# DevOps Dashboard with Heatmap

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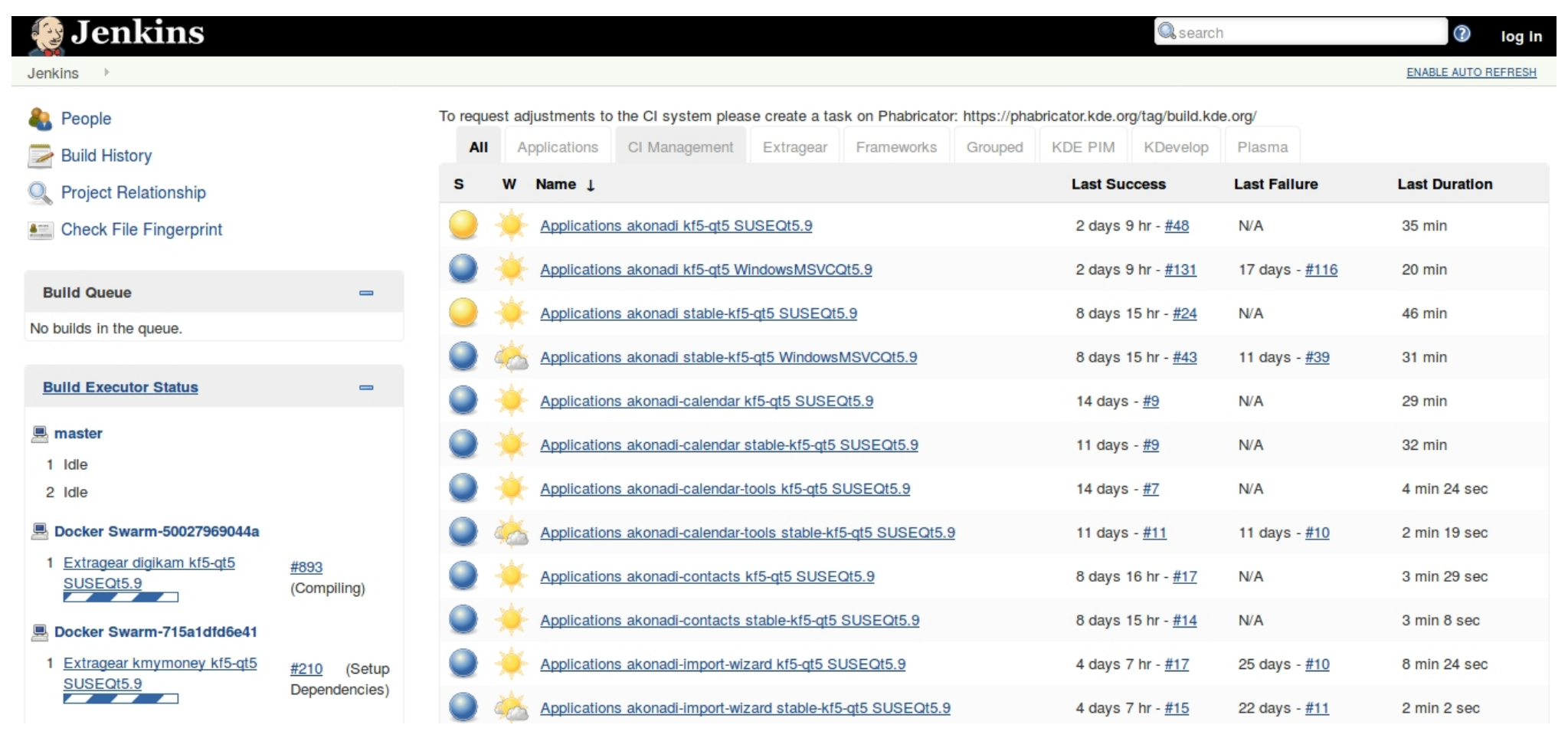
## Introduction

DevOps is an emerging approach that aims at the symbiosis of development, quality assurance and operations. Developers need feedback from the test executions that Continuous Integration (CI) servers support [3]. On the other hand, developers need feedback from deployed application that is in production.

The following figure presents the dashboard of the Jenkins CI:



Build Queue
No builds in the queue.

