



**T22**

Performance Testing

Thursday, May 3rd, 2018

3:00 PM

# Open Source Tools for Performance Testing and Monitoring

Presented by:

**Kaushal Dalvi**

Ultimate Software

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# Kaushal Dalvi

## Ultimate Software

Since he got his first computer at age thirteen, Kaushal Dalvi has been interested in systems and software performance. He spent days researching performance characteristics of different motherboards, CPUs, GPUs, RAM, and disks to configure/overclock them to squeeze the maximum frames/second out of the games he played. Kaushal built and maintained websites for local businesses, where he started learning about performance and reliability. He developed a taste for it and now nine years later continues working in the same field with workload modeling, test scripting and execution, result and bottleneck analysis, and much more.

# OPEN SOURCE TOOLS FOR PERFORMANCE TESTING AND MONITORING

-KAUSHAL DALVI

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## WHY PERFORMANCE?

BUILD CONSENSUS AROUND THE VALUE

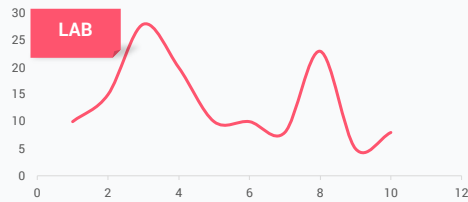


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Pinterest - [https://medium.com/@Pinterest\\_Engineering/driving-user-growth-with-performance-improvements-cf50dafdd7](https://medium.com/@Pinterest_Engineering/driving-user-growth-with-performance-improvements-cf50dafdd7)  
BBC - [www.creativeblog.com/features/how-the-bbc-builds-websites-that-scale](http://www.creativeblog.com/features/how-the-bbc-builds-websites-that-scale)  
Staples - <https://www.ultimate.net/cffracker/velocity-ry-how-to-measure-revenue-in-milliseconds>  
Walmart - <https://www.ultimate.net/cffracker/velocity-ry-how-to-measure-revenue-in-milliseconds>  
Netflix - <http://cdn.oreilystatic.com/en/assets/1/event/7/improving-netflix-performance-2019-presentation.pdf>

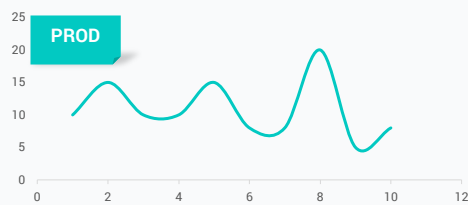
# WHERE DO YOU MEASURE?

PROS AND CONS



## TESTING TOOLS

Lab data is performance data collected within a controlled environment with predefined device and network settings. This offers reproducible results and debugging capabilities to help identify, isolate, and fix performance issues.



## MONITORING TOOLS

(Also Real User Monitoring or RUM)  
Field data is performance data collected from real page loads your users are experiencing in the wild.

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# THE RIGHT APPROACH?

FIND THE BALANCE



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# THE WEB EXPERIENCE

END USER PERSPECTIVE



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## THE WEB REQUEST LIFECYCLE

