

*You get what you measure—  
why metrics are important*

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# Examples



# Metric definition, education and reliability of monitors

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**FROM THE ARCHIVES**

Math Error Exaggerated TriZetto Loss Estimate  
*March 7, 2001*

Math Error Inflated Ventura Blvd. Cost : Traffic: Mistake...  
*November 18, 1994*

## Mars Probe Lost Due to Simple Math Error

October 01, 1999 | ROBERT LEE HOTZ | TIMES SCIENCE WRITER

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NASA lost its \$125-million Mars Climate Orbiter because spacecraft engineers failed to convert from English to metric measurements when exchanging vital data before the craft was launched, space agency officials said Thursday.

A navigation team at the Jet Propulsion Laboratory used the metric system of millimeters and meters in its calculations, while Lockheed Martin Astronautics in Denver, which designed and built the spacecraft, provided crucial acceleration data in the English system of inches, feet and pounds.

<https://mars.jpl.nasa.gov/msp98/news/mco990930.html>

**The New York Times** [SUBSCRIBE NOW](#) [LOG IN](#)

ARCHIVES | 1983

# JET'S FUEL RAN OUT AFTER METRIC CONVERSION ERRORS

By RICHARD WITKIN

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<https://www.nytimes.com/1983/07/30/us/jet-s-fuel-ran-out-after-metric-conversion-errors.html>



# Availability & Downtime

| Availability %                    | Downtime per year           | Downtime per month         | Downtime per week          | Downtime per day           |
|-----------------------------------|-----------------------------|----------------------------|----------------------------|----------------------------|
| <b>90% ("one nine")</b>           | <b>36.5 days</b>            | <b>72 hours</b>            | <b>16.8 hours</b>          | <b>2.4 hours</b>           |
| 95%                               | 18.25 days                  | 36 hours                   | 8.4 hours                  | 1.2 hours                  |
| 97%                               | 10.96 days                  | 21.6 hours                 | 5.04 hours                 | 43.2 minutes               |
| 98%                               | 7.30 days                   | 14.4 hours                 | 3.36 hours                 | 28.8 minutes               |
| <b>99% ("two nines")</b>          | <b>3.65 days</b>            | <b>7.20 hours</b>          | <b>1.68 hours</b>          | <b>14.4 minutes</b>        |
| 99.5%                             | 1.83 days                   | 3.60 hours                 | 50.4 minutes               | 7.2 minutes                |
| 99.8%                             | 17.52 hours                 | 86.23 minutes              | 20.16 minutes              | 2.88 minutes               |
| <b>99.9% ("three nines")</b>      | <b>8.76 hours</b>           | <b>43.8 minutes</b>        | <b>10.1 minutes</b>        | <b>1.44 minutes</b>        |
| 99.95%                            | 4.38 hours                  | 21.56 minutes              | 5.04 minutes               | 43.2 seconds               |
| <b>99.99% ("four nines")</b>      | <b>52.56 minutes</b>        | <b>4.38 minutes</b>        | <b>1.01 minutes</b>        | <b>8.66 seconds</b>        |
| 99.995%                           | 26.28 minutes               | 2.16 minutes               | 30.24 seconds              | 4.32 seconds               |
| <b>99.999% ("five nines")</b>     | <b>5.26 minutes</b>         | <b>25.9 seconds</b>        | <b>6.05 seconds</b>        | <b>864.3 milliseconds</b>  |
| <b>99.9999% ("six nines")</b>     | <b>31.5 seconds</b>         | <b>2.59 seconds</b>        | <b>604.8 milliseconds</b>  | <b>86.4 milliseconds</b>   |
| <b>99.99999% ("seven nines")</b>  | <b>3.15 seconds</b>         | <b>262.97 milliseconds</b> | <b>60.48 milliseconds</b>  | <b>8.64 milliseconds</b>   |
| <b>99.999999% ("eight nines")</b> | <b>315.569 milliseconds</b> | <b>26.297 milliseconds</b> | <b>6.048 milliseconds</b>  | <b>0.864 milliseconds</b>  |
| <b>99.9999999% ("nine nines")</b> | <b>31.5569 milliseconds</b> | <b>2.6297 milliseconds</b> | <b>0.6048 milliseconds</b> | <b>0.0864 milliseconds</b> |