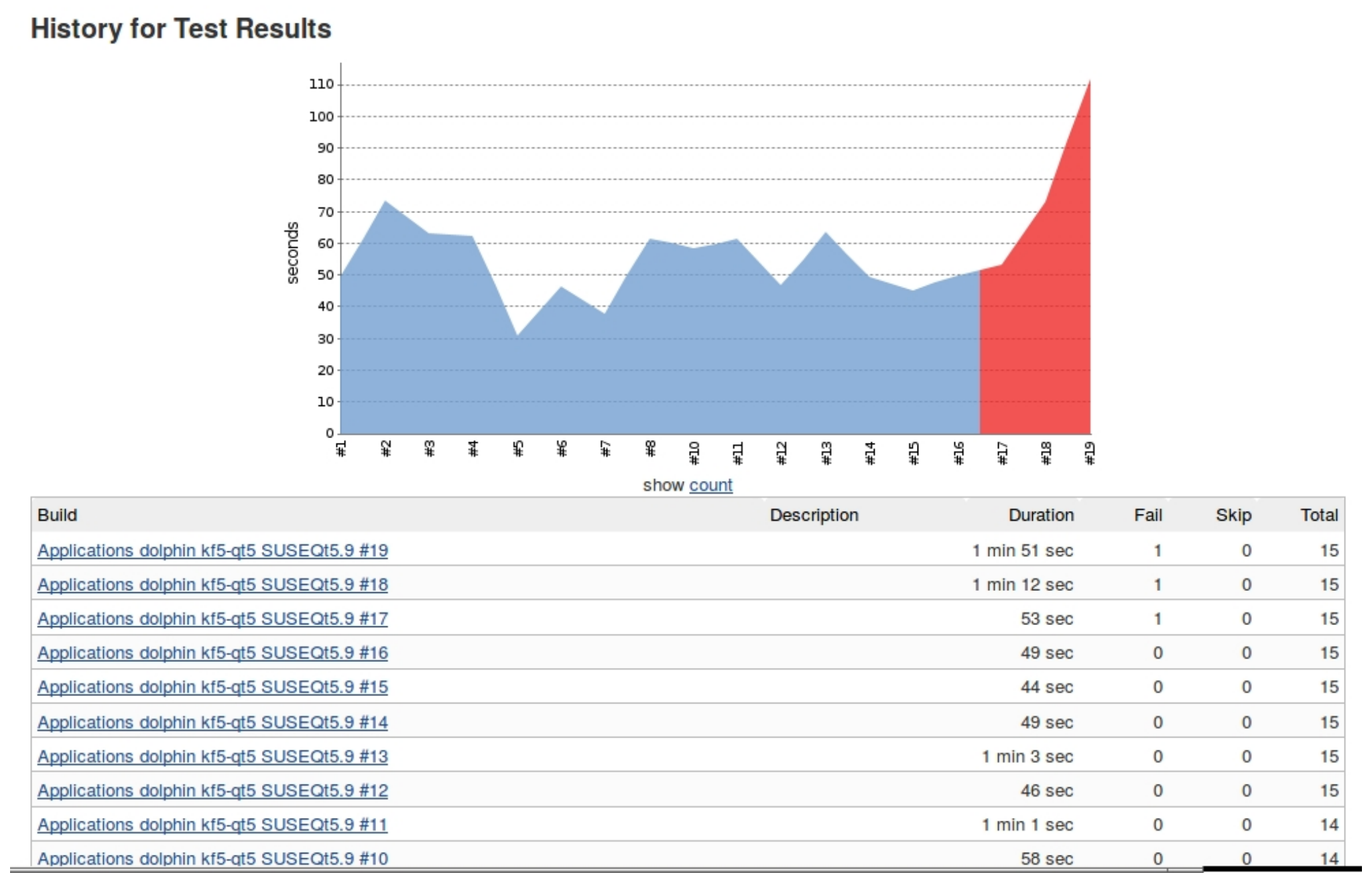
Build Executor Status
master
1 Idle
2 Idle
Docker Swarm-50027969044a
1 Extragear digikam kf5-qt5 SUSEQt5.9 #893 (Compiling)
Docker Swarm-715a1dfd6e41
1 Extragear kmymoney kf5-qt5 SUSEQt5.9 #210 (Setup Dependencies)

To request adjustments to the CI system please create a task on Phabricator: https://phabricator.kde.org/tag/build.kde.org/

All | Applications | CI Management | Extragear | Frameworks | Grouped | KDE PIM | KDevelop | Plasma

| S | W | Name ↓ | Last Success | Last Failure | Last Duration |
|---|---|---|---|---|---|
| ● | ☀ | Applications akonadi kf5-qt5 SUSEQt5.9 | 2 days 9 hr - #48 | N/A | 35 min |
| ● | ☀ | Applications akonadi kf5-qt5 WindowsMSVCQt5.9 | 2 days 9 hr - #131 | 17 days - #116 | 20 min |
| ● | ☀ | Applications akonadi stable-kf5-qt5 SUSEQt5.9 | 8 days 15 hr - #24 | N/A | 46 min |
| ● | ⛅ | Applications akonadi stable-kf5-qt5 WindowsMSVCQt5.9 | 8 days 15 hr - #43 | 11 days - #39 | 31 min |
| ● | ☀ | Applications akonadi-calendar kf5-qt5 SUSEQt5.9 | 14 days - #9 | N/A | 29 min |
| ● | ☀ | Applications akonadi-calendar stable-kf5-qt5 SUSEQt5.9 | 11 days - #9 | N/A | 32 min |
| ● | ☀ | Applications akonadi-calendar-tools kf5-qt5 SUSEQt5.9 | 14 days - #7 | N/A | 4 min 24 sec |
| ● | ⛅ | Applications akonadi-calendar-tools stable-kf5-qt5 SUSEQt5.9 | 11 days - #11 | 11 days - #10 | 2 min 19 sec |
| ● | ☀ | Applications akonadi-contacts kf5-qt5 SUSEQt5.9 | 8 days 16 hr - #17 | N/A | 3 min 29 sec |
| ● | ☀ | Applications akonadi-contacts stable-kf5-qt5 SUSEQt5.9 | 8 days 15 hr - #14 | N/A | 3 min 8 sec |
| ● | ☀ | Applications akonadi-import-wizard kf5-qt5 SUSEQt5.9 | 4 days 7 hr - #17 | 25 days - #10 | 8 min 24 sec |
| ● | ⛅ | Applications akonadi-import-wizard stable-kf5-qt5 SUSEQt5.9 | 4 days 7 hr - #15 | 22 days - #11 | 2 min 2 sec |