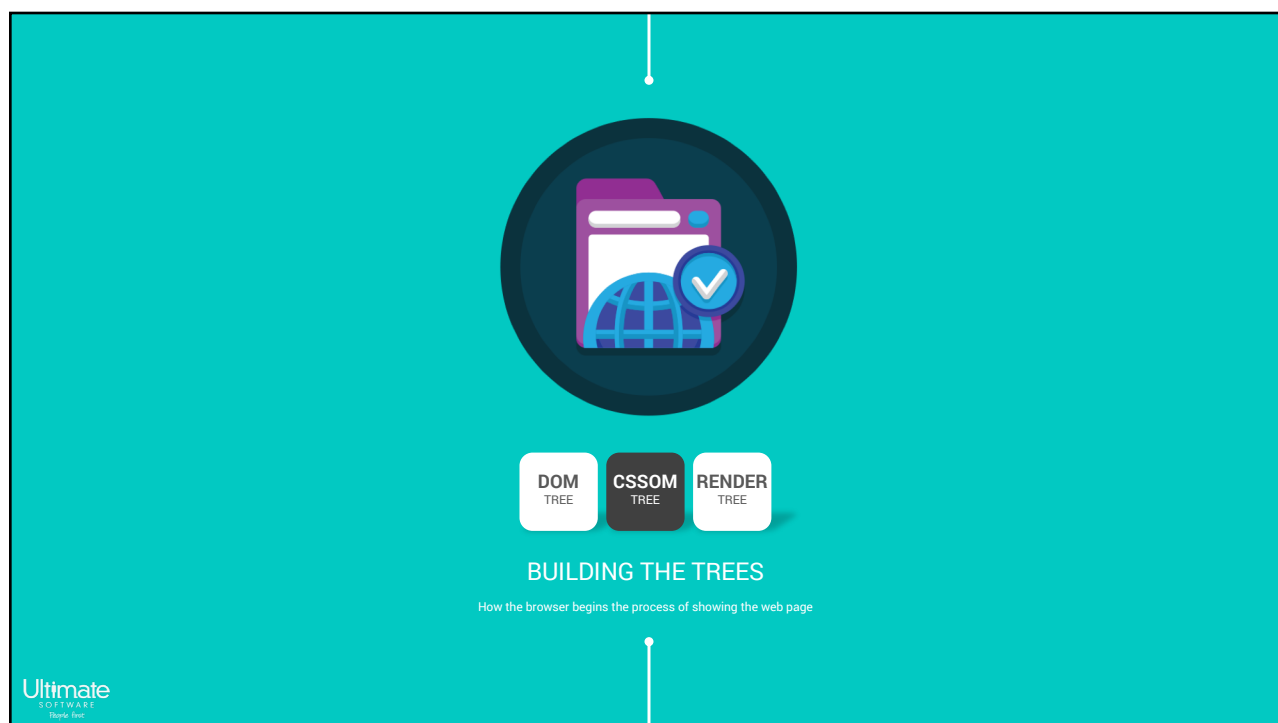
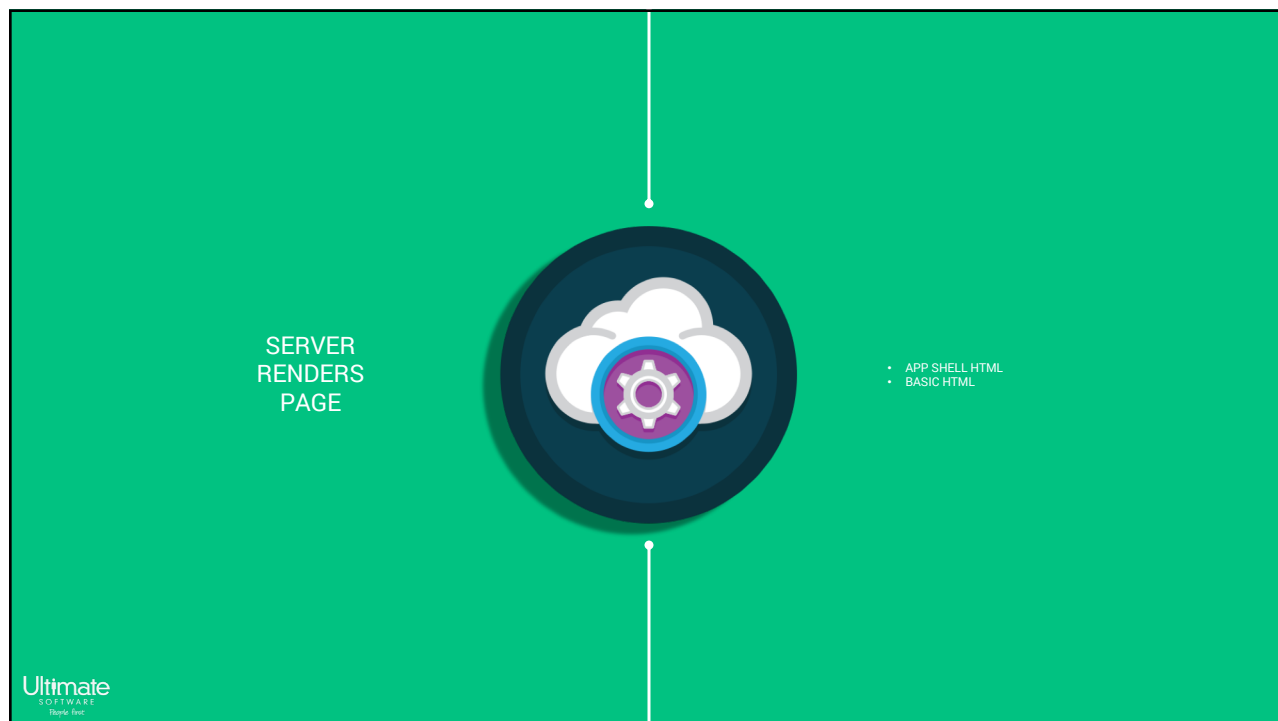
THE COMPONENTS THAT MAKE UP END USER PERCEIVED RESPONSE TIMES

