Gatling

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• WHITEPAPER

Reducing production risk in modern systems

Chapter 1: performance testing for APIs

A practical framework for teams who want to prevent performance incidents, not just run load tests.

Why performance incidents keep happening?

Modern systems are built on APIs.

Web applications, mobile clients, internal services, partners, payments, and AI features all depend on them. When an API degrades, the impact is immediate and systemic: latency propagates, retries amplify load, queues fill up, and user experience collapses upstream.

Yet most production incidents aren't caused by missing features or obvious bugs.
They're caused by **unknown performance behavior:**

- traffic patterns no one modeled
- limits no one measured
- failure modes no one validated

Most teams do load testing. Few teams use it as **a risk management practice.**

This ebook explains how to move from running tests to reducing API production risk, using clear intent, ownership, and decision-making.

What "reducing risk" really means for API performance

Reducing performance risk isn't about testing everything or chasing perfect numbers.
It's about **removing uncertainty where failure would hurt most.**

For APIs, that uncertainty usually falls into four categories:

RISK TYPE	WHAT GOES WRONG
Coverage risk	The critical APIs or scenarios weren't tested
Reality risk	Tests didn't match real traffic or environments
Interpretation risk	Results existed, but no one knew what to decide
Ownership risk	No one was accountable for acting on the signal

> **A risk-based performance strategy deliberately addresses all four.**

1. COVERAGE RISK

Prioritize performance coverage for high-risk APIs

One of the biggest hidden risks is **what never gets tested.**

Start by building an API risk map.

Instead of treating all endpoints equally, teams should explicitly identify APIs that fall into one or more categories:

API CATEGORY	DESCRIPTION	RISK LEVEL	FAILURE IMPACT	IDEAL TEST FREQUENCY	TYPE OF TESTS
Critical-path APIs	Authentication, checkout, payments, core business flows	🟧🟧🟧🟧🟧	**Revenue / access blocked.** Users can’t log in or complete core actions.	Before each release	**Smoke · Ramp–Hold**
High-traffic APIs	Endpoints hit by most users or services	🟧🟧🟧🟧⬜	**Platform-wide slowdown.** Minor regressions explode at scale.	Weekly baseline + regression	**Ramp–Hold · Soak**
Fan-out APIs	APIs that amplify load across multiple downstream dependencies	🟧🟧🟧🟧⬜	**Cascading failure.** One call overloads multiple systems.	On infra/dependency changes (and before major releases)	**Capacity · Breakpoint · Stress**
Externally exposed APIs	Public, partner, or mobile-facing endpoints	🟧🟧🟧⬜⬜	**Unpredictable spikes hit first.** External traffic triggers failure modes early.	Monthly + before major updates	**Breakpoint · Stress**
Change-heavy APIs	Frequently modified endpoints with high regression risk	🟧🟧🟧⬜⬜	**Silent regressions ship.** Performance issues appear only in production.	On every change	**Smoke · Ramp–Hold**

This turns performance testing from a best-effort activity into intentional coverage.

2. REALITY RISK

Craft tests that actually reduce risks

Most performance surprises come from tests that look valid **but don't reflect production.**
When the workload or environment is wrong, results create false confidence, worse than no test.

The common gaps (what teams keep missing)

- **Traffic is too clean** (smooth ramps) instead of bursts, plateaus, retries
- **Topology is simplified** (no gateways/auth/timeouts) so you skip the real bottlenecks
- **Data is too small** so you never see cache misses and cold paths
- **Limits are absent** (no rate limits, pools, autoscaling) so failures never appear

"False confidence" patterns to avoid (and what to do instead)

REALITY DIMENSION	COMMON MISTAKE	WHAT A TEST MUST INCLUDE	WHAT YOU CATCH
Traffic shape	Smooth ramp-up only	Bursts + plateaus + retries + concurrency mix	Latency spikes, queue buildup, retry storms
Topology	Direct-to-service (bypassing edge layers)	Gateways, auth layers, routing, timeouts	Bottlenecks at the edge, timeout cascades
Data scale	Tiny dataset / always warm cache	Production-like datasets + cold vs warm paths	Cache miss penalties, DB amplification
Limits	"Infinite" system (no throttles/ pools/autoscale)	Rate limiting, connection pools, autoscaling thresholds	Saturation points, throttling behavior, instability

Load testing patterns as risk controls

RISK TO CONTROL	QUESTION ANSWERED	LOAD TESTING PATTERN	CONFIDENCE SIGNAL
Broken execution paths	Does the API still work under concurrency?	Smoke	Error rate · response codes
SLO breach at peak	Do latency objectives hold at expected load?	Ramp–Hold	p95 / p99 stability
Unknown capacity limits	How much traffic can we sustain before degrading?	Capacity	Max throughput · saturation point
No safety margin	How far can we push before things break?	Breakpoint	Error cliffs · latency spikes
Uncontrolled overload behavior	How does the API behave beyond safe limits?	Stress	Timeouts · retry storms · recovery behavior
Slow degradation over time	Does performance drift under sustained load?	Soak	Latency drift · resource leaks

3. INTERPRETATION RISK

Map load testing patterns to performance risks

Performance testing only reduces risk when results lead to decisions. Many teams run the right tests, on the right APIs, under realistic conditions, and still ship incidents.