CI provides feedback to the developers whether the code is in proper state [5]:


History for Test Results

| Build | Description | Duration | Fail | Skip | Total |
|---|---|---|---|---|---|
| Applications dolphin kf5-qt5 SUSEQt5.9 #19 | | 1 min 51 sec | 1 | 0 | 15 |
| Applications dolphin kf5-qt5 SUSEQt5.9 #18 | | 1 min 12 sec | 1 | 0 | 15 |
| Applications dolphin kf5-qt5 SUSEQt5.9 #17 | | 53 sec | 1 | 0 | 15 |
| Applications dolphin kf5-qt5 SUSEQt5.9 #16 | | 49 sec | 0 | 0 | 15 |
| Applications dolphin kf5-qt5 SUSEQt5.9 #15 | | 44 sec | 0 | 0 | 15 |
| Applications dolphin kf5-qt5 SUSEQt5.9 #14 | | 49 sec | 0 | 0 | 15 |
| Applications dolphin kf5-qt5 SUSEQt5.9 #13 | | 1 min 3 sec | 0 | 0 | 15 |
| Applications dolphin kf5-qt5 SUSEQt5.9 #12 | | 46 sec | 0 | 0 | 15 |
| Applications dolphin kf5-qt5 SUSEQt5.9 #11 | | 1 min 1 sec | 0 | 0 | 14 |
| Applications dolphin kf5-qt5 SUSEQt5.9 #10 | | 58 sec | 0 | 0 | 14 |

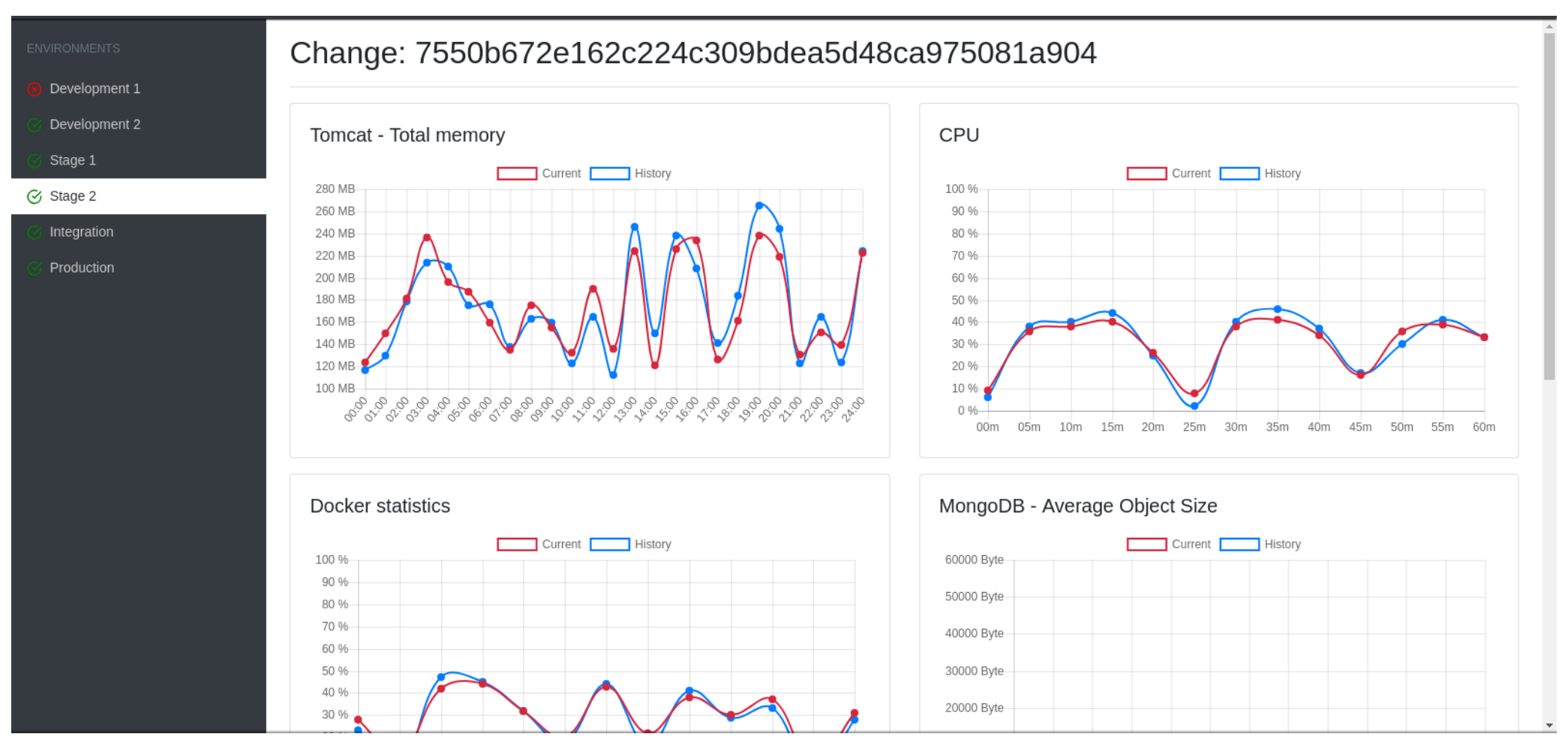
We have created a DevOps dashboard tool that visualizes how the deployed applications behave in production. In this poster, we present our Dashboard tool with a new extension. This extension is a heatmap that presents the features' usage. DevOps tool provides result from the end-users, so it can be seen if a new feature is unused or an old one needs more capacity because too many users take advantage of it.