Simplified formula:

$$Availability = \frac{(Total\ Requests - Failed\ Requests)}{Total\ Requests} \%$$

$$A = \frac{T - F}{T} \%$$

[https://en.wikipedia.org/wiki/High\\_availability](https://en.wikipedia.org/wiki/High_availability)

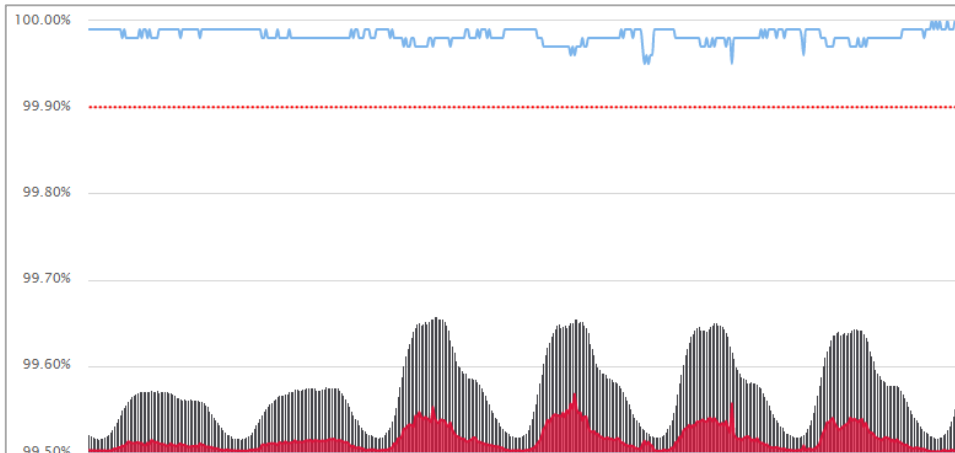


# Hitting the target and missing the point

$$A = \frac{T - F}{T} \%$$

The screenshot shows a search engine results page for the query 'camera reviews'. The search bar at the top contains the text 'camera reviews' and a magnifying glass icon. Below the search bar, there are navigation tabs for 'All', 'Images', 'Videos', 'Maps', 'News', 'Shop', and 'My saves'. The main content area is divided into two columns. The left column contains search results, including an advertisement for 'Netgear Surveillance - Best Buy' and several organic results from 'CNET' and 'Digital Photography Review'. The right column is titled 'Shop for camera reviews' and displays a grid of camera products with their prices and ratings. The overall layout is clean and organized, with clear navigation and relevant search results.

- Bad config led to no web results to the user, just ads
- Remember that one metric may not tell the whole story
- Opposing Metrics



# The Million Dollar Homepage™

1,000,000 pixels • \$1 per pixel • Own a piece of internet history!

