

Site Reliability Engineering: What you need to know about Service Level Indicators (SLIs), Service Level Objectives (SLOs) and Error Budgets

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What does «reliability» mean to you?



A word cloud of responses to the question "What does reliability mean to you?". The words are arranged in a circular pattern around the center. The most prominent words are "consistency" (large blue font), "stability" (large pink font), and "trust" (large red font). Other words include "does what i expect" (purple), "software quality" (orange), "trusting the outcome" (green), "availability" (pink), "confidence" (orange), "trustworthy" (yellow), "failure-free" (blue), "constant" (blue), "according specification" (yellow), "reachability" (red), "performance" (green), "uptime" (pink), and "reliability" (purple).

does what i expect

software quality

trusting the outcome

availability

trust

consistency

confidence

trustworthy

stability

failure-free

constant

according specification

reachability

performance

uptime

reliability

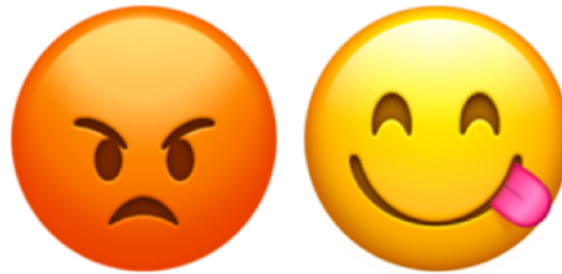
**Reliability is the most
important feature
of any system**

SLI: Service Level Indicator

A quantifiable measure of service reliability

SLO: Service Level Objective

Set a reliability target for an SLI



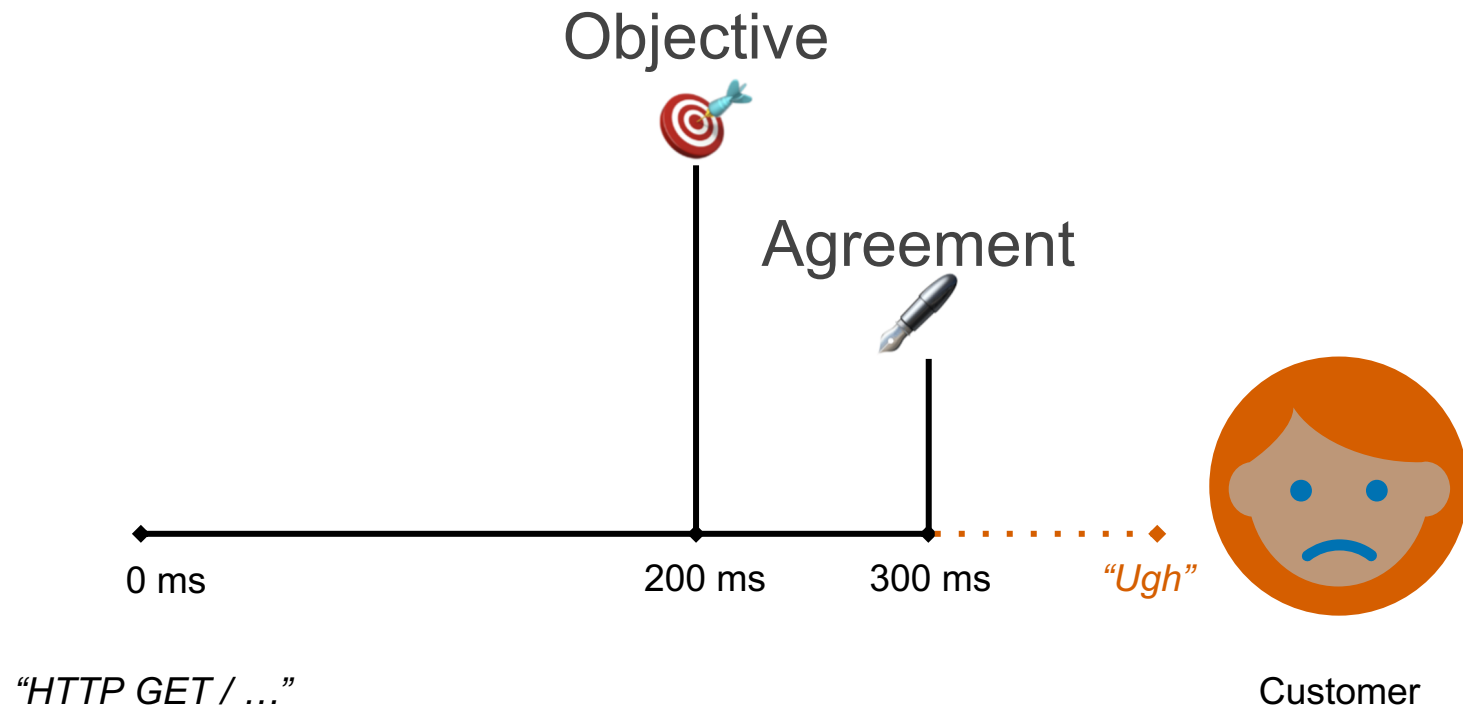
SLOs should capture the performance and availability levels that, if **barely met**, would keep the **typical customer** of a service happy