## Our Dashboard

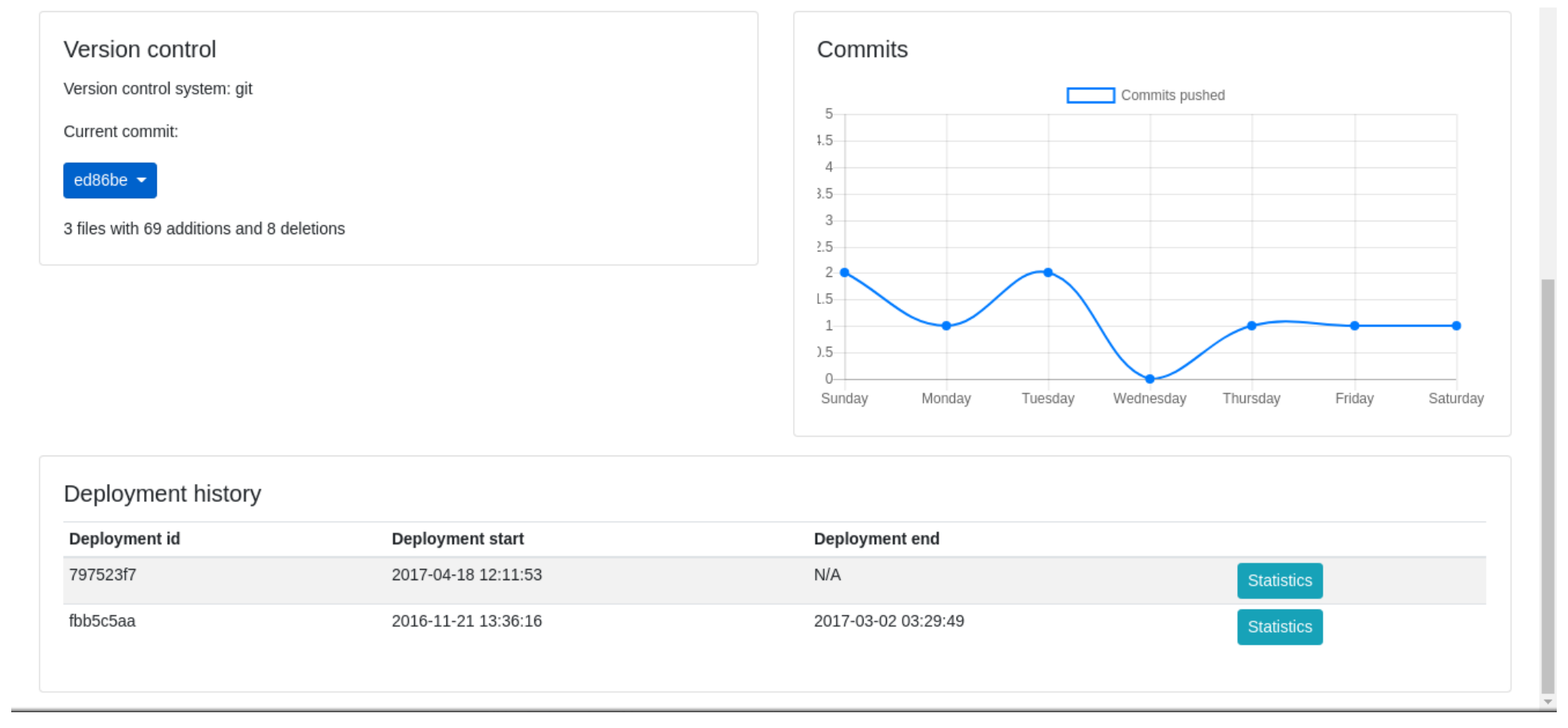
A safe software development requires control over the entire software development lifecycle (SDLC). During the development, it is essential to avoid memory leakage, or overuse of the CPUs. To get a good overview of the resource utilization engineers, DevOps engineers have to keep their eyes on these units that means they have to monitor their environments by using tools that can reflect the status of the different services, databases, network I/Os, or the amount of written/read blocks [8]

Monitoring these changes can provide a closer picture about how the application works in the different environments and provide feedback about the changes that have been applied. This approach reflects whether the new features, bug fixes, optimizations can bring better performance on the specified resources. Monitoring an environment or a service inside an environment requires such an interface to gain information about them. In our approach, we took advantage of agents to observe the changes. These agents are located on machines that play the role of the hosts of the environments. Every single agent is reliable for watching only one service per environment and to hand over the logged data to the Dashboard application. Many agent examples are presented in [8].