Sold: 1,000,000 pixels available: 0

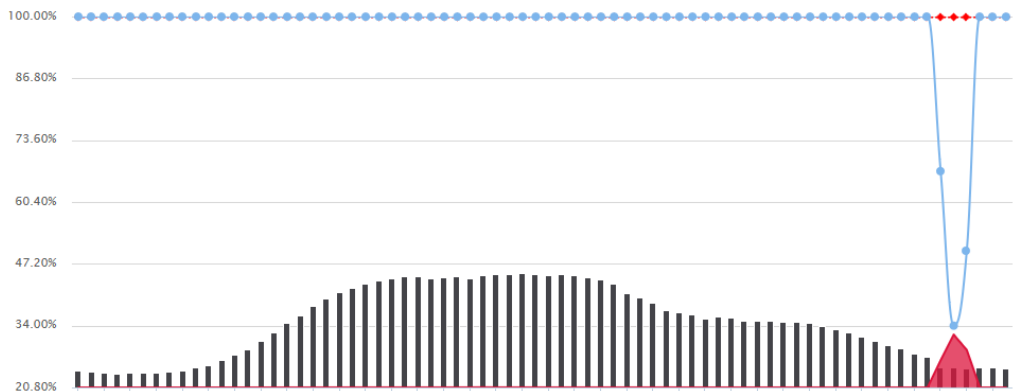
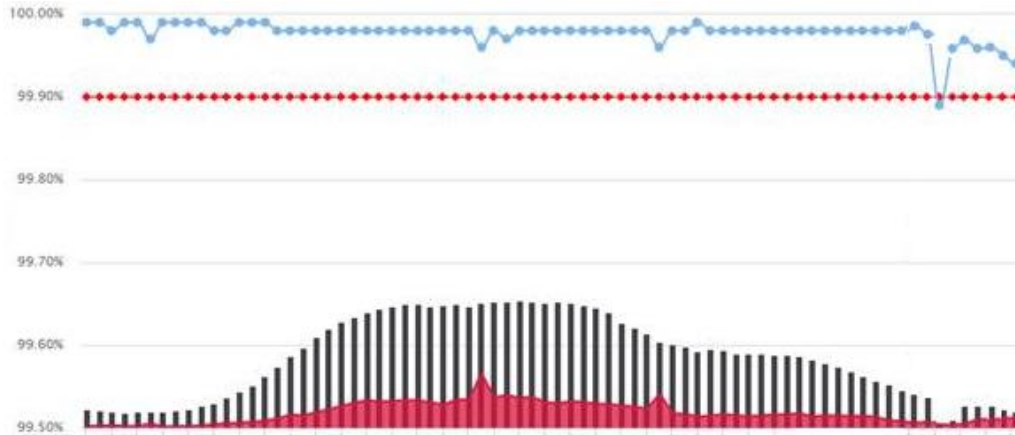
Follow @tewy 13K followers  
Homepage | Buy Pixels | FAQ | Blog | Pixel List | Press | Testimonials | Contact me

The main content of the page is a vast, intricate mosaic of small, colorful advertisements and text blocks. Each block represents a different offer or service, such as 'FREE HOSTING', 'RentClicks', 'WebHosting', 'CASINOSCAMs', 'FREE PIXELS', 'tabmarks', 'WOMEN Pixels', and '15¢ Pixel'. The blocks are arranged in a grid-like pattern, creating a highly detailed and visually busy scene. The colors are vibrant and varied, contributing to the overall aesthetic of the homepage.

# How and where you measure matters

$$A = \frac{T-F}{T} \%$$

- Traffic black-holing - Drop at CDN/Edge
- High availability at service level, but drop in incoming volume
- *Anomaly detection* can identify changes in volume
- Outside-in monitoring should supplement internal metrics
- Incorrect sample sizes can also affect your metric



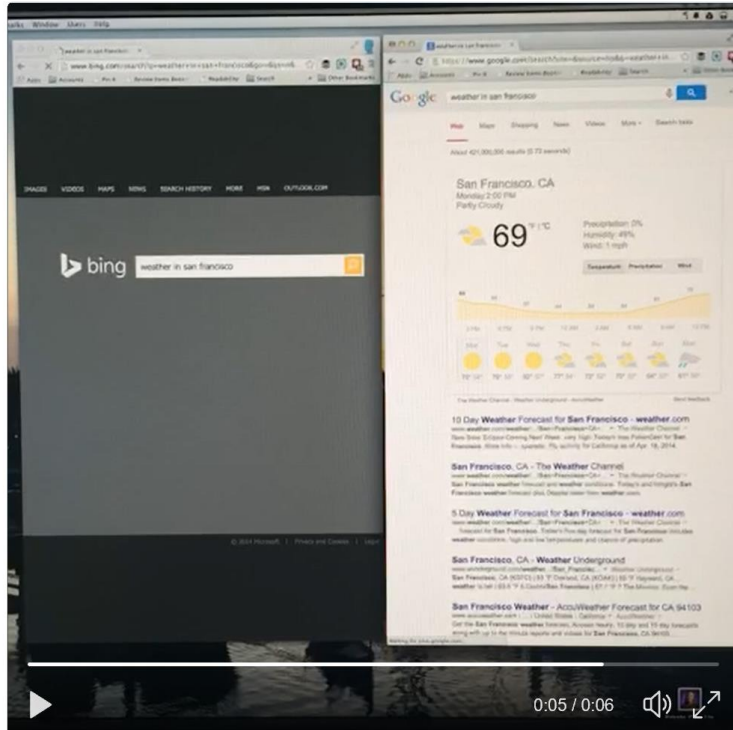
# Gaps in measurement



**Danny Sullivan** ✓  
@dannysullivan

Following

Changing default back to Google from Bing because can't take this slowness. It's pretty insane, Google load...