“meets SLO targets” ⇒ “happy customers”

“sad customers” ⇒ “misses SLO targets”

Source: The Art of SLOs by Google <https://cre.page.link/art-of-slos>

SLOs and SLAs

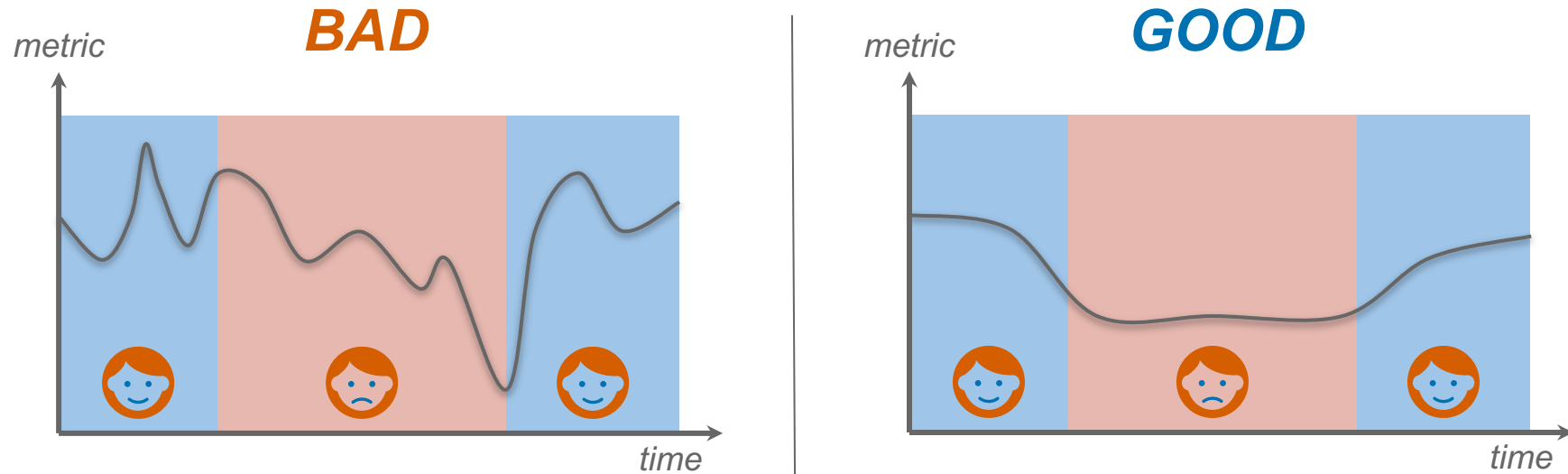


Source: The Art of SLOs by Google <https://cre.page.link/art-of-slos>

Error Budgets

- An SLO implies an acceptable level of unreliability
 - This is a budget that can be allocated

Choosing a good SLI



$$\text{SLI} : \left(\frac{\text{good events}}{\text{valid events}} \right) \times 100\%$$