Our dashboard can be seen on the hereinafter figure:


Change: 7550b672e162c224c309bdea5d48ca975081a904

One can see the deployment history, as well:


Version control

Version control system: git

Current commit:

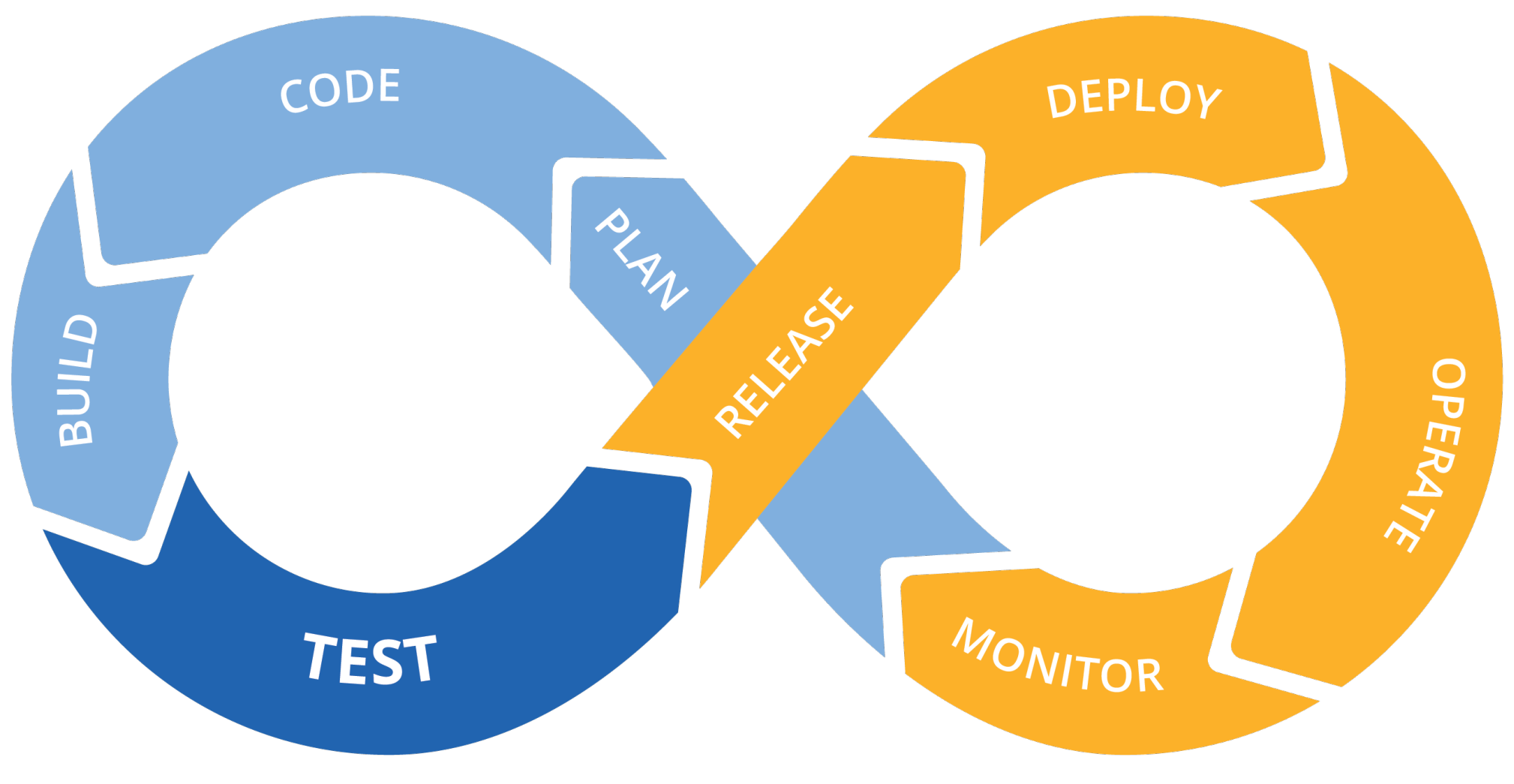
3 files with 69 additions and 8 deletions

Deployment history

| Deployment id | Deployment start | Deployment end | |
|---|---|---|---|
| 797523f7 | 2017-04-18 12:11:53 | N/A | Statistics |
| fbb5c5aa | 2016-11-21 13:36:16 | 2017-03-02 03:29:49 | Statistics |

## DevOps

DevOps is an emerging approach in modern software engineering. The key achievements of DevOps are comprehensive processes from building source to deployment, continuous synchronization of development and operations in order to make every new feature delivered to the end users. DevOps emphasizes the feedback from every phase.