DNS CACHE CHECKS  
& CONNECTION



- BROWSER
  - OS
  - ROUTER
  - ISP
- REQUEST SENT OVER TCP

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## RENDER BLOCKS DOWNLOAD ADDITIONAL RESOURCES

CSS, JS, WOFF files may block the parse and/or render trees from being generated



## AJAX REQUESTS

Data is increasingly being populated after the app shell has bootstrapped



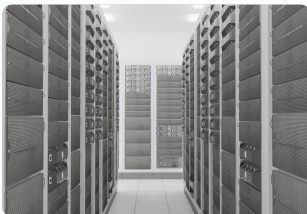
**VISUALLY COMPLETE AND INTERACTIVE**

Page is fully loaded and is usable.

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# WHAT CONSTITUTES PERFORMANCE?


WHAT IS PERFORMANCE FROM THE END USER PERSPECTIVE?



**BACKEND**  
NW SERVERS CODE +

The parts of the system that determine what needs to be served to the user. The design and architecture choices here greatly influence the Performance, Scalability and Reliability characteristics of the system.

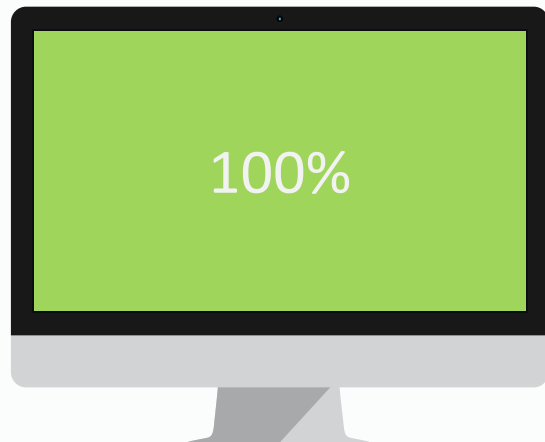
FOR THE MANY



**FRONTEND**  
NW HTML CSS JS +

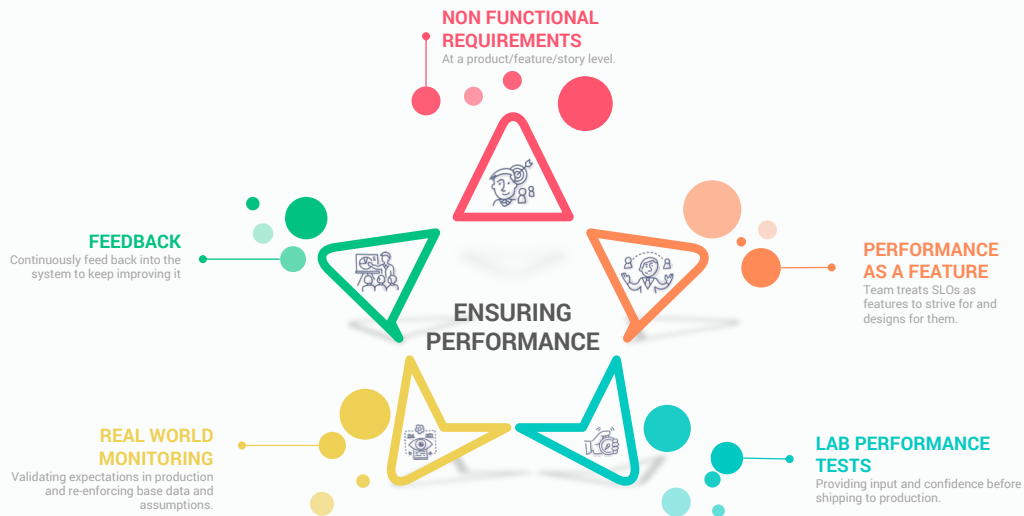
The parts of the system that determine how the information is presented to the user. The design and architecture choices here greatly influence the Performance characteristics of the system for the users based on their device and network conditions.

FOR THE ONE



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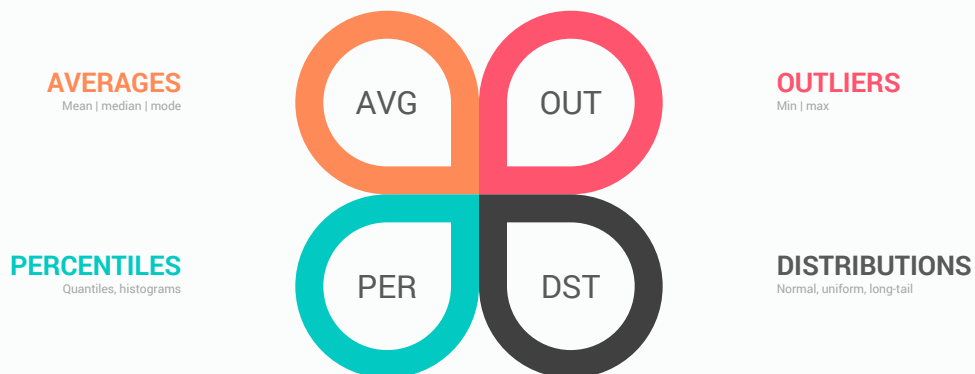
## THE IDEAL SETUP



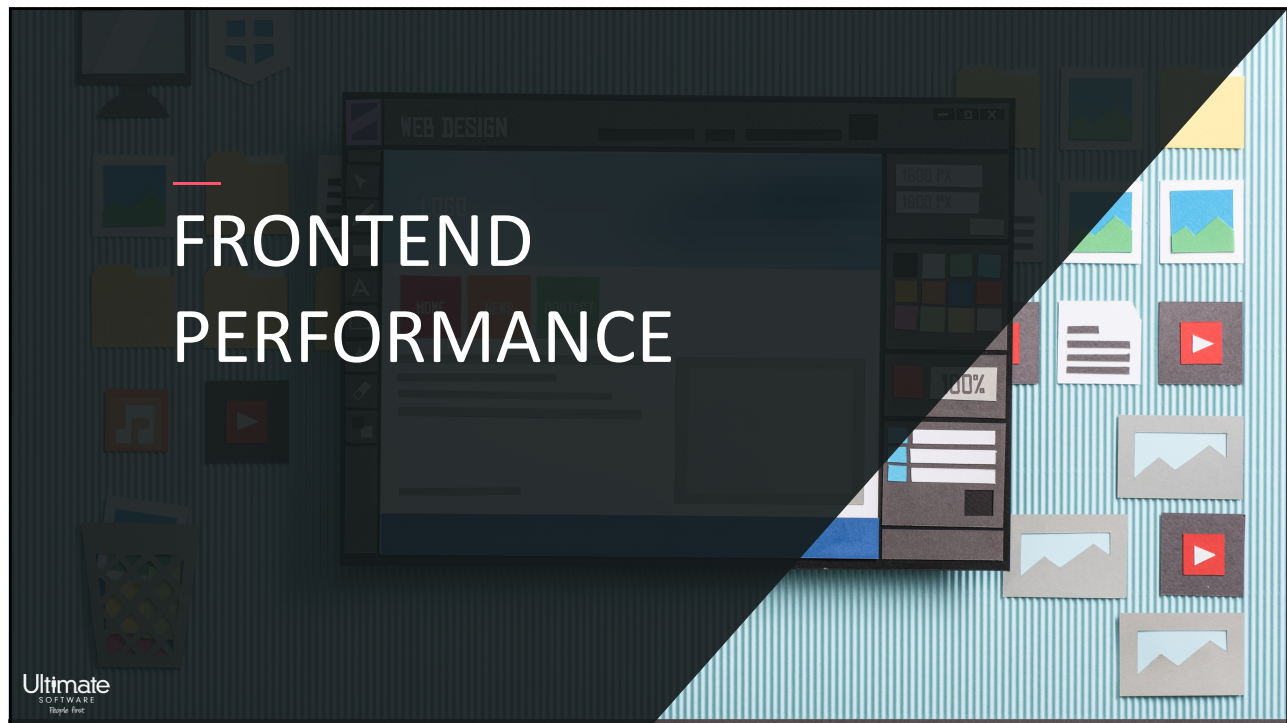
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## STATISTICS TERMS TO KNOW