Source: The Art of SLOs by Google <https://cre.page.link/art-of-slos>



SLI Menu



Request / Response

Availability
Latency
Quality



Data Processing

Coverage
Correctness
Freshness
Throughput

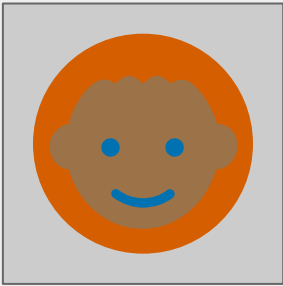


Storage

Throughput
Latency

Example: Fang Faction Game

https://fangfactiongame.com/profile/someuser



SomeUser
Tribe of Frog
 Faction Score: **31337**
[Midwest Canyon](#)

Faction Name:

Leader Name:

Email Address:

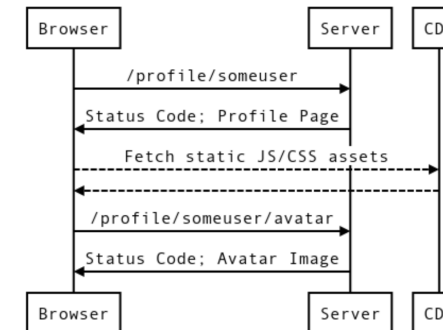
1. Tri-Bool 65535
2. 61995
3. Tri Repetae 52391
4. Triassic Five 37164
5. Tricky Hobbits 31337
6. Tribe of Frog 29243

Trite Examples

User Journeys

View Profile Page

Players can log into their game account, view their settlement and make profile changes from a web browser. A player loading their profile page is a simple journey that we will go through together in the workshop.



Example: SLI Implementations

Availability

Proportion of **HTTP GET** requests
for **/profile/{user}** or **/profile/{user}/avatar**
that have **2XX**, **3XX** or **4XX (excl. 429)** status
measured at the **load balancer**

and

Proportion of **HTTP GET** requests
for **/profile/prober_user** and **all linked resources**
returning **valid HTML containing "ProberUser"**
measured by a **black-box prober** every 5s

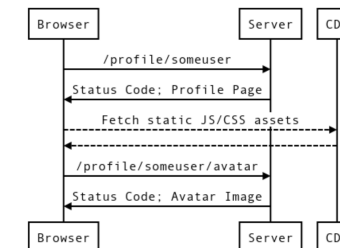
Latency

Proportion of **HTTP GET** requests
for **/profile/{user}**
that send their **entire response within X ms**
measured at the **load balancer**

User Journeys

View Profile Page

Players can log into their game account, view their settlement and make profile changes from a web browser. A player loading their profile page is a simple journey that we will go through together in the workshop.



Source: The Art of SLOs by Google <https://cre.page.link/art-of-slos>

User Journey: Home Page Load

SLI Type: Latency

SLI Specification:

Proportion of **home page requests** that were served in **< 100ms**

(Above, "[home page requests] served in <100ms" is the numerator in the SLI Equation, and "home page requests" is the denominator.)

SLI Implementations:

- Proportion of **home page requests** served in **< 100ms**, as measured from the 'latency' column of the **server log**.
(**Pros/Cons:** This measurement will miss requests that fail to reach the backend.)
- Proportion of **home page requests** served in **< 100ms**, as measured by **probers** that execute javascript in a browser running in a virtual machine.
(**Pros/Cons:** This will catch errors when requests cannot reach our network, but may miss issues affecting only a subset of users.)

SLO:

99% of home page requests in **the past 28 days** served in < 100ms.

Summary

SLI

service level indicator: a monitoring metric that is indicative of a user's goal

SLO

service level objective: a target on an SLI that if barely met, keeps the user happy

SLA

service level agreement: SLO + consequences

Error Budget

the maximum amount of time the system can fail without contractual consequences. It is the remainder / inverse of the SLO

Further Information

- The ART of SLOs:
<https://cre.page.link/art-of-slos>
- Site Reliability Engineering: Measuring and Managing Reliability
<https://www.coursera.org/learn/site-reliability-engineering-slos>
- Site Reliability Engineering Books (free):
<https://landing.google.com/sre/books/>