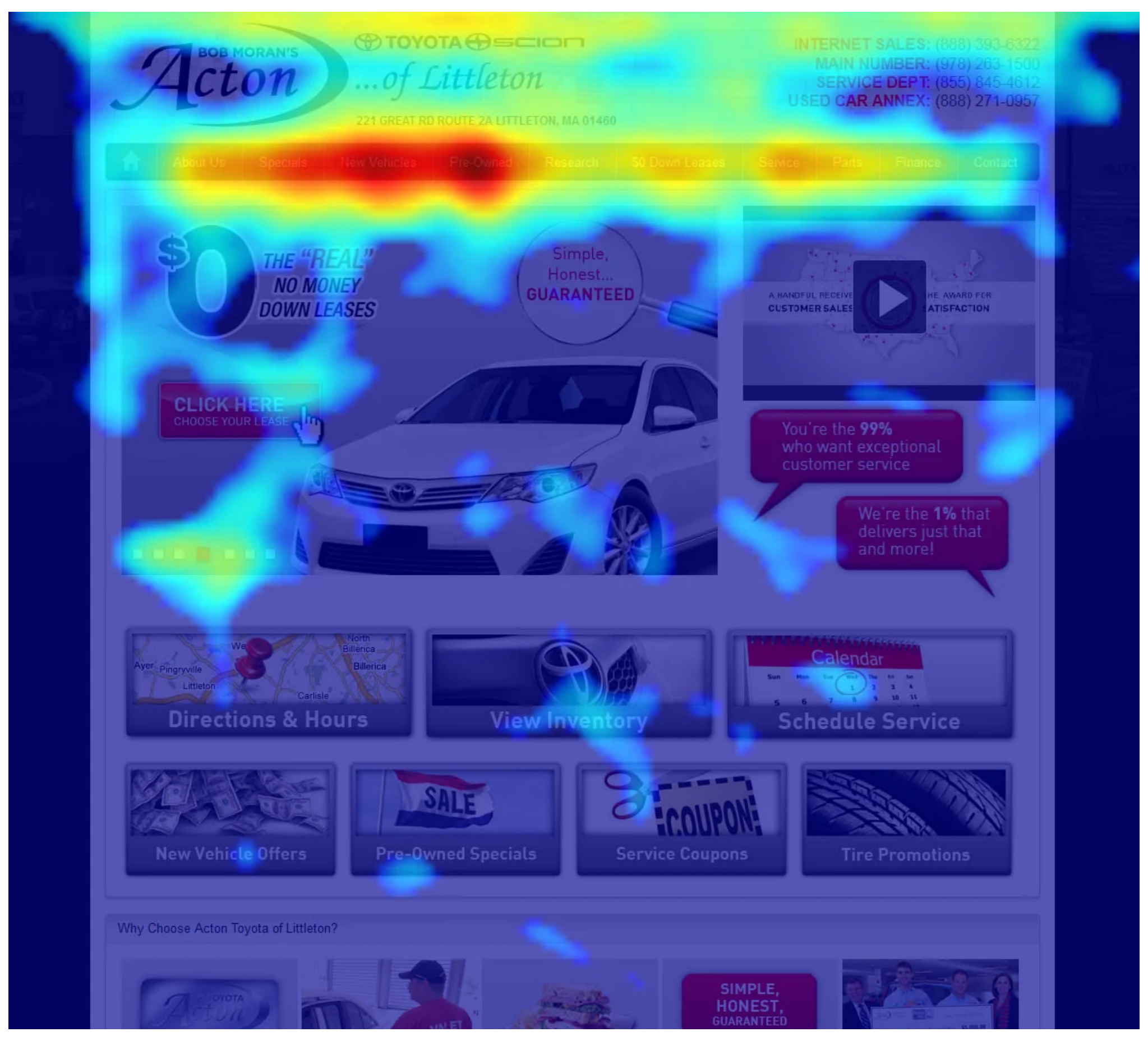
Continuous Delivery (CD) is a software development discipline. This discipline aims at building software in such a way that the software can be released to production at any time [4]. It is a series of processes that aims at the safe and rapid deployment to the production. Every change is being delivered to a production-like environment called a staging environment [7]. Rigorous automated testing ensures that the business applications and service work as expected [6].

The DevOps approach extends the CD discipline and focuses on comprehensive CD pipelines: starting with building, followed by different kinds of comprehensive testing. After the comprehensive QA phase, the automatic deployment of the application starts. The DevOps culture argues for the deployment automation at the level of the application. The automatic upgrade and roll-back processes involve many difficult challenges. This approach requires automation and visibility.

DevOps considers the monitoring and logging of the deployed application in the production environment [7]. The development team is eager for feedback from the application which is in the production environment. The feedback may include many aspects of the software: for instance, unused features in the software, memory or other resource leak detection or performance bottlenecks. Problems may cause automatic roll-back of the application to the previous stable version.

## Heatmap

A heatmap is a graphical representation of data that uses a system of color-coding to represent different values. Heatmaps are used in various forms f analytics but are most commonly used to show user behaviour on specific webpages or webpage templates [1].