## Danny Sullivan's post on Vine

Changing default back to Google from Bing because can't take this slowness. It's pretty insane, Google loads faster even with Bing headstart

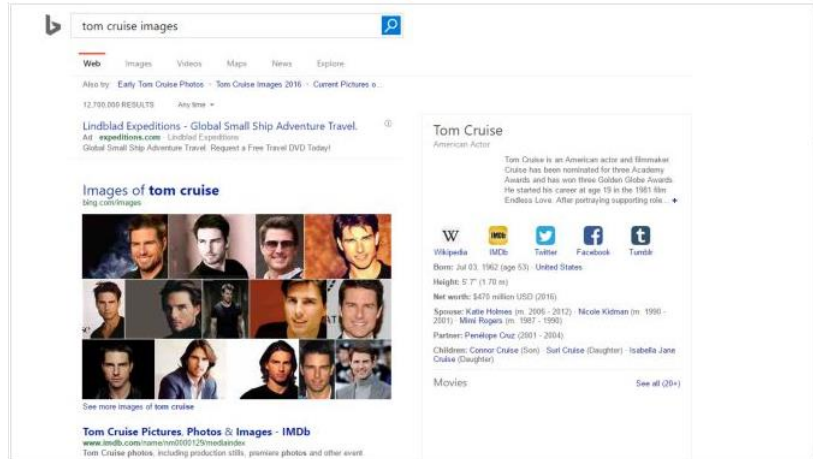
[View on Vine](#)

- Terrible slowness for a small segment of users
- PLT tracked at 75<sup>th</sup> or 95<sup>th</sup> didn't show issues
- Investigation and findings led to additional dimensions