TERMS GOOD TO BE AWARE OF WHEN ANALYZING/INTERPRETING TEST/MONITORING RESULTS



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## FRONTEND PERFORMANCE METRICS

Each of these have an impact on the perception of performance by the user.



### FIRST PAINT

When the app shows some sign of life/activity upon submitting request.



### FIRST CONTENTFUL PAINT

When the canvas of the app has taken the shape and structure of the final form.



### FIRST MEANINGFUL PAINT

When the user can start to get meaningful cues from the app.



### HERO ELEMENT

When the most important part of the page that the user is interested in has loaded.



### TIME TO INTERACTIVE (FIRST)

When most of the elements on the page respond to input from the user.



### CONSISTENTLY INTERACTIVE

When the app is no longer issuing network requests (except websockets)

# FRONTEND PERFORMANCE METRICS

●●●●●●  
In build pipelines.

## window.performance

```
function showPaintTimings() {  
  if (window.performance) {  
    let performance = window.performance;  
    let performanceEntries =  
      performance.getEntriesByType('paint');  
    performanceEntries.forEach(  
      (performanceEntry, i, entries) => {  
        console.log("The time to " + performanceEntry.name  
          + " was " + performanceEntry.startTime +  
            "milliseconds.");  
      });  
    } else {  
      console.log('Performance timing isn\'t supported.');    }  
  }  
}
```

## \_\_lighthouse

```
module.exports = {  
  passes: [{  
    recordTrace: true,  
    pauseAfterLoadMs: 5000,  
    useThrottling: true,  
  }],  
  audits: [  
    'first-meaningful-paint',  
    'estimated-input-latency',  
    'first-interactive',  
    'consistently-interactive',  
    'user-timings'  
  ]  
};
```

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### PERFORMANCE

How long does the page/app take to show content and become usable

### PROGRESSIVE WEB APP

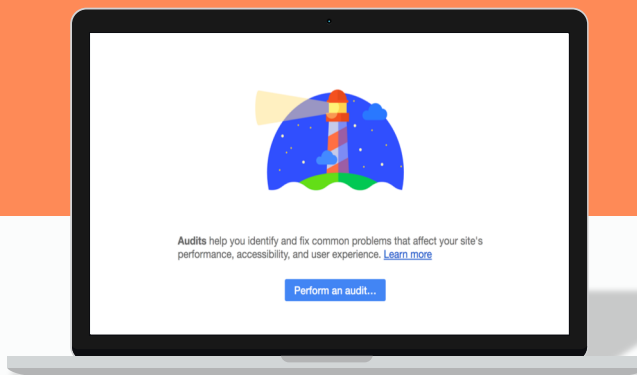
Does the page meet standards of a progressive web app

### BEST PRACTICES

Does the page follow best practices for modern web development

### ACCESSIBILITY

Is the page usable by people with disabilities or impairments



## LIGHTHOUSE DEMO

Lighthouse is an open-source, automated tool for improving the quality of web pages. You can run it against any web page, public or requiring authentication. It has audits for performance, accessibility, progressive web apps, and more.