BOB MORAN'S
Acton
TOYOTA SCION
...of Littleton
221 GREAT RD ROUTE 2A LITTLETON, MA 01460
INTERNET SALES: (888) 393-6322
MAIN NUMBER: (978) 263-1500
SERVICE DEPT: (855) 845-4612
USED CAR ANNEX: (888) 271-0957
About Us
Specials
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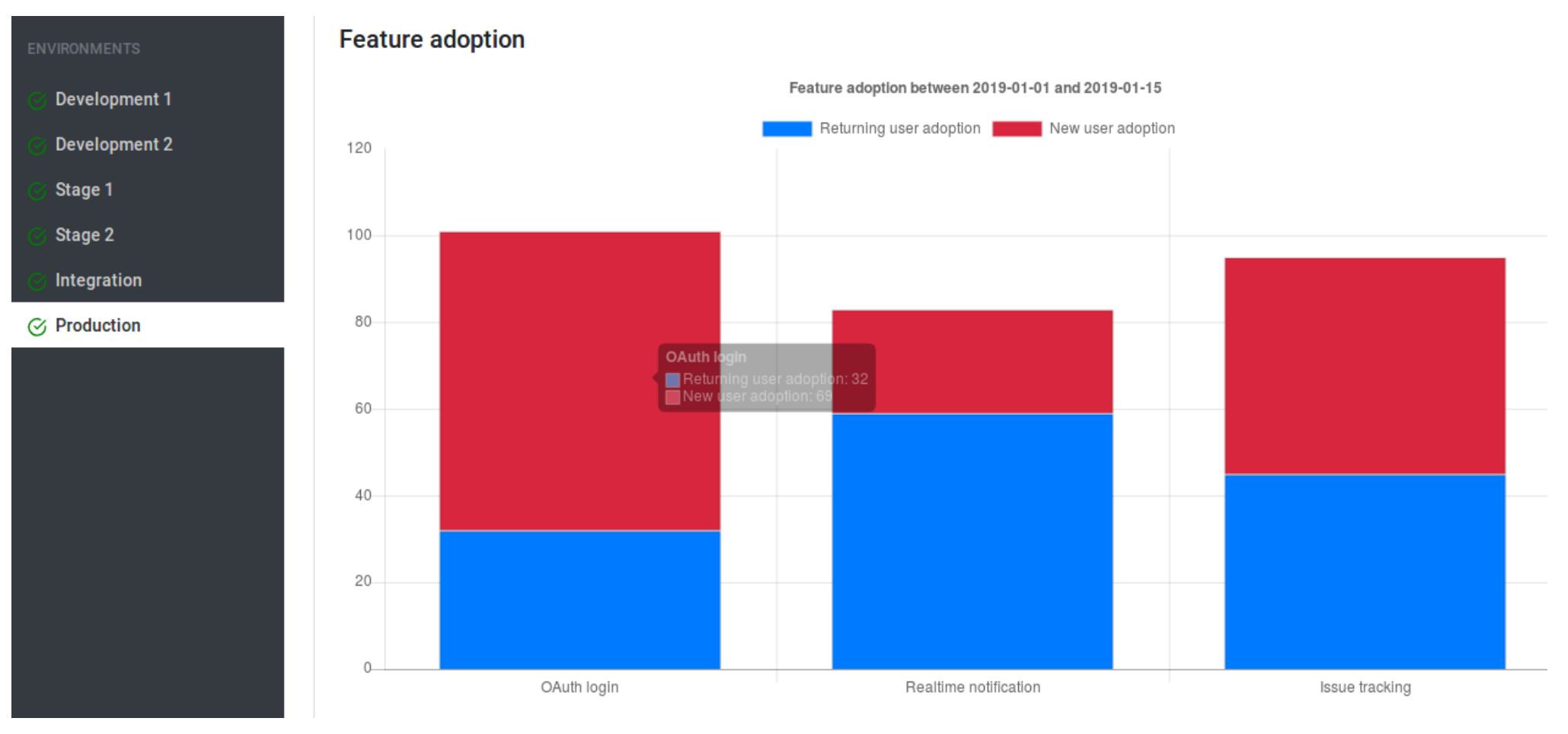
Pre-Owned
Research
$0 Down Leases
Service
Parts
Finance
Contact
$0
THE "REAL" NO MONEY DOWN LEASES
Simple, Honest... GUARANTEED
CLICK HERE
CHOOSE YOUR LEASE
You're the 99% who want exceptional customer service
We're the 1% that delivers just that and more!
Directions & Hours
View Inventory
Calendar
Schedule Service
New Vehicle Offers
SALE
Pre-Owned Specials
COUPON
Service Coupons
Tire Promotions
Why Choose Acton Toyota of Littleton?
SIMPLE, HONEST, GUARANTEED

We have developed a logging and monitoring solution that takes advantage of the special logs of back-end functionalities. We do not deal with the front-end, we retrieve what are the endpoints that end-users call via the front-end. Our agents inform the tool about usage information.

