Header

Title: Verification Gaps in Real-World Simulation for Software Updates
Product Line: Cross-Portfolio
Related Project: Firmware Update Triggering False High-Priority Alerts
Primary Teams: R&D (Software), Quality
Document Type: Lessons Learned
Keywords: firmware risk, alarm sensitivity, real-world simulation, alert fatigue, post-market monitoring, software verification

---

Context

A firmware update intended to enhance alert sensitivity led to unintended high-priority alerts in certain real-world usage conditions. While compliant under baseline verification scenarios, variability in field usage exposed simulation gaps.

Observed Patterns

- Minor sensitivity adjustments produced amplified behavioural impact in real-world environments.
- Verification relied heavily on controlled lab datasets.
- Field variability was underrepresented in simulation inputs.
- Early complaint signals were fragmented across regions.
- Alarm fatigue implications were not explicitly modelled.

Root Causes Identified

- Incomplete modelling of real-world behavioural variability.
- Limited scenario diversity during verification phase.
- Risk assessment focused on detection performance rather than behavioural response.
- Delay in aggregating complaint signals across markets.

Effective Interventions

- Expanded scenario-based testing including diverse usage datasets.
- Formal inclusion of field variability review during design change approval.

- Integration of alert fatigue consideration into risk documentation.
- Strengthened early-warning complaint aggregation mechanisms.
- Defined rollback and remediation protocol for firmware releases.

Generalised Lessons

1. Software modifications must be evaluated for behavioural system effects, not just technical compliance.
2. Real-world simulation datasets should reflect geographic and user variability.
3. Alarm-related risks require explicit consideration of user response dynamics.
4. Complaint aggregation mechanisms must detect weak signals early.
5. Rollback planning should be built into all firmware release strategies.

Applicability to Future Projects

Applicable to:

- Firmware updates
- Algorithm sensitivity tuning
- Alarm logic redesign
- Remote software patch deployments
- Any software-driven performance modification