring can work as a countermeasure for preventing certain attacks from adversaries, more specifically website defacement attacks. These types of attacks change the visual appearance of websites by adding malicious content [15]. Without effective monitoring practices in place, these attacks can be difficult to detect. Content monitoring simply monitors the content of your website in order to detect any unwarranted changes to the HTML elements of different pages. Lastly, Synthetic Transaction Monitoring simulates the end-user experience by sending synthetic request to the server. These requests are similar to what a typical user of the website would send. Thereafter, the APM service monitors that these requests happens seamlessly which, hopefully, ensures that the user experience ends up being seamless as well [14].

3 Conclusions

The importance of website monitoring cannot be disregarded with there being many different consequential factors as a result of websites not functioning correctly. It can be difficult to keep all performance issues in check as many of them even fall outside the boundary of you what you are capable of preventing. For instance, you cannot affect bandwidth limitations in different regions of the world which might put a significant toll on the overall user-experience. Even if that is the case, we can try to counteract these issues to the best of our ability by utilizing effective monitoring practices for websites.

If you decide to go the route of utilizing an APM service provider, the act of picking a specific one can be quite intimidating. Especially with the abundance of different options available at your disposal. The main performance indicators brought up in section 2.2.1 should be sufficient for getting a broad overview of how well your website is performing in terms of both performance and engagement. Choosing a service which is capable of monitoring the aforementioned performance indicators could, therefore, be an effective strategy.

However, with most website monitoring providers employing similar techniques, one of the most consequential factors when making a decision is the costs that you are willing to pay. A consequence of there being a plethora of different options available is the fact that there are several different price plans to choose from as well. If you manage a smaller website with traffic loads on the lower end, you could consider cheaper options where website checks are being carried out with longer intervals. However, the completely free options should most likely be disregarded considering that paid upgrades are usually necessary in order for the monitoring to be sufficiently comprehensive. If different services is of no interest for you, recall the importance of employing internal monitoring as it can pay dividends on its own.

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