

Error Budget Formulas

Symbol[s]	Unit	Description
SLI	%	Service Level Indicator. A quantifiable measure of service reliability that tells you if things are working.
SLO	%	Service Level Objective. A reliability target for an SLI that tells you if the users are happy or sad.
SLA	%	Service Level Agreement. A contract that the service provider promises users on service reliability. Agreed reliability targets should be more relaxed than the internal SLOs to give enough room for unexpected outages.
Target	%	SLO Target. It is the availability target (%) defined by the SLO.
Budget	%	Error Budget. Either the number of requests out of the total requests or the amount of time for a given period, a system can afford to be unreliable before users become unhappy.
Burn Rate	R+	It is an indicator that define how fast, relative to the SLO, the service consumes the error budget.
Max Burn Rate	R+	It is the max value allowed given the budget percentage.
Budget Window	h	The length of the error budget window. We recommend 30 days (720 hours). It usually is 7, 30, or 90 days.
Alert Window	h	It is a time window (in hours) in which we'd calculate the burn rate and notify the team if the budget is burning too fast. For example: 1 hour.
Budget Remaining	%	Error Budget Remaining. The remaining error budget within the Budget Window
Budget Consumed	%	It is the percentage of Error Budget consumed within a time-period. For alerts, it refers to the Alert Window.
Current Status	%	It is the SLI value (%) over the budget window.
Budget Consumption Time	h	Time (hours) until error budget is fully consumed within the time window.
Window Budget	h	Is the total amount of time we can spend with a completa outage that will consume the entire Budget.

$$\text{Current Status} = 100 \cdot \frac{\text{good behavior during time period}}{\text{total behavior during time period}}$$

$$\text{Error Rate} = 1 - \frac{\text{good behavior during time period}}{\text{total behavior during time period}}$$

$$\text{Budget} = 100\% - \text{Target} \qquad \text{Budget Remaining} = 100 \cdot \frac{\text{Current Status} - \text{Target}}{100 - \text{Target}}$$

$$\text{Burn Rate} = \frac{\text{Budget Window}}{\text{Budget Consumption Time}}$$

$$\text{Max Burn Rate} = \frac{100\%}{\text{Budget}}$$

$$\text{Burn Rate} = \frac{\text{Error Rate}}{\text{Budget}}$$

$$\text{Window Budget} = \frac{\text{Budget Window} \cdot \text{Budget}}{100}$$

$$\text{Burn Rate} = \frac{\text{Budget Window} \cdot \text{Budget Consumed}}{\text{Alert Window} \cdot 100\%}$$

$$\text{Budget Consumed} = \frac{100 \cdot \text{Alert Window}}{\text{Window Budget}}$$

$$\text{Burn Rate} = \frac{\text{Budget Window}}{\text{Alert Window} \cdot \text{Window Budget}}$$