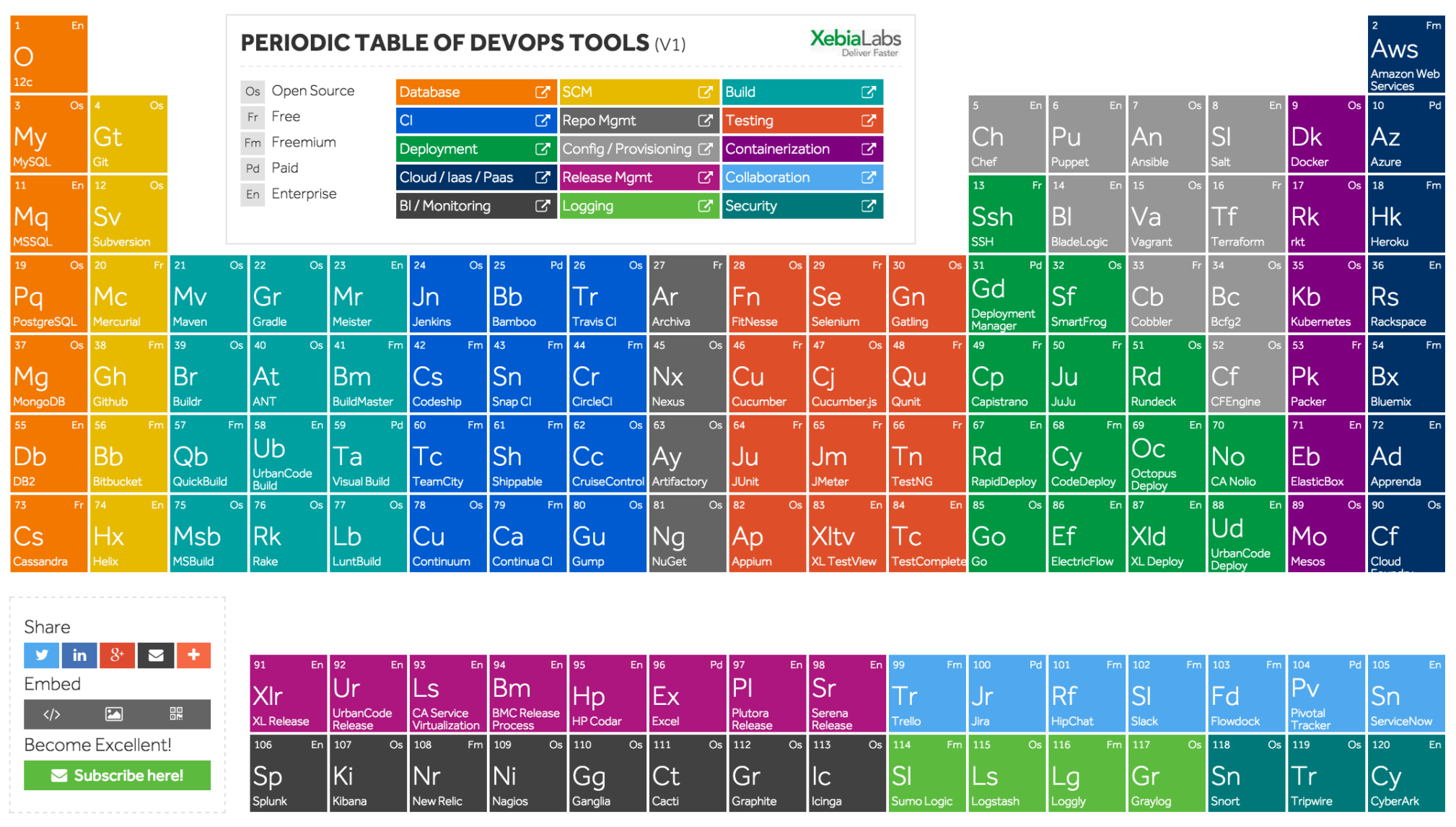


The main questions are:

- How has a new feature increased the number of users since its introduction (or release)?
- Should we advertise an unused new feature?
- Should we cease an unused feature and its maintenance?

## DevOps toolset

DevOps engineers take advantage of many different tools for different purposes:



DevOps engineers need

- Version Control System – to store the source code
- Build systems – for building and packaging
- Continuous Integration/Continuous Delivery – to detect integration problems
- Testing frameworks – for executing test cases, creating reports
- Infrastructure and Delivery – how we start the entire application (starting virtual machines, containers from images) [2].
- Configuration Management tool – for automatized configuration steps
- Monitoring and Logging tools – for status of application

However, tools landscape is missing good tools which are able to present the runtime performance of applications in staging or production environment regarding the changes of the source code. We are working on a dashboard tool to visualize how the deployed application behaves in specific environment. Many typical use-cases can be mentioned. Does the memory consumption decrease when a feature's new implementation is deployed? Which commit may cause a memory leak, if it is suspicious. Does the introduction of a new feature or API cause increase in the number of end-users? How can one compare the performance of the system if the webserver or a database server is replaced?

## Conclusion

DevOps is an emerging approach for the symbiosis of development, quality assurance and operations. According to DevOps, feedback is required from any aspect of the development and operation, therefore many tool are applied by the engineers.

We have created a DevOps dashboard that returns feedback from the production. This tool is connected to the CI, so it can support many different versions from the software. Engineers can analyse how the new features behave. We add a new heatmap functionality based on the backend's log. Managers can take advantage of usage information.

## References

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[8] Márk Török, Norbert Pataki: *Service Monitoring Agents for DevOps Dashboard Tool*, in Proc. of the 21th International Multi-Conference INFORMATION SOCIETY IS'2018, Volume G : Collaboration, Software and Services in Information Society, pp. 47–50.