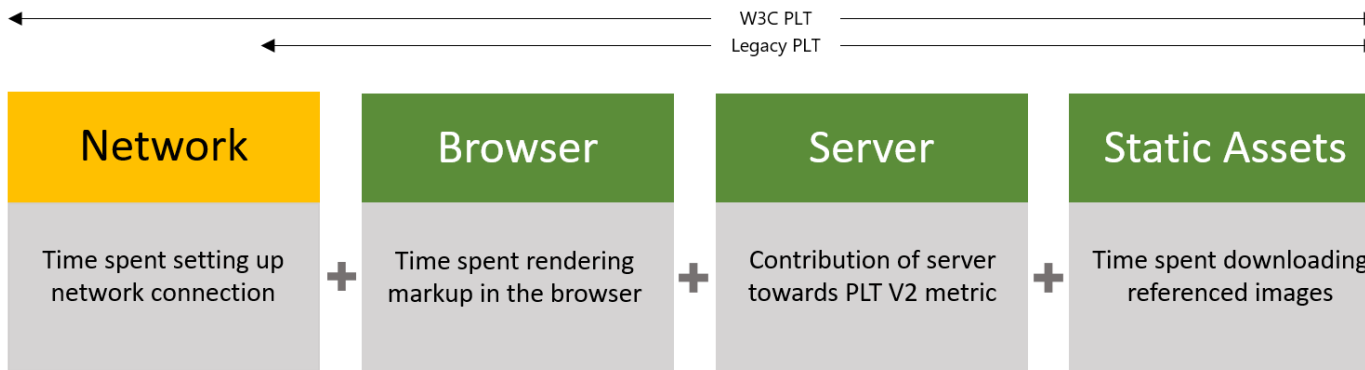




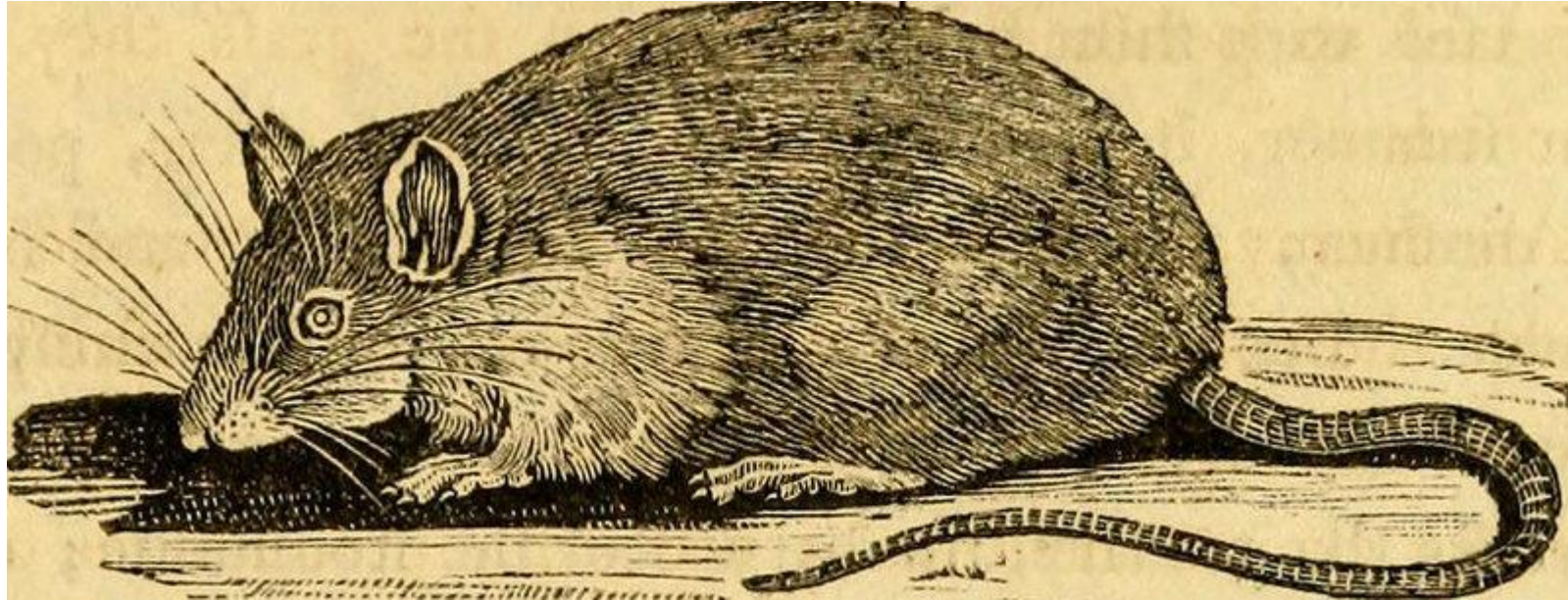
# Performance measurement journey



- Periodic update of metrics
- Above fold vs below fold



# The great Hanoi rat massacre



<https://flic.kr/p/ovusTD>

More: <http://freakonomics.com/media/vannrathunt.pdf>  
<https://www.atlasobscura.com/articles/hanoi-rat-massacre-1902>

# Unintended consequences - Window tax



[https://en.wikipedia.org/wiki/Window\\_tax#/media/File:Window\\_Tax.jpg](https://en.wikipedia.org/wiki/Window_tax#/media/File:Window_Tax.jpg)



[https://en.wikipedia.org/wiki/Window\\_tax#/media/File:Windows\\_in\\_Brighton\\_Street,\\_Edinburgh.jpg](https://en.wikipedia.org/wiki/Window_tax#/media/File:Windows_in_Brighton_Street,_Edinburgh.jpg)

# Closing thoughts

- High data quality
  - Correctness, completeness and cleanliness
- Periodic metrics update
  - Metrics do get “gamed”
- Wrong incentives – unintended consequences
- Metrics overload
- Percentiles can hide problems
- Some metrics do flat-line. Important to let them not regress



# Questions?

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