Availability
Thinking beyond 9's

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Adding 9's to Bing
Since 2009
Recently, Firefox had an incident in which most add-ons stopped working. This was due to an error on our end: we let one of the certificates used to sign add-ons expire which had the effect of disabling the vast majority of add-ons. Now that we've fixed the problem for most users and most people's add-ons are restored, I wanted to walk through the details of what happened, why, and how we repaired it.

https://hacks.mozilla.org/2019/05/technical-details-on-the-recent-firefox-add-on-outage/
Available, but is it useful?
Availability & Downtime

Simplified formula:

\[ \text{Availability} = \left( \frac{\text{Total Requests} - \text{Failed Requests}}{\text{Total Requests}} \right) \times 100\% \]

\[ A = \left( \frac{T - F}{T} \right) \times 100\% \]

<table>
<thead>
<tr>
<th>Availability %</th>
<th>Downtime per year</th>
<th>Downtime per month</th>
<th>Downtime per week</th>
<th>Downtime per day</th>
</tr>
</thead>
<tbody>
<tr>
<td>90% (&quot;one nine&quot;)</td>
<td>36.5 days</td>
<td>72 hours</td>
<td>16.8 hours</td>
<td>2.4 hours</td>
</tr>
<tr>
<td>96%</td>
<td>18.25 days</td>
<td>38 hours</td>
<td>8.4 hours</td>
<td>1.2 hours</td>
</tr>
<tr>
<td>97%</td>
<td>10.56 days</td>
<td>21.6 hours</td>
<td>5.04 hours</td>
<td>43.2 minutes</td>
</tr>
<tr>
<td>98%</td>
<td>7.30 days</td>
<td>14.4 hours</td>
<td>3.36 hours</td>
<td>28.8 minutes</td>
</tr>
<tr>
<td>99% (&quot;two nines&quot;)</td>
<td>3.65 days</td>
<td>7.20 hours</td>
<td>1.68 hours</td>
<td>14.4 minutes</td>
</tr>
<tr>
<td>99.5%</td>
<td>1.83 days</td>
<td>3.60 hours</td>
<td>50.4 minutes</td>
<td>7.2 minutes</td>
</tr>
<tr>
<td>99.8%</td>
<td>17.52 hours</td>
<td>86.23 minutes</td>
<td>20.16 minutes</td>
<td>2.88 minutes</td>
</tr>
<tr>
<td>99.9% (&quot;three nines&quot;)</td>
<td>8.76 hours</td>
<td>43.8 minutes</td>
<td>10.1 minutes</td>
<td>1.44 minutes</td>
</tr>
<tr>
<td>99.95%</td>
<td>4.38 hours</td>
<td>21.56 minutes</td>
<td>5.04 minutes</td>
<td>43.2 seconds</td>
</tr>
<tr>
<td>99.99% (&quot;four nines&quot;)</td>
<td>52.96 minutes</td>
<td>4.38 minutes</td>
<td>1.01 minutes</td>
<td>8.66 seconds</td>
</tr>
<tr>
<td>99.995%</td>
<td>26.28 minutes</td>
<td>2.16 minutes</td>
<td>30.24 seconds</td>
<td>4.32 seconds</td>
</tr>
<tr>
<td>99.999% (&quot;five nines&quot;)</td>
<td>5.26 minutes</td>
<td>25.3 seconds</td>
<td>6.05 seconds</td>
<td>864.3 milliseconds</td>
</tr>
<tr>
<td>99.9999% (&quot;six nines&quot;)</td>
<td>31.5 seconds</td>
<td>2.59 seconds</td>
<td>604.8 milliseconds</td>
<td>86.4 milliseconds</td>
</tr>
<tr>
<td>99.99999% (&quot;seven nines&quot;)</td>
<td>3.15 seconds</td>
<td>262.97 milliseconds</td>
<td>60.48 milliseconds</td>
<td>864 milliseconds</td>
</tr>
<tr>
<td>99.999999% (&quot;eight nines&quot;)</td>
<td>315.569 milliseconds</td>
<td>26.297 milliseconds</td>
<td>6.048 milliseconds</td>
<td>0.864 milliseconds</td>
</tr>
<tr>
<td>99.9999999% (&quot;nine nines&quot;)</td>
<td>31.569 milliseconds</td>
<td>2.6297 milliseconds</td>
<td>0.6048 milliseconds</td>
<td>0.0864 milliseconds</td>
</tr>
</tbody>
</table>

https://en.wikipedia.org/wiki/High_availability
Used only weekdays
During work hours
99 or 99.9%?
100,000 Flights a day
99.9% ➞ 100 failures/day
99.999% ➞ 1 failure/day
99.99999% ➞ 0.01 failure/day
99.99999% ➞ 3.65 failures/year
How do you measure Availability?
Remember our formula?

\[
\text{Availability} = \frac{(\text{Total Requests} - \text{Failed Requests})}{\text{Total Requests}} \times 100\%
\]

\[
A = \frac{(T - F)}{T} \times 100\%
\]
What’s a failure?

- HTTP 5xx responses
- Error pages
- Slow responses
- No results
- No algo pages

System to User
What about total traffic?

- Measure at Bing origin
- Difference between CDN & Origin
- Traffic that can’t reach our CDN
- Network error logging (NEL)
Things to consider...

• How many 9’s?
  • Guided by user expectation & business needs
  • Think of diminishing returns

• Where and how you measure matters

• Synthetic monitoring can hide issues

• Client issues cannot be ignored

• Metrics need to evolve over time

• Outages/failures can affect metrics

• Reliable telemetry pipeline is critical
Track 2

Room 331–332

Understanding Business Metrics Can Make You a Better SRE
Friday, 2:00 pm–3:00 pm
Mohit Suley, Microsoft, and Kurt Andersen, LinkedIn

Practical Instrumentation for Observability
Wednesday, 12:00 pm–12:30 pm
Gabe Krabbe, Google

Show details ▼
Questions?

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