SOURCE - <https://github.com/GoogleChrome/lighthouse>

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# PSR

WHAT DO WE NEED TO ENSURE ON THE BACKEND




Commonly used as an Umbrella term. Performance is concerned with achieving response times, throughput, and resource-utilization levels that meet performance objectives.

PERFORMANCE



Scalability is the application's ability to handle additional workload, without adversely affecting performance, by adding resources such as processor, memory, and storage capacity.

SCALABILITY



Reliability is the probability of the application operating without a failure for a given period of time. Also measured as MTBF.

RELIABILITY

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An open source load testing tool.

Define user behaviour with Python code, and swarm your system with millions of simultaneous users.

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Docs

LOCUST

A PYTHON-POWERED LOAD TESTING TOOL

STATUS: RUNNING

USERS: 6

AVG. RATE: 76.4

FAILURES: 0%

Reset Stats

Statistics Failures Exceptions

Type	Name	# requests	# fails	Median	Average	Min	Max	Content Size	# requests
GET	/	1851	0	21	21	4	38	10847	18.3
GET	/blog	608	0	25	26	3	43	10841	6.9
GET	/blog/feed.rss	812	0	14	15	2	37	10858	7.6
GET	/about	573	0	26	26	3	43	10839	5.5
GET	/about/feed.rss	596	0	30	30	6	35	10839	5.3
POST	/about/feed.rss	71	0	62	63	13	120	11188	0.6
POST	/about/new	64	0	59	58	6	108	3272	0.7
GET	/login	3439	0	26	26	3	43	10850	31.3

LOCUST DEMO

Define user behavior with Python code, and swarm your system with millions of simultaneous users.

SOURCE - <https://github.com/locustio/locust>

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MONITORING

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# MONITORING TIPS

DOS AND DONTs



## NO SILVER BULLETS

Don't be too obsessed with a tool. Replacing a tool to fill a minor gap starts a never ending cycle.



## NOT A JOB

Monitoring is a skill not a job and not suited for someone who doesn't know what it is they are monitoring.



## NOT A CHECKBOX

Monitoring for the sake of it almost never helps, rather it generates more noise and causes more confusion than it helps.



## AUTOMATION

Deploying monitoring should never have to be a manual task, it almost guarantees that it will eventually be ignored.



## USER PERSPECTIVE

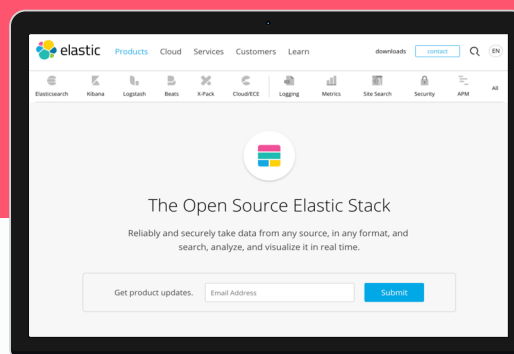
When starting to monitor, start from the perspective of the user and then start expanding outwards.



## DON'T BUILD

Building a new monitoring system from scratch is almost never a good idea unless you are a tech giant that needs a custom solution.

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## ELK STACK DEMO

Reliably and securely take data from any source, in any format, and search, analyze, and visualize it in real time.

SOURCE - <https://github.com/elastic>


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### TIG STACK DEMO

InfluxData provides a Modern Time Series Platform, designed from the ground up to handle metrics and events.

SOURCE - <https://github.com/influxdata>



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## SOFTWARE

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—  
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