Why? Because results exist, but **no one knows what they mean, what question they answer, or what action they trigger.**

Interpretation risk appears when:

- Metrics are observed but not contextualized
- Dashboards are reviewed but not acted on
- Failures are debated instead of decided

Every recurring test should have:

An owner: accountable for interpretation
A question: the risk this test reduces
A decision path: what happens next

Interpretation risk: common anti-patterns and how to fix them

ANTI-PATTERN	WHAT GOES WRONG	RISK INTRODUCED	WHAT A GOOD TEST DEFINES
Metrics without intent	Numbers look "fine" but no one knows why they matter	Silent regressions shipping unnoticed	The specific risk this test is meant to reduce
Dashboards without ownership	Everyone looks, no one decides	Delayed or inconsistent reactions	A named owner accountable for interpretation
Results without thresholds	No clear pass / fail signal	Endless debates, subjective calls	Explicit SLOs or guardrails
Tests without decision paths	Failures trigger analysis, not action	Known issues remain unresolved	A predefined decision tree
One-size-fits-all interpretation	Same judgment for smoke, stress, soak	Wrong conclusions from the wrong test	Interpretation aligned to test pattern

A simple decision model

RESULT	ACTION
Meets SLO/Stable	Ship
Minor degradation	Ship with mitigation or follow-up
Breaks SLO/Unstable	Block release or rollback

These decisions assume the test reflects production conditions.

If the workload, data, or environment is unrealistic, the decision itself is invalid.

Make performance everyone's responsibility

Performance risk cannot live with one role alone. **Successful teams adapt ownership to their structure.**

Below are three common operating models, **all compatible with Gatling.**

Developer-led model

ROLE	ROLE ON LOAD TESTING	RESPONSIBILITY
Developers	Craft and maintain tests	Own scenarios alongside API code
Developers	Run in CI	Execute smoke and regression tests
Tech leaders	Analyze and triage	Investigate regressions
Eng leaders	Decide and gate	Release decisions

QA / performance-champion model

ROLE	ROLE ON LOAD TESTING	RESPONSIBILITY
QA / Performance engineers	Maintain test architecture	Patterns, baselines, data
QA / Performance engineers	Run & operate	Pre-release campaigns
Developers	Craft scenarios	Endpoint logic & payloads
Eng / Product leads	Decide & gate	Accept or mitigate risk

Platform / SRE-led model

ROLE	ROLE ON LOAD TESTING	RESPONSIBILITY
SRE / Platform engs	Maintain architecture	Global profiles, environments
SRE / Platform engs	Run and analyze	Capacity and resilience testing
Developers	Support scenarios	Business logic correctness
Leadership	Set guardrails	Safe operating range

A lightweight cadence that works

- **Daily (CI / PR):** smoke or micro-tests
- **Weekly:** baseline regression detection
- **Before release:** ramp–hold vs SLOs
- **Quarterly / infra change:** capacity + resilience

This creates a habit, not a fire drill.

Why performance incidents keep happening?

Production incidents rarely come from a single bad deploy or an obvious bug.

They emerge when systems behave in ways teams did not anticipate under load.

An API slows down.
Retries amplify traffic.
Dependencies inherit pressure.

Failures propagate faster than humans can reason about them.

This is systemic risk — and it cannot be managed with ad hoc testing or last-minute performance checks.

Reducing API production risk requires a different posture:

- Deciding which APIs matter most
- Testing them under conditions that reflect real traffic and real limits
- Running the right load patterns for the right questions
- Agreeing in advance on what results mean and who acts on them

Most importantly, it requires treating performance testing as a decision-making system, not a reporting exercise.

When teams do this well, performance testing stops being reactive.

It becomes a way to:

- Expose failure modes early
- Set safe operating boundaries
- Validate architectural assumptions
- Ship with confidence instead of hope

Remember, performance incidents are not inevitable. They are usually the result of unanswered questions about capacity, behavior, and failure.

Gatling

Gatling is the leading solution for modern load testing, enabling developers and organizations to deliver fast, reliable applications at scale.

With its powerful open-source and enterprise platforms, Gatling empowers teams to test APIs, microservices, and web apps in real-world conditions.

Trusted by thousands of companies worldwide, Gatling is the performance backbone for development, QA, and DevOps teams building the next generation of software.

Whether you're scaling APIs, migrating to the cloud, or handling flash traffic spikes, Gatling helps you deliver fast, reliable performance.

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